MENTAL HEALTH CARE SYSTEM PERFORMANCE AND RESILIENCE IN THE EUROPEAN UNION COUNTRIES

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Abstract

The mental health of citizens is essential for the quality of life and economic development. Despite its importance, mental illness is increasing across European Union (EU) countries, intensified by the COVID-19 pandemic, to meet growing needs. The article evaluates the performance of EU mental health care systems in the EU from 2016 to 2020. The research assesses mental health care policies and indicators monitored by the Organization for Economic Co-operation and Development (OECD). It applies the technique for order of preference by similarity to ideal solution (TOPSIS) method. The result is a comparison of the performance of mental health care systems in the EU member countries, highlighting the strengths and the weaknesses of the implemented mental health care systems.

Keywords

European Union; Evaluation; Mental illness; TOPSIS.

Introduction

Mental health is integral to human health and significantly impacts societal resilience and a productive economy (OECD/European Union, 2022). According to World Health Organization (WHO), good mental health is when people feel well and can use their abilities to manage stress, work, and contribute to society (WHO, 2021b). Based on the principles of an economically advanced society, the population's mental health becomes the highest value to be promoted and protected (Prince et al., 2007; Petruzyte et al., 2017). However, the burden associated with psychological problems is extreme in the EU (Eurostat, 2023). Winkler & Janoušková (2013) state that there is an increasing burden due to mental illnesses and an increase in their share of the total burden for all diseases in the countries of the EU in recent periods. According to the OECD data, at least €600 billion (600 billion euros) is spent on mental health annually in the EU-27 countries and the United Kingdom, representing more than 4% of Gross Domestic Product (GDP) (OECD/European Union, 2022; Eurostat, 2023). For this reason, health care focused on mental health is also at the forefront of political interest in the EU. From a social and economic point of view, improving mental health is necessary for the EU and its member countries, which has become clearer since the COVID-19 pandemic (European Council, 2023).

According to (OECD, 2021), the incidence of anxiety and depression worldwide increased by 25% during the first year of the pandemic. The European Commission (2023) also reported that loneliness has increased among people in the EU. The COVID-19 pandemic has significantly worsened the mental health of young people across Europe (Racine et al., 2021;

Meda et al., 2021). The number of young people with symptoms of anxiety and depression has more than doubled in several member countries compared to pre-pandemic levels, according to data from OECD/European Union (2022). In a recent report, the United Nations Children's Fund states that in Europe, suicide is the second leading cause of death for young people (road traffic accidents are in first place). However, almost half (49%) of young people in the EU said that their healthcare needs related to their mental health problems were not met, compared to 23% of the adult population (EECEA, 2022). According to the OECD, at least 84 million people in the EU had a mental illness before the COVID-19 pandemic. This means that one in six people (17.3%) suffered from a mental illness in the EU (OECD/European Union, 2022).

Although mental health is an important part of overall well-being, it has long been a neglected area of public health (Hook & Bogdanov, 2021; Höschl et al., 2012). Recently, however, it has experienced a resurgence of importance. The political importance of the topic is related to the great potential for increasing the productivity of the economy of the EU countries (Campion & Knapp, 2018; WHO, 2023). Several studies deal with this topic in EU countries (WHO, 2021a; Winkler et al., 2017; Winkler & Janoušková, 2013), but there is still a specific research gap regarding the comprehensive assessment of EU countries using multi-criteria evaluation. The presented article focuses on the performance evaluation of the mental health care systems in the EU countries, because a well-set-up mental health care system is a priority area of public policy in all EU countries and contributes to the availability and quality of the services provided. Approaches and policy applications of EU countries vary widely in this area; therefore, the article provides a comparative view of the systems and identifies differences that may provide good practice for other countries. Compared to previous research, the added value is the orientation towards EU countries and the comparison of their performance in terms of the achieved indicator values. Research with this focus and using multi-criteria decision-making (MCDM) methods has not been published yet.

The presented article deals with research on the topic of mental health in Section 1 using a methodology that describes the use of the TOPSIS method in Section 2. It also includes a research Section 3 summarizing findings from multi-criteria analysis, including discussion and research limits in Section 4.

1 Literature Review

An individual's state of health is a significant factor in determining whether a person will live a whole life. Poor mental health significantly affects the ability to self-actualize, participate in public life, and be productive at work (WHO, 2021b). Untreated mental health conditions can result in disability, homelessness, suicide, and poor quality of life (Knifton & Inglis, 2020) and also affect the performance of the economy. Many studies report that the mental health situation of the population is worsening in Europe (Winkler & Janoušková, 2013; Young et al., 2022; OECD/European Union, 2022; Castelpietra et al., 2022; Aliev et al., 2023). The most common mental disorders include depression, anxiety disorders, eating disorders, and substance use disorders. In most cases, these disorders harm the daily life of the individual and those around them.

1.1 Mental Health of the EU Population

The health of the population can be measured based on mortality. Death as a result of mental and behavioral disorders per 100,000 inhabitants reached 28.26 on average in the period 2016-2020 in EU countries (Eurostat, 2023). The highest values were reported in the Netherlands (65.20), Denmark (59.35), Sweden (53.18), and Ireland (51.35). The burden caused by mental illness can also be expressed by the summary DALY indicator, which

indicates disability-adjusted life years (Winkler & Janoušková, 2013). The average value in the EU was 2.73. The lowest values were reached in Czechia (2.24), Slovakia (2.23), Romania (2.07), and Bulgaria (2.01) (Eurostat, 2023; Ardielli & Freibrücková, 2023).

Mental health is influenced by many factors throughout an individual's life, such as psychological or personal predispositions or social, cultural, environmental, or economic conditions. The main factors that affect an individual's mental health negatively include harsh parenting methods, bullying, unhealthy lifestyles, social changes, and stress (WHO, 2023). However, economic, environmental, and regional differences also play an important role. People living in more underdeveloped regions show a lower level of mental health than people living in richer regions. Underdeveloped regions may also show higher suicide rates (Scottish Government, 2020).

The COVID-19 pandemic has also had a significant impact on individuals` mental health. In addition to health professionals, the decline in mental health has been noted by people who were already struggling with mental illness before the pandemic. Other groups affected were people with low incomes, people who had lost loved ones due to the pandemic, and children who had lost social contact with their peers. Since the summer of 2020, there has been a significant decline in mental well-being and an increase in negative feelings (tension, anxiety, loneliness, feeling unhappy, and depression) in all age groups, reaching the lowest level in the spring of 2021. An increase in sleep disturbances in the general population has also been observed (European Commission, 2023).

Preventing mental illness and promoting mental health is key to combating the negative impacts of more than just the COVID-19 pandemic. There are several mental health prevention approaches, one of which is classified into three basic types of prevention (primary, secondary, and tertiary) (Singh et al., 2022). Primary prevention focuses on preventing the onset of mental health problems. It is a set of measures that aim to prevent and stop mental illness before it occurs. This includes promoting a healthy lifestyle (avoiding stressful situations and improving overall mental and physical health through relaxation techniques, meditation, or mindfulness). Mental health education and efforts to minimize risk factors (unhealthy habits, isolation, and unbalanced lifestyles) can also be part of primary prevention. Therefore, primary prevention aims to help people maintain good mental health and reduce the risk of mental health problems (WHO, 2021b). Secondary prevention is designed to support people who are at higher risk of developing mental health problems (individuals with pre-existing mental illness or traumatic experiences). The aim of secondary prevention is, therefore, to identify signs of mental health problems early and minimize their negative impact. In addition to providing specialist help and treatment, secondary prevention also focuses on monitoring the patient's health and preventing the return of mental illness. Tertiary prevention helps people living with mental health problems stay mentally well and improve their quality of life. The purpose of this prevention is to reduce the symptoms of people with mental health problems, enable them to successfully manage their mental well-being, and reduce the risk of relapse (Mental Health Foundation, 2021).

1.2   Mental Health Care Models in EU Countries

In mental health care, the so-called balanced model of care is often applied, emphasizing the cooperation of community and inpatient services in the care area for persons with mental illness (Thornicroft & Tansella, 2013). Community-based services are currently widely regarded as the best approach for providing mental health treatment and care, and they are also preferred by patients themselves (Krieg, 2001). However, there are still developed countries in the EU that have focused on mental health care in psychiatric hospitals so far. This approach is based on the traditional institutional concept of care as described by

Dvořáková & Kondrátová (2020) and Winkler et al. (2017). The institutional model is characterized by institutional care in residential inpatient facilities where patients are segregated and an institutional culture is enforced. Psychiatric hospitals are specialized hospital-based facilities providing inpatient care and long-stay residential services for people with severe mental disorders. According to WHO (2014), long-stay psychiatric institutions tend to be inefficient, insufficiently available, and too frequently inhumane. Patients are isolated from the community and have no control over their lives. The adverse effects of this approach and long-term hospitalization in psychiatric facilities are the stigmatization of the individuals, the institutionalization of patients, the insufficient quality of the services provided, and the reduction of patients' self-sufficiency.

Regarding public funds, psychiatric institutions consume more mental health budgets (Rajkumar, 2022; Jacobs & Lesage, 2019). It is 54% in high-income countries, but in low-income countries, it is even significantly more (median of 73%). The capacities of the psychiatric infrastructure are, therefore, the subject of internal reforms in the healthcare sector of many countries, which are based on the principles of deinstitutionalization in the long term. The institutional model is currently being superseded and gradually replaced by a more effective model of care combining institutional and community services (Saraceno et al., 2007; Dvořáková & Kondrátová, 2020; Thornicroft & Tansella, 2013).

Deinstitutionalization directly ensures that users are not exposed to the adverse effects of institutional care and promotes the sustainability of the community mental health care system (Lamb & Bachrach, 2001). Deinstitutionalization has also become a policy strongly promoted by the WHO (2021b) in the past decade when their document "Comprehensive Mental Health Action Plan 2013-2030" was adopted. The recommendations are compiled based on experiences made in Europe and worldwide, describing the transformation process from institutional care into community care. This process aims to improve the quality of life for people with disabilities and enable them to live an everyday life comparable to their peers. WHO (2014) defined five key principles for deinstitutionalization:

- community-based services must be in place;
- the health workforce must be committed to change;
- political support at the highest and broadest levels is crucial;
- timing is key;
- additional financial resources are needed.

Great importance is attached to the coordination and interconnection of individual professions and types of support and services. An important element of modern care is cooperation and long-term involvement of the entire community. The effort is to provide services in the patient's natural environment and to focus the intervention not only on alleviating the symptoms of mental illness but also on increasing independence and autonomy, the quality of life, and the development of the patient's abilities (Jailobaeva et al., 2021; Thornicroft & Tansella, 2013).

Good practice in deinstitutionalizing psychiatric care has already been done, for example, in Great Britain or the United States of America, where it has been applied for several decades. The care of people with mental illness has undergone a significant transformation in recent years, also in EU countries. Italy is an important example (the first mental health center was established in the mid-1980s). However, many other countries have recently introduced reforms to the psychiatric care system, bringing positive changes (Barbui et al., 2018; Dumont & Dumont, 2008). These changes are based on the principles of deinstitutionalization. They are mainly characterized by a shift away from care in large psychiatric hospitals and the development of robust community care to create a balanced relationship between community,

outpatient, and hospital services (Jacobs & Lesage, 2019; Killaspy et al., 2020). Indeed, this process is facilitated using innovative procedures in treatment, such as telehealth (Ardielli, 2021a; Ardielli, 2021b) and modern psychopharmaceuticals, which make it possible to manage the treatment in the home environment. In Western European countries, innovative treatment methods such as intensive home treatment, which is used in the Netherlands, are more often applied (van Asperen et al., 2022). Deinstitutionalization is a challenge, especially for the countries of Central and Eastern Europe, which have a system of psychiatric care based mainly on inpatient facilities (Winkler et al., 2017). A caveat for these reforming countries is that the mere abolition of psychiatric hospitals should not characterize deinstitutionalization, but, above all, by sufficiently allocating funds for financing and building community services (Zhou et al., 2018). Otherwise, without ensuring adequate community care, the discharge of psychiatric patients would lead to an increase in homelessness and crime in this population (Dumont & Dumont, 2008). However, the benefit of abandoning the institutional model of psychiatric care is undoubtedly an increase in humanization and a reduction in stigmatization in the care of people with mental disorders (Krieg, 2001).

2   Methodology

The article aims to evaluate the performance and resilience of mental health care systems in the EU member countries in the period from 2016 to 2020 by using the multiple-criteria decision-making method TOPSIS. The performance of the psychiatric care system is evaluated based on a review of mental health care policies and mental health indicators. The research included studies and sources from the Web of Science and Scopus databases, international reports, and comparisons of transnational organizations, primarily the EU, OECD, and WHO. Publications were selected based on relevance, timeliness, and geographical focus on EU countries. Secondary research data were obtained from the Eurostat (2023) database and the "Mental Health Atlas 2020" published by WHO (2021a). The selected period from 2016 to 2020 depends on data availability for international comparison. The availability of international data is limited; data is published with delays and more recent data is often not complete to cover all EU countries. The latest dated WHO publication is the report "Mental Health Atlas 2020" (WHO, 2021a), which is the reason for choosing the period under review.

A total of 12 indicators were selected for the research, see Table 1. They are based on significant determinants of the psychiatric care system of each country as technical capacity of hospital facilities for the care of patients with mental disorders (number of beds and psychiatric hospitals), personnel security (number of psychiatrists and nurses), financial resources to cover treatment (expenditure on healthcare), the implementation of psychiatric care policies (legislation, plans, and strategies), system of care (functional integration of mental health into primary care) and prevention systems and tools (existence of promotion and prevention programs). As a part of the research, the results of the EU-14 countries (the former Western Bloc countries – Ireland, Denmark, Portugal, Finland, Italy, Sweden, Germany, Belgium, France, Austria, Luxembourg, Greece, Netherlands, Spain) and EU-13 countries (the former Eastern Bloc countries – Slovenia, Czechia, Poland, Lithuania, Cyprus, Latvia, Estonia, Croatia, Romania, Hungary, Bulgaria, Slovakia, Malta) of the EU are compared due to different approaches to mental health care in the past decades.

The methodology aims to answer two research questions (RQ1 and RQ2) and includes a description of the analysis, input indicators, and the chosen method. TOPSIS was chosen because of its appropriateness for calculations where the input data include different scales and measurements. The research questions (RQ) are the following:

RQ1: What is the gap in the quality of mental health policies between EU-13 and EU-14 countries (according to the average c_i value in %)?

RQ2: What is the gap in the performance of mental health care systems between EU-13 and EU-14 countries (according to the average c_i value in %)?

The premise for the posed RQ1 and RQ2 is the claim that the countries of the former Eastern Bloc are more backward in the development of mental health care due to a political regime that did not support community care systems. The countries of the former Eastern Bloc have a system of mental health care historically primarily based on an institutional model and the care of patients with mental disorders in psychiatric hospitals. In contrast, the countries of the former Western bloc are considered more advanced in mental health care, having already implemented elements of deinstitutionalization. Their health care is more flexible, and their mental health policies are more developed (Höschl et al., 2012; Winkler et al., 2017). In addition, the population's mental health is significantly influenced by the population's quality of life. Boitan & Costica (2020) confirm that old member countries recorded a better state of life quality than new EU countries.

The evaluation of the state of mental health care systems is based on a multi-criteria analysis using the TOPSIS method. MCDM models aim to improve the formal and informational side of the decision-making process. In these models, a final set of variants m is given and evaluated according to r criteria. The model aims to find the best variation on all considered considerations, exclude ineffective variants, or arrange a set of variants (Šubrt et al., 2019). There are some basic elements of the MCDM model:

- variants of decision-making a_i, $i = 1,\ldots, m$,
- criteria f_j, $j = 1,\ldots, r$ by which variants are evaluated,
- preference of criteria v_j, $j = 1,\ldots, r$, expressing their importance.

In this article, the multicriteria evaluation model by the TOPSIS method is based on the application of criteria that include 12 input indicators of mental health care. These criteria are then analyzed for 27 variants (individual EU member countries). TOPSIS is an operations research method that minimizes the distance from the ideal option (Yoon & Hwang, 1995). The process of the TOPSIS procedure is as follows:

1. Data are organized into the criteria data matrix, and the normalized data matrix is created using formula (1):

$$r_{ij} = \frac{y_{ij}}{\sqrt{\sum_{i=1}^{m} y_{ij}^2}} \qquad (1)$$

where
r_{ij} are the elements of matrix $\boldsymbol{R}$,
$i = 1, 2,\ldots, m$ and $j = 1, 2,\ldots r$,
y_{ij} is the original input data for alternative i and criterion j, and
m is the number of variants.

2. Weighted normalized data matrix $\boldsymbol{W}$ is created using formula (2):

$$w_{ij} = v_i \cdot r_{ij} \qquad (2)$$

where w_{ij} is the weighted normalized value and v_{ij} is the criterion's weight.

3. Determination of the ideal and basal variant relative to the matrix values is made according to formulas (3) and (4):

$$H_j = \max_i w_{ij} \tag{3}$$

$$D_j = \min_i w_{ij} \tag{4}$$

for $i = 1, 2,…, m$ and $j = 1, 2,…, r$.

4. Distance calculation of variants is performed according to formulas (5) and (6):

$$d_i^+ = \sqrt{\sum_{j=1}^{r}(w_{ij} - H_j)^2} \tag{5}$$

$$d_i^- = \sqrt{\sum_{j=1}^{r}(w_{ij} - D_j)^2} \tag{6}$$

for all $i = 1, 2,…, m$ and $j = 1, 2,…, r$.

5. The calculation of the relative distance indicator is processed by formula (7):

$$c_i = \frac{d_i^-}{d_i^+ + d_i^-} \tag{7}$$

where $i = 1, 2,…, m$.

Finally, variants are ranked. Non-growing values of the index ci order them. The calculated index values range between 1 and 0. Value 0 corresponds to the basal variant; value 1 corresponds to the ideal alternative.

The application of cluster analysis supplemented the TOPSIS method to obtain a more detailed result. Cluster analysis is a type of statistical grouping. The method sorts units into groups so that units belonging to the same group are more similar than objects from other groups. There are different approaches for clustering objects based on their distance or similarity. In this article, Ward's method, based on an analysis of variance, was used. The squared Euclidean distance measures the distances between objects.

3 Results

The research results are sorted sequentially according to the article's aim and research questions RQ1 and RQ2 set in Section 2.
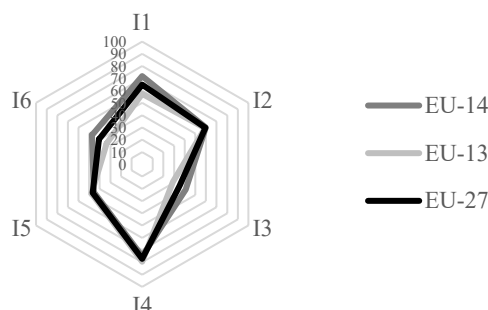
3.1 Evaluation of Quality of Mental Health Policies in EU Countries

Mental health policy is essential to coordinate all services and activities related to mental health. Without adequate policies and plans, mental disorders are likely to be treated in an inefficient and fragmented manner (WHO, 2023).

The evaluation of the quality of mental health policies in EU countries is based on six aggregated mental health policy indicators (I_1-I_6). First, the basic characteristics of the mental health policies of all EU countries were selected and scored according to the availability of national documents, laws, and strategies. Subsequently, aggregated indicators I_1-I_6 have been calculated, see Table 1 (Ardielli & Skupniková, 2023; Ardielli et al., 2023). The results for individual groups of EU countries (EU-27, EU-14, and EU-13) were compared in Figure 1.

In comparison with the average of the EU-27, the EU-13 countries reached less successful results in individual indicators than the EU-14 countries. The quality gap between EU-14 and EU-13 mental health policies was 15.2% on average. Out of a possible total of 59 points, the best score was achieved by Portugal (47 points), Germany (45 points), and Denmark (44

points). Finland and Ireland both scored 42 points. On the contrary, the Netherlands, Spain, and France achieved the lowest score among the EU-14 countries (the Netherlands 20 points; Spain 23 points; France 26 points). Within the EU-13 countries, the most successful were Slovenia (48 points) and Lithuania (43 points), the only ones in this group of EU countries to score higher than 40 points. The worst result was achieved by Bulgaria, with only 8 points.
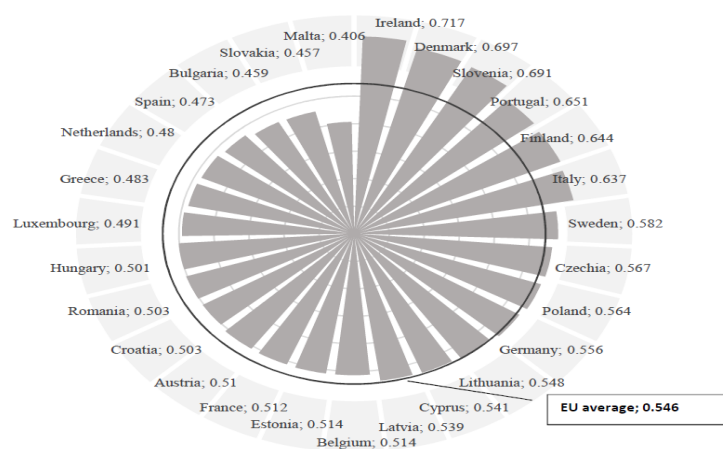

Source: Own using (WHO, 2021a)
Fig. 1: *Evaluation of quality of mental health policies in EU countries groups (in %)*

As seen from Figure 1, significant differences among EU country groups were mainly in the indicators I_1 (Mental health policy/plan), I_3 (Child and/or adolescent mental health policy/plan and Suicide prevention strategy/policy/plan), and I_6 (Mental health promotion and prevention). In the case of indicators I_2 (Mental health legislation), I_4 (Insurance for mental health), and I_5 (Integration of mental health into primary health care), the results are negligible among the groups of EU countries. However, improving mental health policy is challenging for EU countries in all areas assessed. EU country groups achieved the highest percentage of success in the case of indicator I_4 (EU-27 77.2%; EU-13 79.5%; EU-14 75.0%), while the lowest percentage of success was achieved in indicator I_3 (EU-27 35.2%; EU-13 28.8%; EU-14 41.4%).

3.2   Performance Evaluation of Mental Health Care Systems in EU Countries

The evaluation of the performance and resilience of mental health systems in the EU member countries was carried out by applying the TOPSIS method. The results of the multicriteria analysis are summarized in Figure 2. The results are sorted from the best score to the worst according to the achieved value of the relative distance indicator c_i. Ireland, Denmark, Slovenia, Portugal, and Finland occupy the first five positions. Netherlands, Spain, Bulgaria, Slovakia, and Malta occupy the last five positions.

Source: Own using (Eurostat, 2023; WHO, 2021a; OECD/European Union, 2022)
Fig. 2: *Evaluation of EU countries by usage of the TOPSIS method in the period of 2016-2020*

The model of multiple-criteria decision analysis with character and weights of indicators is summarized in Table 1.

Tab. 1: Model of multiple-criteria decision analysis

Indicator $I_1 - I_{12}$	Weight of indicator	Character of function
Mental health policy	**45%**	
I_1 -Mental health policy/plan	0.075	MAX
I_2- Mental health legislation	0.075	MAX
I_3- Child and/or adolescent mental health policy/plan and suicide prevention strategy/policy/plan	0.075	MAX
I_4- Insurance for mental health	0.075	MAX
I_5 - Integration of mental health into primary health care	0.075	MAX
I_6 - Mental health promotion and prevention	0.075	MAX
Availability and capacity of mental healthcare	**30%**	
I_7 - Available hospital beds for psychiatric care (per 100,000 inhabitants)	0.1	MIN
I_8 - Psychiatrists (per 100,000 inhabitants)	0.1	MAX
I_9 - Total health care expenditure (% of GDP)	0.1	MAX
State of mental health of the population	**25%**	
I_{10} - DALY of Depressive disorders	0.083	MIN
I_{11} - DALY of Neurological conditions	0.083	MIN
I_{12} - Length of hospital stay - mental and behavioral disorders (number of days per 100,000 inhabitants)	0.083	MIN

Source: Own using (WHO, 2021a; Eurostat, 2023)

The performance of mental health care systems in the EU countries is analyzed based on the selected indicators. Indicators I_1-I_6 describe the quality of mental health policy as a state of mental health policy implementation (mental health plans, legislation, strategies, and other aspects). Indicators I_7-I_9 describe the availability and capacity of mental healthcare, where the number of psychiatrists is considered long-term insufficient and an increase in the number is desirable to increase the quality of primary care; on the contrary, the number of hospital beds should be reduced from the point of view of the policy of deinstitutionalization of psychiatric care and replaced by community care in a natural environment (Mundt et al., 2021; Thornicroft & Tansella, 2013). A financial issue is also included here, where the amount of healthcare expenditure is decisive. These indicators are commonly used to assess healthcare performance (Lacko et al., 2020). Indicators I_{10}-I_{12} capture the mental health of the population, which can be judged based on the length of hospital stay due to mental and behavioral disorders in the number of days per 100,000 inhabitants. The burden caused by mental illness can be expressed with the help of a summary indicator of the health status of the population, DALY, which indicates disability-adjusted life years. Applying the TOPSIS method, the weights of individual indicators and the function character are also considered. The scoring method was used to determine the weights of indicators.

The founding countries of the EU, the countries that joined the EU before 2004 (EU-14), and the countries that joined the EU in 2004 and later (EU-13) achieved different results. Table 2 summarizes the basic statistics for different groups of EU countries. The EU-13 countries achieved, on average, a lower c_i value than the EU-14 countries (EU-14, c_i = 0.567; EU-13, c_i = 0.523). The performance gap between EU-14 and EU-13 was 8.4% on average over the observed period (2016-2020). The difference between the best-rated country, Ireland (c_i = 0.717), and the worst-rated country, Malta (c_i = 0.406), was 70%. 12 EU countries are above the EU-27 average (c_i = 0.546), and 15 EU countries are below the average.

Tab. 2: Descriptive statistics of the variants in the period of 2016-2020

Count	Mean	SD	Median	Variance	Minimum	Maximum
EU-27	0.546	0.080	0.514	0.006	0.406	0.717
EU-14	0.567	0.086	0.535	0.007	0.473	0.717
EU-13	0.523	0.069	0.514	0.005	0.406	0.691

Source: Own using (Eurostat, 2023)

The dendrogram in Figure 3 compares c_i values of 27 variants using cluster analysis and the Wards method, measured by squared Euclidean distance.
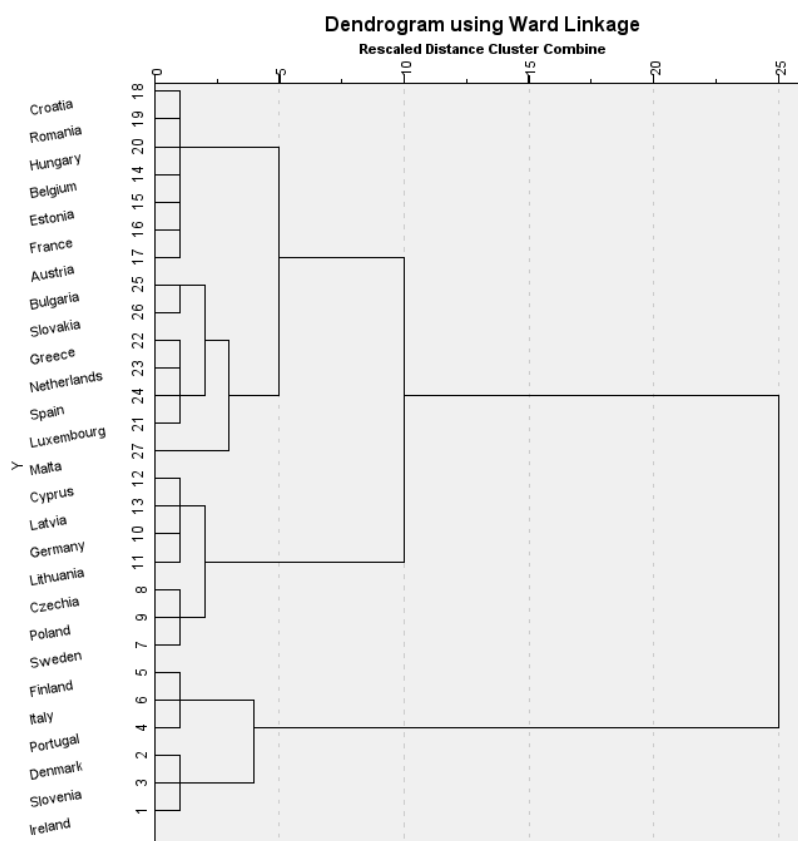
Source: Own using (Eurostat, 2023; WHO, 2021a; OECD/European Union, 2022)
Fig. 3: *Evaluation of EU countries by usage of Ward Linkage (2016-2020)*

The dendrogram in Figure 3 identifies 4 clusters of EU countries (C_1-C_4):

- C_1 (high performance) includes six variants: Ireland (1), Denmark (2), Slovenia (3), Portugal (4), Finland (5), and Italy (6).

- C_2 (upper medium performance) includes seven variants: Sweden (7), Czechia (8), Poland (9), Germany (10), Lithuania (11), Cyprus (12), and Latvia (13).

- C_3 (lower medium performance) includes seven variants: Belgium (14), Estonia (15), France (16), Austria (17), Croatia (18), Romania (19), and Hungary (20).

- C_4 (low performance) includes seven variants: Luxembourg (21), Greece (22), Netherlands (23), Spain (24), Bulgaria (25), Slovakia (26), Malta (27).

Cluster analysis confirms the high performance of the EU-14 countries. Slovenia is the only EU-13 country in C_1. C_2 is dominated by Central and Eastern European countries, which achieve above-average performance. In C_3 and C_4, the representation of EU-14 and EU-13 countries is balanced.

4   Discussion

The mental health of the population of the EU has been decreasing during the past decades (European Commission, 2023; Eurostat, 2023; Winkler & Janoušková, 2013; OECD/European Union, 2022; Racine et al., 2021; Milicev et al., 2023; Meda et al., 2021). It demonstrates the deterioration of the mental health of the population in recent periods and, above all, during the COVID-19 pandemic.

RQ1 (research question 1) was verified using a comparison of the c_i values of EU-13 and EU-14 and confirmed. There is a gap in the quality of mental health policies between EU-13 and EU-14 countries. The former Eastern Bloc countries of the EU member countries (EU-13) have less developed mental health policies than the former Western Bloc countries. The quality gap between EU-14 and EU-13 was 15.2% on average. RQ2 (research question 2) was also verified using a comparison of the c_i values of EU-13 and EU-14 and confirmed. There is a gap in the performance of mental health care systems between EU-13 and EU-14 countries. The former Eastern Bloc countries of the EU member countries (EU-13) have a lower level of performance of mental health care systems. The performance gap between EU-14 and EU-13 was 8.4% on average over the observed period (2016-2020). The results achieved are also supported by other authors (Winkler et al., 2017; Barbui et al., 2018; Ardielli & Freibrücková, 2023). Mental healthcare systems in EU-13 countries are still centralized and standardized, primarily based on the available psychiatric care hospital beds.

In contrast, the number of general psychiatric beds is being reduced in EU-14 countries (Mundt et al., 2021). However, some systems in Western Europe (Italy, Finland, Sweden) are quite heterogeneous, and the beds here are diversified into different types of facilities (Winkler & Janoušková, 2013). E.g., Italy has an advanced system of mental health care based on community care. The transformation of psychiatric care was legislatively supported in 1978. Beds in psychiatric hospitals were abolished, and community mental health services were introduced. This is good practice for deinstitutionalizing mental health care in EU member countries. As stated by WHO (2014), institutional care is considered inefficient, so transformation outside the institution can also bring financial savings, which have been confirmed in the USA, the Netherlands, or Czechia (Winkler et al., 2017). It can, therefore, represent a suitable option for countries with underdeveloped mental health care systems that can save public resources in this way. Although institutional care tends to be inefficient, deinstitutionalization requires additional funds, at least in the short term (WHO, 2014).

The research limitations include the selection of mental health care indicators, which do not include indicators describing community-type services, beds in non-hospital facilities, other medical personnel, etc. These indicators are not comparably available across EU countries. Another factor is the selection of the TOPSIS method. If a different MCDM method were chosen, slightly different results could be obtained.

Conclusion

The deinstitutionalization of mental health care is considered a fundamental step towards the modernization of the mental health care system in every EU country. The institutional model of psychiatric care is often replaced by a balanced care model that favors community-based services for people with severe and long-term mental illness over long-term stays in psychiatric hospitals. Also, concerning the increasing emphasis on human rights, this model is referred to as more humane and effective, which is evidenced by some experiences in countries where it has been applied. In addition, this process is facilitated using modern psychotropic drugs, which enable the transition from institutional care to community care. From a system-level perspective, the most significant opportunity associated with

deinstitutionalization is the potential to reduce the cost of care by shortening hospital stays and shifting care to the ambulatory sphere. However, the challenge in many countries reforming the mental health care system is finding suitable funding schemes to ensure adequate community services. However, there are also still many other challenges for EU member countries following this research. The quality gap in mental health policies between EU-14 and EU-13 was 15.2% on average. The detectable percentage performance gap of 8.4% between EU-14 and EU-13 country groups was also confirmed in 2016-2020. Among the most successful countries in terms of performance and resilience of the mental care system are Ireland, Denmark, Slovenia, Portugal, Finland, and Italy (cluster C_1). On the contrary, the countries in clusters C_2, C_3, and C_4 show some deficiencies in the performance of the systems. For example, Czechia, Bulgaria, or Hungary have not yet adopted mental health legislation. No mental health prevention programs exist in Slovakia, Greece, or Estonia. Bulgaria, Croatia, and Estonia have no child and adolescent mental health policies. Belgium, Germany, and Lithuania again have relatively high inpatient care beds per 100,000 inhabitants. Slovakia, Poland, and Bulgaria suffer from a shortage of psychiatrists. As can be seen, the systems of mental health care differ significantly. Therefore, it is important to carry out cross-national comparisons, which will draw attention to the shortcomings, and subsequently, an addressable policy can be applied. The research contributed to understanding the development of mental health care systems of EU countries, which can contribute to the appropriate application of policy instruments.

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Ing. Eva Ardielli, Ph.D.

VÝKONNOST A ODOLNOST SYSTÉMU PÉČE O DUŠEVNÍ ZDRAVÍ V ZEMÍCH EVROPSKÉ UNIE

Duševní zdraví občanů je zásadní pro kvalitu života a hospodářský rozvoj. Navzdory svému významu se duševní onemocnění v zemích Evropské unie (EU) stále častěji vyskytují, což je ještě umocněno pandemií COVID-19, a je třeba reagovat na rostoucí potřeby. Článek hodnotí výkonnost systémů péče o duševní zdraví v EU v letech 2016 až 2020. Výzkum hodnotí politiky a ukazatele péče o duševní zdraví sledované Organizací pro hospodářskou spolupráci a rozvoj (OECD). Používá metodu pořadí preferencí podle podobnosti s ideálním řešením (TOPSIS). Výsledkem je srovnání výkonnosti systémů péče o duševní zdraví v členských zemích EU, které zdůrazňuje silné a slabé stránky zavedených systémů péče o duševní zdraví.

LEISTUNGSFÄHIGKEIT UND WIDERSTANDSFÄHIGKEIT DER SYSTEME DER PSYCHISCHEN GESUNDHEITSVERSORGUNG IN DEN LÄNDERN DER EUROPÄISCHEN UNION

Die psychische Gesundheit der Bürger ist für die Lebensqualität und die wirtschaftliche Entwicklung von entscheidender Bedeutung. Trotz ihrer Bedeutung treten psychische Erkrankungen in den Ländern der Europäischen Union (EU) immer häufiger auf, was durch die COVID-19-Pandemie noch verstärkt wird, und es muss auf die wachsenden Bedürfnisse reagiert werden. Der Artikel bewertet die Leistungsfähigkeit der Systeme der psychischen Gesundheitsversorgung in der EU im Zeitraum 2016 bis 2020. Die Studie bewertet die von der Organisation für wirtschaftliche Zusammenarbeit und Entwicklung (OECD) beobachteten Strategien und Indikatoren für die psychische Gesundheitsversorgung. Sie verwendet die Methode der Rangfolge nach Ähnlichkeit mit der idealen Lösung (TOPSIS). Das Ergebnis ist ein Vergleich der Leistungsfähigkeit der psychischen Gesundheitssysteme in den EU-Mitgliedstaaten, der die Stärken und Schwächen der bestehenden psychischen Gesundheitssysteme hervorhebt.

EFEKTYWNOŚĆ I ODPORNOŚĆ SYSTEMU OCHRONY ZDROWIA PSYCHICZNEGO W KRAJACH UNII EUROPEJSKIEJ

Zdrowie psychiczne obywateli jest istotne dla jakości życia i rozwoju gospodarczego. Pomimo swojego znaczenia, choroby psychiczne w krajach Unii Europejskiej (UE) występują coraz częściej, co jeszcze bardziej nasiliła pandemia COVID-19, należy więc reagować na rosnące potrzeby. Artykuł koncentruje się na ocenie efektywności systemów ochrony zdrowia psychicznego w krajach członkowskich UE w latach 2016–2020. Badania opierają się na ocenie polityk i wskaźników ochrony zdrowia psychicznego, monitorowanych przez Organizację Współpracy Gospodarczej i Rozwoju (OECD). Zastosowano metodę porządkowania preferencji wedle podobieństwa do idealnego rozwiązania (TOPSIS). Wynikiem badań jest porównanie efektywności systemów ochrony zdrowia psychicznego w krajach członkowskich UE, podkreślające mocne i słabe strony wdrożonych systemów ochrony zdrowia psychicznego.

Regional Product Brands: In-depth Interviews with Producers

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Abstract

Regional products' significance is increasing for consumers and producers, highlighting the need to examine regional labeling. This study explores the perceptions of regional product brand owners in the Liberec region (Czech Republic) regarding labeling systems, focusing on challenges and strategic approaches. A qualitative methodology included semi-structured interviews with four brand owners between July and November 2023. Findings reveal varied perspectives on regional branding, with challenges in certification criteria, consumer trust, and marketing. The results are analyzed with existing literature, concluding with recommendations for improving certification standards and promotional strategies.

Keywords

Liberec region; Product labeling; Regional product branding systems; Regional producers.

Introduction

Regional product brands are increasingly relevant in academic and practical contexts, reflecting the growing importance of regional identity, local economies, and sustainable business practices. Regions, shaped by their unique historical, cultural, and natural characteristics, play a vital role in economic and social development. As previous research has primarily focused on consumer perceptions of regional products, there remains a significant gap in understanding how producers view regional branding and its impact on their businesses. Addressing this gap is crucial, as regional brands serve as marketing tools and contribute to strengthening local economies, fostering cooperation between stakeholders, and enhancing the competitiveness of regional businesses. By examining producers' perspectives, this research provides valuable insights into the benefits and challenges of regional branding, thereby contributing to both academic discourse and practical applications in territorial and marketing strategies.

Thanks to their rich natural and cultural diversity, which creates local traditions, customs, and specialties, regions are integral to every country today. The term region originates from the Latin word *regio*, which can be translated as *bordered*, *landscape* or *direction* (Žižka, 2013). The term *region* is interpreted by Maier & Tödtling (1998, p. 32) as: "*area that emerges as a result of merging elements of spatial structure subsystems, according to certain content criteria, into diverse functional and hierarchically organised territorial units*". Skokan (1999) defines a region as an area with shared features and criteria. From a marketing perspective, however, a region is a complex structure comprising several independent subsystems, including municipalities, cities, micro-regions, businesses, citizens' interest associations, and entrepreneurs (Ježek et al., 2007). Together, these subjects create networks of

interrelationships between individual subjects and actors located at 'higher levels', which can include, for example, various ministries, the government and European Union (EU) institutions (Pauličková, 2005). In the environment of the Czech Republic, the entire country can be divided into eight regions of cohesion and 14 self-governing regions (ČÚZK, 2024). As in many European Union countries, the regions of the Czech Republic show differences due to historical development, regional disparity, and geographical, economic, and natural conditions (Bardone & Kannike, 2022). The existence of these differences helps to develop territorial marketing, regional marketing, and the very concept of regional product brands.

The author found that most Czech and foreign publications focus on analyzing consumers of regional products. Based on the literature review in Section 1, the author also identified a research gap in analyzing the regional producer aspect that has not been given much space in the literature (Beran & Dědková, 2024; Butoracová Šindleryová & Hoghová, 2020; Xu et al., 2024). The article's primary goal is to discover what attitudes the owners (producers) have towards regional product brands. To better achieve the main objective, the author has therefore set 3 sub-objectives (SO):

SO1: Research how producers perceive the regional brand concept.

SO2: Identify the advantages and disadvantages of regional brands from the producers' perspective.

SO3: Investigate the impact of the regional brand on the marketing strategy of the company and business activity

This article begins with a review of the literature on regional products and brand marketing, followed by an overview of the methods used. Based on the outlined objectives, the author has decided to conduct in-depth interviews with producers of regional products. These interviews provide insights that can assist other businesses in determining the potential value of obtaining certification for their products as a regional brand. Additionally, this study contributes to the existing theoretical framework by offering new perspectives on the topic. Finally, the results from in-depth interviews are summarized and analyzed in terms of theoretical approaches.

1 Literature Review

Branding is a fundamental strategy in business, facilitating differentiation and competitive advantage. According to the AMA (2023), a brand comprises a name, design, or symbol that distinguishes a product and exists primarily in consumers' perceptions (Healey, 2008). Establishing a strong brand image fosters customer loyalty and repeat purchases (Kaputa, 2011). Keller (2007) emphasizes branding's role in product identification, risk reduction, quality assurance, and legal protection. Place branding extends this concept to geographic locations, shaping their image through symbolic associations (Johansson, 2011). It enhances a place's attractiveness for visitors, investors, and residents, contributing to economic development. The 'place of origin' effect links a positive regional image to perceived product quality, reinforcing the value of regional branding (Molotch, 2003; Kašková & Chromý, 2015).

Doležalová (2007) notes that the historical development of multiple brand systems in the Czech Republic has hindered the establishment of a unified theoretical definition. Initially designed by government institutions to ensure product quality, these systems set criteria that benefited both small producers and consumers. This led to the creation of various brand programs, many of which later adopted shared criteria for regional branding. Currently, there are several hundred different brands and brand programs in the Czech Republic. However, the

proliferation of these systems has contributed to consumer confusion regarding the meaning and significance of product brands (Pitrunová & Stoklasa, 2018).

Although, according to the Association of Regional Brands (ARZ, 2024a), the first regional brands were created in the Czech Republic after 2004, many authors still disagree on their unified theoretical definition and demarcation within the marketing discipline (Chalupová & Prokop, 2016; Kašková & Chromý, 2014). According to the ARZ (2024b), regional branding is one way to raise the profile of a particular region, highlight the interesting products produced there, and make it easier for visitors to the region to find their way around the services on offer. The uniqueness and distinctiveness of individual regions characterize the Czech Republic. This regional diversity can be related to the historical development of the individual territorial units and factors, including culture, traditions, customs, natural wealth, and geographical location (Kažmierski, 2013).

According to Butoracová Šindleryová & Hoghová (2020, p. 169): "*If we perceive regional product as the sum of a region's supply to its real and potential customers – space, products, services, activities, etc., then it is also necessary to realize that the term 'customers' means not only the visitors to the region but also its inhabitants, tourists, entrepreneurs and investors. It is through the product that the region can provide its values*". These authors further state in their article that "*The actual product of a region can be classified as the public services offered by the region, the investors' supply in ownership of the region to private owners, events organized by the region, i.e., all factors that are a part of the product and operate in a natural, economic, historical and social environment*".

Čadilová (2011, p. 8) defines regional products in much the same way, arguing that "*Regional branding is one of several ways how to promote rural regions and support development of socially, culturally and environmentally oriented economies in areas that are interesting due to their natural and cultural heritage.*". In addition to building and enhancing the image of the selected area, regional products have significant impact on the local economy and social and environmental areas (Čadilová, 2011, p. 8).

For this reason, local products can be identified as tools for sustainable development (Moro & Soares, 2019; Haid et al., 2024). Based on various publications, a consensus has been shown that regional products help to build regional identity, culture, and the belonging of inhabitants or producers to the region itself (Kažmierski, 2013; Zheng et al., 2022; ARZ, 2024b; Ekoregion Úhlava, 2010). It is therefore clear that the product policy of producers will follow the possibilities and uniqueness based on the offer of each region.

Based on a literature search, the author presents a classification of basic concepts that, according to current knowledge, helps to define the fundamental essence of the issue better:

- **Regional product** = any product produced in a specific region.

- **Regional product label** = a regional product label is a label that allows products or services to be distinguished from 'ordinary products' and, at the same time, acts as a guarantee or certification for both producers and consumers (e.g., guarantee of the product's origin, link to the region, guarantee of handmade production, culture, traditions, etc.).

- **Regional labeling systems** = labeling systems that bring together regional producers under common certification criteria or rules that operate across the Czech Republic and other countries, e.g. ARZ (2024a), regional competitions, etc.

2   Methodology

The article is based on a literature search in the scientific databases (Web of Science, Scopus) related to the basic concepts of regional product brands in the Czech Republic. The author defined the terms *region*, *regional product*, *regional product label*, and *regional labeling systems*. The author subsequently identified a total of 170 producers in the Liberec region, based on the members list of local action groups, who own one of the regional product brands: *Regional Product of the Jizera Mountains*, *Regional Product of Bohemian Paradise*, *Regional Product of the Lusatian Mountains and Máchův kraj Region*, *Regional Product of the Krkonoše Mountains*, *Regional Specialty of the Liberec Region*, and *Product of the Year of the Liberec Region*. It is important to note that the Liberec Region is not included in the most extensive regional branding system in the Czech Republic, the ARZ labeling system (ARZ, 2024a). Based on a literature search and the creation of a database of owners of regional product brands in the Liberec region, a structure of in-depth interviews was subsequently designed to collect qualitative data on the attitudes and preferences of producers (owners of regional product brands) towards these regional product brands.

Qualitative data collection and in-depth interviews with selected respondents were conducted from July to November 2023. The structure of the in-depth interviews and the questions were developed based on the methodology developed by Granot et al. (2012). The in-depth interview (face-to-face interview time ranged from 30-60 minutes) was a semi-structured in-depth interview. It included a total of 16 open questions that can be divided into four main parts: background information on business activities, interpretation of the concepts of regional product labels and motives for obtaining them, advantages and disadvantages associated with regional product branding, the impact of regional product branding on corporate strategy and marketing activities. All interviews were recorded using a mobile phone (dictaphone) at the respondents' headquarters, and all responses were transcribed into a full-text version in Czech. After completing the full-text transcription, a translation was conducted through a language agency.

The first part of each in-depth interview focused on identifying the manufacturer's basic characteristics. At respondents' requests, all company names, and names of the respondents were anonymized. The second part of the in-depth interview focused on the perception of the regional product brand concept from the perspective of individual producers. This part aimed to discover what regional producers perceive as a regional product label and what reasons producers have for applying for their chosen regional product label. The third part focused on obtaining attitudes and identifying advantages/disadvantages associated with owning a regional product brand. In this part, a pilot semantic differential was tested, focusing on a more detailed analysis of attitudes. The last, fourth part of the in-depth interview focused on the impact of the regional product brand's award on the selected respondent's marketing strategy and the regional product brand's future use.

The core group of the pilot survey was all 170 producers owning regional product brands within the Liberec region. This set was divided into four groups within the database based on the regional product brand type (label). By selecting four representatives, researchers can ensure that each interview is thorough and focused, allowing for a more detailed examination of the participants' views on regional branding (Uberwimmer et al., 2021). This approach aligns with the findings of studies that emphasize the importance of depth over breadth in qualitative research, where fewer participants can lead to more significant insights (Opazo-Basáez et al., 2020). For instance, in a study involving semi-structured interviews, Karasmanaki & Tsantopoulos (2023) found that a smaller sample size allowed for a more profound exploration of the themes relevant to the research question.

Based on this database, one representative from each group was randomly selected using the function RANDBETWEEN in Microsoft Excel and approached for an in-depth interview. In total, it was possible to obtain statements from 4 respondents, i.e., every representative of a regional product brand in the Liberec region. Although the obtained statements are unique regarding the issue of regional product brands, as no author has thus far investigated this issue from the producers' side, it should be noted that the results are only an initial step before primary quantitative research. The following section presents the results of the in-depth interviews themselves.

3   Results

In the first part of the in-depth interview the respondents were asked questions aimed at introducing the business, the historical development of the business and a description of a typical customer. A list and description of the respondents are given below.

- **Respondent 1** holds the *Regional Product of the Krkonoše Mountains* label and specializes in the traditional craft of glass bead blowing and the production of beaded Christmas decorations, a craft with roots dating back to 1902 with only 20 employees. The company is proud to be the only one globally to have preserved and maintained these old technologies. In 2020, the production of bead ornaments was included on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity. The craft involves several processes, including bead blowing, silvering, dyeing, painting, and cutting, followed by weaving Christmas decorations, which can be experienced in the company's creative workshops. Additionally, the respondent operates a company store and e-shop and offers production tours.

- **Respondent 2** represents the *Regional Product of the Jizera Mountains* label and is a small family business with four employees specializing in butchery since 2016, focusing on producing dried meat in various flavor variations. Based in Podještědí, the respondent also manages an establishment in Liberec. The respondent values controlling the entire production process, from meat selection to cutting and processing. Emphasizing sustainability, they support regional farmers and advocate fair pricing for their work and quality. In recognition of their original dried meat recipe, the respondent received the *Regional Specialty of the Liberec Region* award in 2022, a regional competition honor.

- **Respondent 3** holds both the *Regional Product of the Lusatian Mountains and Máchův kraj Region* and *Product of the Year of the Liberec Region* labels. Founded in 1993, the company focuses on producing and selling bakery and confectionery products. A key milestone occurred in 2001 when the company introduced a specialized range of gluten-free products. Its current product range includes over 30 varieties, including gluten-free mixtures distributed nationwide to cater to those with coeliac disease. In addition to its core business, the company has developed a retail network to test customer reactions to new products. With more than 350 employees and annual sales exceeding a quarter of a billion crowns, the company holds a strong market and marketing position relative to other respondents.

- **Respondent 4**, a holder of the *Regional Product of Bohemian Paradise* label, represents a small business (self-employed) that started in 2009. The company specializes in cultivating herbs and their sale in various forms, including herbal blends, oils, macerates, and other products such as pads, syrups, and scapulars. The business is managed by a team of three people, which influences its marketing strategies. The entrepreneur has held the regional product brand nearly since the beginning of the business.

The second part of the in-depth interview analyzed producers' conceptual understanding of regional product brands. Due to space constraints, Table 1 presents a condensed summary of key findings. This part of the interview also investigated the underlying motivations for obtaining a regional product label, the procedural aspects of certification, and the sources from which producers acquired information about regional labeling. The findings indicate that respondents predominantly define a regional product brand as a designation associated with uniqueness, local provenance, and verified quality, emphasizing sustainability and regional identity. The primary motivations for pursuing regional product certification included fostering regional economic development, enhancing product visibility, and ensuring alignment with personal or corporate values. The certification process was generally perceived as accessible, with information primarily sourced through professional networks and local industry associations.

Tab. 1: *Results of the second part of the in-depth interviews*

Question	Respondent	Answer
What do you think a *regional product brand* is, and what are its characteristics?	1	A product is characterized by its uniqueness, as it differs across regions, is made within a specific place in the region, and meets the quality criteria set by that region. Additionally, emphasis is placed on the origin of raw materials, particularly local ingredients, while also considering sustainable development and ecological factors.
	2	Certification involves a structured system that ensures a certain level of quality, guaranteeing high-quality food and products. It functions as a consumer assurance, verifying that the product is made with quality, locally sourced raw materials. Additionally, certification highlights the product's uniqueness and establishes a connection to tourism.
	3	It is a product closely tied to sustainable development, addressing the production, business, social, economic, and cultural aspects of the region. It belongs to the region and its people, incorporating local ingredients from nearby areas to emphasize its uniqueness. Whether made by a small or large entrepreneur, the product reflects the identity and values of its place of origin.
	4	It is a product that should be made through craftsmanship, typically by a small entrepreneur, and rooted in the tradition of the region. It has a strong connection to the region and tourism, adhering to qualitative criteria. The origin of raw materials, especially local ones, plays a key role while also considering ecological factors.
When and for what reasons did you start thinking about obtaining a *regional product label*?	1	Around 2005, we helped to create and introduce the regional brand. We did not expect it to bring significant benefits to our business but saw it as beneficial for both the business and the region, believing in entrepreneurship and a product that was 'regional' and 'unique'.
	2	We do not recall the exact date (around 2009) when the *Regional Product of the Jizera Mountains* label was introduced. We were unaware of the *Regional Specialty of the Liberec Region* label initially but applied for it in 2020 to increase product awareness. Marketing support was key in this effort.
	3	Around 10 years ago, the key reasons were ecology, sustainability, and supporting the region and its people (through jobs and regional products). We aim to create added value for the region and make regional products central to our portfolio, driven by philosophical and personal beliefs.
	4	We do not remember the exact date, but it was more by accident than by design. We resisted regional labeling for a while due to our small product portfolio but saw it as an opportunity to raise our product profile and tell a story to consumers.

Question	Respondent	Answer
How would you describe the process of obtaining a *regional product brand* in your case?	1	We helped set the certification criteria at the birth of the regional product brand and applied and passed the requirements with a simple process.
	2	We researched certification options, contacted the local action group for the *Regional Product of the Lusatian Mountains* label, applied, and met the criteria. We also won the regional competition and received the mark.
	3	We were approached by various groups organizing regional designations and competitions. We took part in several competitions, aiming to succeed and be the best regional product. Our success in this led to securing the regional brand label.
	4	The local action group visited me personally. Based on the application form and product description, the certification took place, and I was asked questions like what I use and how I create it. After clarifying the information, I decided to undergo certification, and everything went smoothly in a friendly atmosphere.
Where did you get information about the *regional product brand* you are considering?	1	I got information about the regional product brand from a coworker and, being involved in the creation of the local action group, received first-hand information directly.
	2	I received information from the supervising veterinarian and a member of the evaluation committee, and I found more details on regional product websites and from the regional agrarian council.
	3	We primarily got information from external sources like the agrarian chamber, local action group, and district chambers of commerce, as well as from internet searches.
	4	I got initial information from friends in the region who were also applying for the label and from the local action group (brand manager) after a personal visit.

Source: Own

The third part of the in-depth interview focused on identifying barriers within the certification process and examining the advantages and disadvantages of holding a regional product brand. This part allowed respondents more freedom to share their perspectives and experiences with regional product labels. As a result, Table 2 contains a higher number of direct quotations from their statements. Findings from Table 2 indicate that while obtaining regional certification was generally straightforward, the perceived benefits varied. Some respondents reported increased marketing opportunities and brand awareness, while others saw little to no advantage. Identified disadvantages included outdated certification criteria, market saturation, stricter production control requirements, and concerns that large companies might weaken the regional brand's distinctiveness.

Tab. 2: *Results of the third part of the in-depth interviews*

Question	Respondent	Answer
Were there any obstacles to obtaining the *regional product brand*?	1	There were no obstacles.
	2	There were no obstacles.
	3	The biggest obstacle I see is the employee count requirement. The size of the company should not impact on the creation of regional products.
	4	There were no obstacles.

Question	Respondent	Answer
What benefits do you get from owning a *regional product brand*?	1	In my opinion, using this regional brand either does not currently bring us any benefits or I do not see them now. We have that brand, we are marketing it, but I am not sure that brand has any greater message to the end customer than when our corporate brands are there.
	2	The only benefit of the *Regional Product of the Jizera Mountains* label is the brand on packaging, with a slight advantage of being listed on the brand owner's website. The brand *Regional Specialty of the Liberec Region* has a boosted marketing, increased awareness of customers and participation in activities and TV programs. It also helped us to secure a subsidy from the State Agricultural and Intervention Fund.
	3	I do not see any significant benefits or advantages in our case.
	4	The brand owner has supported our marketing efforts, offered mentoring and expert advice, and boosted brand awareness through participation in markets, web presence, and social media. We are currently involved in several markets thanks to the tips from the brand owner.
Do you observe any disadvantages with *regional product brands*?	1	From my perspective, some disadvantages include the obsolescence of certification criteria, the large number of certified products and owners, and the fact that regional labeling seems like a concept copied from neighboring countries, where it is more closely tied to tourism than it is here.
	2	The brand *Regional Product of the Jizera Mountains* brings us nothing special, so there are not many disadvantages. Regarding *Regional Specialty of the Liberec Region* label, the requirements for production control and sampling (increased supervision) can be a disadvantage. We cannot arbitrarily change the recipe for certified products; all changes must be notified, even if the product is discontinued.
	3	Disadvantages of *Product of the Year of the Liberec Region* and *Regional Product of the Lusatian Mountains and Máchův kraj Region* include a fragmented concept of regional product brands, market saturation with various labeling systems, and inconsistent certification criteria. Criteria should ensure product uniqueness and be uniform across organizations, with restrictions for large businesses based on size.
	4	A large number of certified products and owners is a disadvantage. Regional brands should not be owned by large companies, as they are less appealing to customers and often lack the charm of handmade craftsmanship.

Source: Own

The fourth part of the in-depth interview explored the impact of regional product brands on producers' corporate strategies and marketing activities. It also examined how producers convey these brands to their customers. Table 3 presents the specific questions and statements related to this interview aspect. Findings indicate that respondents primarily use regional product branding for marketing communication, including product labeling, website presence, and national advertising. Some also leverage it to secure grants. While several respondents reported benefits such as increased brand awareness and sales, others observed no significant impact. Respondents' plans are focused on maintaining and expanding the brands, enhancing customer communication, and streamlining regional branding efforts.

Tab. 3: Results of the fourth part of the in-depth interviews

Question	Respondent	Answer
How do you use *regional product branding* in your corporate (marketing) strategy?	1	We use regional product branding on leaflets and product labels in our marketing.
	2	In our strategy we use the brand to secure grants and for marketing communication.
	3	We use it in marketing communication including national ads like the *Food Bulletin* and *Food Magazine*, which reach multinational chains.
	4	We use it in marketing communication.
Do you think that the award of the *regional product label* has had a major impact on your business? Are you able to describe the situation before/after the *regional product label* was obtained?	1	In my opinion, it did not make a difference and I do not see any change before and after.
	2	No significant impacts of *Regional Product of the Jizera Mountains* label were identified. *Regional Specialty of the Liberec Region* label boosted brand awareness and helped with brand building. It also led to increased sales and helped secure subsidies.
	3	No significant impacts of *Regional Product of the Lusatian Mountains and Machův kraj Region* label were identified. Brand *Product of the Year of the Liberec Region* helped us receive funds, which we dedicated to various charitable purposes.
	4	Yes, definitely. Though I am unsure about before and after, acquiring the brand gave me a more precise direction and insight into other manufacturers and marketing options.
How do you communicate the *regional product brand* to your customers?	1	On the web, flyers, and product labeling.
	2	Labeling directly on the products (for both brands), on the web, limited use on social media, and spoken communication with customers.
	3	Labeling directly on the products (though we feel the label has not been communicated enough) and on the web.
	4	Labeling on products, marking market stalls with the regional product brand logo, oral communication, and on the web.
What are your plans for the future with the *regional product brand*?	1	We plan to maintain and develop the brand.
	2	We plan to enter more products into the regional competition, improve customer communication, and develop both brands.
	3	We plan to maintain and develop the brand, improve customer communication, and aim for a unified regional product brand in the future.
	4	We plan to maintain and develop the brand. Currently, regional brand managers have been invited to update photos and texts to improve marketing communication.

Source: Own

The results and individual findings from the in-depth interviews are discussed in the following section.

4 Discussion

SO1 (sub-objective 1) asked how producers perceive the concept of a regional brand. According to the in-depth interviews, it is evident that the producers themselves identify the interpretation of the terms product and brand, and producers of regional product brands

sometimes perceive these words as synonymous. According to the AMA (2023) a brand is a name that distinguishes individual products. Čadilová (2011, p. 8) adds "*The group that is provided most of the support includes local business people, i.e. handicraftsmen, farmers, small and medium-sized enterprises, whose skills and proficiency help to spread the region's renown, and, at the same time, identification with the region represents a great marketing opportunity for them*". The respondents' statements contain many standard features that can be found in expert definitions (Karlíček, 2018; Kotler & Keller, 2013; ARZ, 2024b). However, the statements also provided new insights into this area. In particular, manufacturers extend the definitions to include the following features: *product uniqueness*, *the local nature of the raw materials used to produce the regional products*, *the size of the business*, and *the link to tourism*. Apart from the misidentification of the concept (*brand = product*), the view on the issue of the selected factors differs:

- **Product uniqueness** – All respondents agree that brand providers need to work on the uniqueness of the products themselves. If the regional label is to retain a certain credibility and value, then the certification criteria should be adapted to guarantee uniqueness.

- **Locality of raw materials used to produce regional products** – As far as professional definitions are concerned, e.g. (Čadilová, 2011, p. 8), none of them deals with this aspect when interpreting the issue of regional product labels. All respondents agree that the products should be made from local ingredients.

- **Size of the entrepreneur** – Another aspect that varies in the definitions of regional product brands is the size of the entrepreneur. In the described definitions (Čadilová, 2011, p. 8; ARZ, 2024b; Karlíček, 2018) is stated that it is usually a small or medium-sized enterprise or entrepreneur. It should be noted that there is also a certain degree of disagreement among entrepreneurs in the interpretation of this aspect.

- **Product connection to tourism** – Several studies have already described the impact of regional products on tourism development and tourists (Beresecká et al., 2020; Gonda et al., 2021; Stoklasa & Matušínská, 2022). Respondents pointed to the importance of tourism for the producers themselves.

The evaluation of the first part shows the inconsistent approach that exists in the field of regional brands in academia (Donner et al., 2017; Waehning & Filieri, 2022; Gonda et al., 2021; Jaďuďová et al., 2023). Based on the in-depth interviews, it is also possible to define an inconsistent approach on the part of the producers themselves. Respondents also indicated that they most often obtained information about the regional brand itself from people they knew or cooperated with, from the websites of regional product brands, or directly from the owners of regional brands and their members (local action groups, regions, members of certification committees).

SO2 (sub-objective 2) was to identify the advantages and disadvantages of regional brands from the producers' perspective. Concerning the identified advantages, it is necessary at this point to divide the brands of regional products into two basic groups:

- **Private regional product labeling schemes** – Regional product labels are owned by local action groups.

- **State-coordinated regional product labeling systems** – Regional product labels are awarded at the regional level or by other entities owned by the Czech Republic.

For the private regional product labeling systems (*Regional Product of the Jizera Mountains*, *Regional Product of the Lusatian Mountains and Máchův kraj Region*, *Regional Product of Bohemian Paradise*, *Regional Product of the Krkonoše Mountains*), 3 out of 4 respondents

agreed that they could not identify any significant advantages associated with the labels. Respondents most frequently mentioned the possibility of labeling their products with a regional product brand as an advantage. On the other hand, these manufacturers pointed out that they are not even sure whether customers are interested in these brands and pay enough attention to them in the purchasing process. Manufacturers partly blame themselves for this, as they are unsure whether they communicate this sufficiently and appropriately to their customers. However, they also blame the owners and providers of regional product brands for not appropriately communicating their brand across market segments. In academic practice, for example, Aaker (1996) and Keller (2007) have already shown that building brand knowledge and awareness through communication positively impacts overall brand equity. Only one respondent was able to define this positive impact on marketing support.

Compared to the previous group, producers with the label of the state-coordinated labeling systems (*Regional Specialty of the Liberec Region*, *Product of the Year of the Liberec Region*) were able to identify many more excellent marketing benefits and many more advantages. Respondents pointed to the greatest benefits as the possibility of obtaining funding and the possibility of participating in subsidy programs. Another advantage mentioned was the increase in brand awareness and knowledge, the impact on economic activity, and other marketing activities of the company (participation in TV shows, markets, fairs, etc.).

Regarding identified benefits, most producers cannot identify any key regional product brand ownership drivers. This is particularly evident in the case of brands that are owned by private entities. Producers usually describe the advantages of regional product brands as negligible.

Regarding disadvantages, producers generally agree that the current problem is the high number of regional producers, the inadequate and outdated certification criteria, and increased demands on control of regional product production. No mapping has thus been done in the Czech Republic examining the number of entities with regional designations. As for the certification criteria, the producers agreed that they are currently unable to ensure the uniqueness of the products or uniformity across the high number of different regional labeling systems in the Czech Republic. As a result, this may lead to mistrust by producers and consumers or fragmentation of the entire system of regional labeling across the Czech Republic. These disadvantages were also pointed out by Pitrunová & Stoklasa (2018).

The in-depth interviews found that the certification process was carried out in two basic ways for the respondents: the entrepreneurs went through the certification process (primarily for brands owned by the local action group), or the entrepreneurs participated in regional competitions. A surprising finding was that most respondents did not identify significant obstacles to obtaining regional product labels. Respondents praised the administrative process itself and the negotiations with brand owners. The only obstacles identified were the size of the business and the number of employees, which may make it impossible to obtain a regional product label.

SO3 (sub-objective 3) was to determine the influence of the regional brand on the company's marketing strategy and business activity. A finding that emerged from the in-depth interviews is that the respondents generally do not place increased emphasis on the use of the regional brand in their marketing strategy. The most common way is using the brand to label the products themselves or apply marketing communication in accordance with (Kotler & Keller, 2013). How respondents communicate regional product brands to their customers includes communication on the manufacturer's website, communication on the manufacturer's social media channels, labels displayed on the products, word-of-mouth communication to customers, and signage at market stalls. However, most producers agreed that they do not currently sufficiently communicate this regional product labeling in their marketing strategies,

which needs to changed, as highlighted by Johansson (2011), Fan (2006), and van Ham (2008). Respondents could not describe consistently the impact of regional product brands on their business activity. Some producers indicated that regional product labeling does not significantly impact their business activity or that regional labeling has a negligible impact. However, respondents could identify aspects in which the awarding of the regional label helped them. These aspects include the impact on brand knowledge, brand awareness, economic impact (increase in a number of customers, increase in sales), and the possibility of applying for subsidies in national and regional programs. One respondent also stated that being awarded a regional label and receiving support from a regional label provider helped him to gain business confidence, creating a more comprehensive overview of how other businesses operate and marketing support. An interesting finding is that, despite all the shortcomings and reservations mentioned by the producers, they are not obstacles to the future maintenance and development of these regional product brands. On the other hand, most manufacturers stated that they plan to maintain and develop the brand in the future.

The author of this article is aware of the limitations of the research presented in it. The limitations include the selection of respondents and sample size, which affects the generalizability of the research results. It will be necessary to conduct research in other regions of the Czech Republic to generalize the findings. The result and the statements are also based on a certain degree of subjectivity. The author's next step is to conduct in-depth interviews with other producers (owners of regional brands) outside of the Liberec region and to prepare a questionnaire survey focusing on the attributes of the value of regional product brands from the producers' perspective, because this issue has thus far not been explored in detail in other published studies. At the same time, these findings may benefit other scholars and non-scholars studying regional brands.

Conclusion

This article has identified significant challenges confronting regional product branding, including inconsistent certification criteria across numerous independent labeling systems and ambiguity in differentiating between products and brands. These factors contribute to producers' mixed or even negative perceptions of regional product branding, hindering its full utilization in their marketing strategies. Overcoming these obstacles necessitates a multi-pronged approach. First, establishing a standardized, tiered certification system overseen by a national or supra-regional body could ensure consistency and transparency while allowing regional differentiation. Second, revising certification criteria to emphasize product uniqueness, quality, and origin would enhance credibility and consumer trust. Third, integrating regional branding into comprehensive marketing efforts, supported by knowledge transfer initiatives and industry collaborations, would empower producers to leverage their full potential.

While offering valuable insights from producers in the Liberec region, this article acknowledges limitations in its sample size and geographic scope. Future research should expand on these findings by incorporating quantitative data from a larger, more diverse sample of producers across different regions. Moreover, exploring consumer perceptions of regional product branding would provide a comprehensive understanding of its value and impact. By addressing these challenges and fostering collaboration between producers, policymakers, and researchers, regional branding can evolve into a powerful tool for promoting local economies, preserving cultural heritage, and achieving sustainable development goals. This article serves as a critical foundation for future research and practical interventions aimed at maximizing the potential of regional product branding, ultimately benefiting producers, consumers, and regional economies alike.

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REGIONÁLNÍ ZNAČKY PRODUKTŮ: PODROBNÉ ROZHOVORY S VÝROBCI

Význam regionálních produktů pro spotřebitele i výrobce roste, což zdůrazňuje potřebu prozkoumat regionální označování. Tato studie zkoumá vnímání majitelů regionálních produktových značek v libereckém regionu (Česká republika) ohledně systémů označování, se zaměřením na výzvy a strategické přístupy. Kvalitativní metodika zahrnovala polostrukturované rozhovory se čtyřmi majiteli značek v období od července do listopadu 2023. Výsledky odhalují různé pohledy na regionální branding, včetně výzev v oblasti certifikačních kritérií, důvěry spotřebitelů a marketingu. Výsledky jsou analyzovány s ohledem na existující literaturu a závěrem jsou doporučení pro zlepšení certifikačních standardů a propagačních strategií.

DIE MARKEN HEIMISCHER PRODUKTE: AUSFÜHRLICHE INTERVIEWS MIT PRODUZENTEN

Die Bedeutung regionaler Produkte wächst sowohl für den Verbraucher als auch für den Hersteller. Dies betont den Bedarf an regionaler Auszeichnung. Diese Studie untersucht die Meinungen der Besitzer der Marken regionaler Produkte in der Reichenberger Region (Tschechische Republik) zu den Systemen der Kennzeichnung mit der Ausrichtung auf Herausforderungen und strategische Ansätze. Die qualitative Methodologie umfasst halbstrukturierte Gespräche mit vier Markeninhabern in der Zeit von Juli bis November 2023. Die Feststellungen enthüllen verschiedenartige Sichtweisen auf heimische Kennzeichnungen, mit Herausforderungen auf dem Gebiet der Zertifizierungskriterien, des Vertrauens der Verbraucher und des Marketings. Die Ergebnisse werden mit der vorhandenen Literatur analysiert, und am Schluss werden Empfehlungen zur Verbesserung von Zertifizierungsstandards und Propagationsstrategien angeboten.

REGIONALNE MARKI PRODUKTÓW: WYWIADY POGŁĘBIONE Z PRODUCENTAMI

Znaczenie produktów regionalnych dla konsumentów i producentów rośnie, co podkreśla potrzebę zbadania regionalnego oznakowania. W niniejszym opracowaniu badaniu poddano poglądy właścicieli regionalnych marek produktów w regionie libereckim (Republika Czeska) na temat systemów przyznawania marki, koncentrując się na wyzwaniach i podejściach strategicznych. Metodyka jakościowa obejmowała półstrukturalne wywiady z czterema właścicielami marek przeprowadzane między lipcem a listopadem 2023 roku. Wyniki pokazują różne spojrzenia na przyznawanie marek regionalnych, w tym wyzwania w zakresie kryteriów certyfikacji, zaufania konsumentów i marketingu. Wyniki są analizowane pod kątem istniejącej literatury, a w zakończeniu wskazano zalecenia dotyczące poprawy standardów certyfikacji i strategii promocji.

PREPARING UNIVERSITY STUDENTS FOR THE LABOR MARKET DIFFERENTLY: LESSONS FROM THE BLENDED INTENSIVE PROGRAM (BIP)

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Abstract

This article examines how a Blended Intensive Program (BIP) can support the development of key labor-market competencies. The aim is to explore how participation in a BIP contributes to students' acquisition of future-ready skills. The authors qualitatively analyzed final posters from international student teams in a 2025 BIP on "AI in Practice" within the Euroregion Neisse. The reported learning outcomes were mapped to the World Economic Forum's Future of Jobs 2025 taxonomy. Results indicate concurrent development of technical skills (Artificial Intelligence or AI and data literacy) and transversal capabilities (analytical thinking, leadership, empathy, multilingualism). The study empirically proves that short, international, collaborative, blended formats foster future-ready competencies.

Keywords

Blended learning; AI; Generation Z; International cooperation; Employability; Euroregion Neisse.

Introduction

In today's rapidly evolving labor market, integrating AI into business processes has become one of the most transformative trends (World Economic Forum, 2025). Young professionals, particularly university students, face the challenge of preparing for careers connected with digitalization and Industry 4.0 (Aranda-Jiménez et al., 2024). Higher education institutions are increasingly expected to bridge the gap between formal academic instruction and the real-world demands of workplaces (Jo et al., 2024; OECD, 2024).

Despite the growing body of literature on AI and workforce transformation, limited attention has been paid to how students of Generation Z themselves perceive these changes and develop relevant competencies towards the labor market (Hovořáková & Pauknerová, 2024). The BIP combines virtual and physical mobility in international and mostly interdisciplinary learning environments, mainly as a short-term learning format (Laine et al., 2025). While
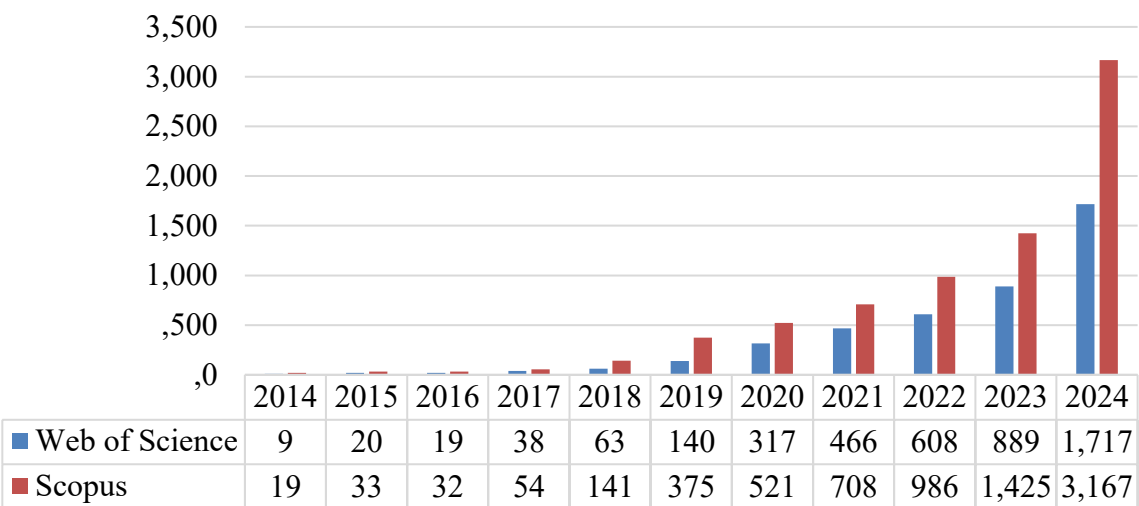
BIPs are recognized for promoting skills in different fields, there is still little empirical evidence on whether BIPs can be implemented in AI.

The primary goal of this article is to explore how participation in a selected BIP can contribute to developing key competencies required for the labor market. The authors used a qualitative content analysis method of the final posters created during the BIP. The article's structure is as follows. The first section presents the literature review with a theoretical background. The following section explains the applied methodology. The third section summarizes the key findings discussed in the next section, including the limitations of this research. The conclusion brings new ideas for further research.

1   Literature Review

Numerous studies highlight the impact of AI on employment and workplace transformation, emphasizing the need for technical and transversal skills (Eger & Žižka, 2024; Jo et al., 2024; OECD, 2024; World Economic Forum, 2025).

As shown by literary research in the Web of Science and Scopus databases, AI has seen a substantial rise in academic attention across disciplines related to Economics, Management, and Business. Figure 1 demonstrates that the number of AI-related scientific articles in these fields has grown steadily over the last decade.

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Web of Science	9	20	19	38	63	140	317	466	608	889	1,717
Scopus	19	33	32	54	141	375	521	708	986	1,425	3,167

Source: Own processing of Web of Science and Scopus databases on 14th June 2025

Fig. 1: *Published articles related to AI in Business, Economics, and Management (2014–2024)*

The number of publications indexed in the Scopus database increased from 19 in 2014 to 3,167 in 2024, while it rose in the Web of Science database from 9 to 1,717 in the same period. This development signals the growing importance of AI not only in technical disciplines but also in business and economics-oriented research. This trend reflects not only the technological advancement of AI but also its growing relevance for management practice, policy-making, and academic inquiry. Moreover, AI awareness can positively influence career competencies and job burnout (Kong et al., 2021). Also, higher education is focusing more and more on AI-related topics (Crompton & Burke, 2023).

The concept of BIP has gained increasing scientific attention as a tool for enhancing professional and other competencies in different industries, such as medicine (Duś-Ilnicka et al., 2024), geophysical and archaeological fields (Rabbel et al., 2023), art and design (de Castro et al., 2025), or education (Tsvetkova, 2023). According to Laine et al. (2025), BIP

creates a unique learning space that encourages students to collaborate with a positive impact on the entrepreneurial ecosystem. These programs foster collaboration and critical thinking (de Castro et al., 2025), both essential for preparing students for complex careers (Duś-Ilnicka et al., 2024; Frampton et al., 2025). The BIP supports the development of professional skills and soft skills, which are needed to develop, especially in higher education (Coelho & Martins, 2022). Moreover, BIP can enhance other competencies, such as the intercultural skills of participants (Tsvetkova, 2023). BIP represents an alternative that allows learners to address different topics through collaboration, reflection, and peer feedback, both in person and online. BIP could also be an appropriate tool for the development of Generation Z and employees from this cohort (Trávníčková, 2023).

A deeper understanding of Generation Z's defining characteristics helps contextualize how and why BIP may be particularly effective for this group. Unlike preceding cohorts, Generation Z has grown up in pervasive digital connectivity, economic uncertainty, and heightened social consciousness. Several defining characteristics emerge from the literature:

- **Digital natives and AI-savvy** – Generation Z has interacted with algorithm-driven platforms such as social media, voice assistants, and recommendation systems from an early age. As noted by Crompton & Burke (2023) and Eger & Žižka (2024), they expect seamless integration of AI in both education and work environments and quickly acquire basic data literacy.

- **Value orientation focused on authenticity, inclusion, and impact** – According to Hovořáková & Pauknerová (2024) and Kong et al. (2021), Generation Z prefers meaningful, purpose-driven careers and emphasizes ethical, inclusive, and sustainable values when evaluating potential employers.

- **Preference of collaborative, experiential learning styles** – Having experienced online education during the COVID-19 pandemic, Generation Z favors project-based formats that mix virtual and in-person interaction. The BIP structure aligns closely with this learning preference (Laine et al., 2025).

- **Multichannel communication habits** – Generation Z prefers informal, fast-paced communication via instant messaging, short videos, and collaborative platforms. Practical pedagogy leverages tools such as digital whiteboards, asynchronous video reflection, and microlearning (Jo et al., 2024).

- **Resilience amid economic volatility** – Having grown up amid global crises, Generation Z balances a pragmatic approach to job security with openness to freelance and portfolio careers. This drives demand for technical skills and soft-skill adaptability (OECD, 2024).

Integrating these generational traits with the broader discourse on AI-driven labor market transformation further underscores the relevance of BIP as a learning format. By combining AI-focused content with collaborative, multimodal delivery, BIP addresses the values, preferences, and competencies Generation Z needs to thrive in future workplaces (World Economic Forum, 2025).

2   Methodology

To achieve this article's main objective, a stepwise methodological approach was adopted.

First, a literature review was conducted in the Web of Science and Scopus databases, the main findings of which were described in the previous section.

Second, an analysis of secondary data was carried out with a focus on labor market requirements. The Future of Jobs Report 2025 (World Economic Forum, 2025) was selected

because it provides a well-established and up-to-date taxonomy of future skills, broadly recognized in research and practice. The taxonomy reflects insights from more than 1,000 leading global employers, covering over 14 million employees across 22 industries and 55 economies worldwide (World Economic Forum, 2025). Such a broad perspective ensures that the identified competencies are theoretically grounded and mirror the most recent expectations of the labor market. Therefore, this framework was used as a reference point for categorizing student-reported competencies and linking the findings to current global trends in employability.

Based on the literature review and the secondary analysis of the Future of Jobs Report (World Economic Forum, 2025), the following research questions (RQ) were formulated:

RQ1: Which key competencies defined by the World Economic Forum (2025) have been enhanced among participants of the selected BIP?

RQ2: How do participants perceive the opportunities and risks associated with artificial intelligence after completing the selected BIP?

Third, primary data collection was conducted. An international BIP was selected. BIP was held in spring 2025 on the topic "Artificial Intelligence in Practice — Its Contribution to the Development of the Euroregion Neisse" (further "AI in Practice"). A total of 50 students came from six universities in Central Europe, reflecting the cross-border collaboration on the topic of "AI in Practice" connected with the Euroregion Neissa, which consists of the Liberec Region in Czechia, the Lower Silesian Province in Poland, and the Bautzen and Görlitz districts in Germany. The first meeting was held online in April 2025, followed by a five-day in-person meeting in May 2025. The students were split into eight diverse teams, each comprising members from different universities.

The learning process during this BIP combined lectures, practical workshops, and company visits, such as ŠKODA Auto, one of the most awarded employers in the Czech Republic. The topic was also discussed during the practical workshop delivered by Beey.io. Additional lectures during both the online and in-person phases further deepened participants' knowledge of AI implementation, which was presented in more detail on the ACC Forum 2025 websites (ACC, 2025).

As part of the BIP, each student team was expected during the whole BIP to prepare a final poster addressing the two following points:

1. Identify five key takeaways from the ACC Forum 2025, particularly those connected to AI, drawing on experiences from lectures and workshops with emphasis on what was surprising, inspiring, or relevant for their future careers; select one concept or theory that supports one of these takeaways and present it using real data, forecasts, and a relevant visual such as a chart or model; reflect on the Škoda Auto visit and summarize the most impactful insights related to AI.

2. The second section of the poster should focus on skills and competencies development, encouraging students to reflect on when and how they developed specific competencies during the program, with each team member contributing at least one skill or learning outcome. In this way, each team created a poster addressing areas of particular interest to its members, voluntarily selecting the focus and assigning an appropriate title.

Finally, the data were collected as final posters, which were presented by teams on the last day of the BIP. Afterwards, the data were analyzed through thematic analysis to explore how students perceived and reflected on their experiences in a selected BIP. Thematic analysis is

suitable for analyzing patterns within qualitative data and is valued for its flexibility and potential to generate trustworthy insights (Nowell et al., 2017).

In the first step, competencies reported in posters were coded and categorized according to the World Economic Forum's taxonomy of future skills (World Economic Forum, 2025). In the second step, poster reflections on AI were examined to identify opportunities, risks, and participants' overall awareness of AI. To enhance the reliability of the findings, all authors cross-checked the results of the analysis. This multi-layered approach ensured coherence between the conceptual background, the formulated research questions, and the empirical findings derived from the BIP.

3   Results

The results are structured according to the two main research questions. They are based on analyzing student-generated digital posters created by the students' team during the selected BIP.

3.1   Competencies Developed during BIP

RQ1 (research question 1) explores which competencies related to the labor market can be developed through participation in a BIP. Students' self-reported learning outcomes were categorized using the World Economic Forum's taxonomy of future skills (World Economic Forum, 2025).

The most frequently developed competencies include leadership and social influence, as well as AI and big data literacy, reported by 14% of students. These are followed by key soft skills such as empathy, active listening, analytical thinking (12% each), motivation and self-awareness, and multilingualism (11% each). Competencies, such as creative thinking and flexibility, were also mentioned. Related to BIP, 9% of the mentioned competencies were connected to some specific job tasks.

Figure 2 presents the relative frequency of competency development presented in final posters according to the World Economic Forum (2025), which highlights the following combination of technical and soft competencies enhanced through BIP experience.
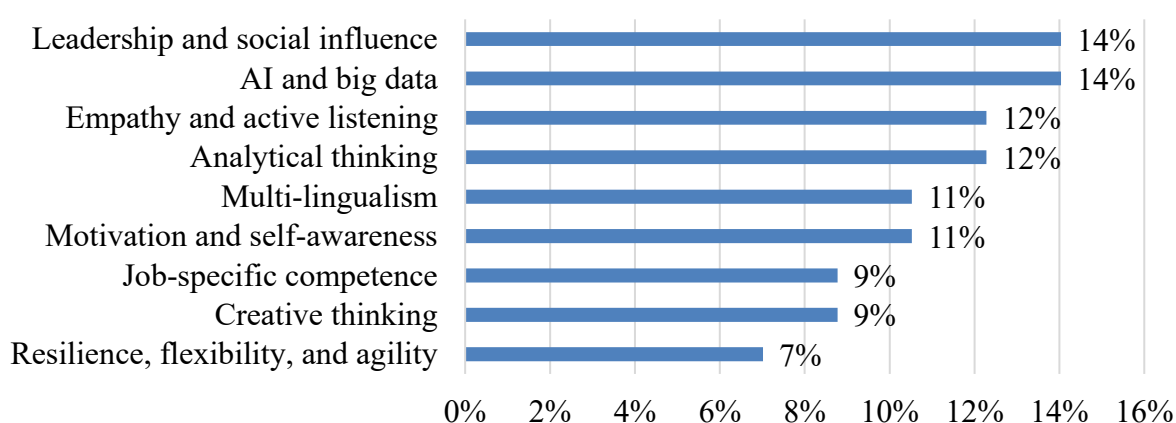
Source: Own processing based on student poster analysis

Fig. 2:   *Competencies categorized according to the World Economic Forum (2025), which were developed through BIP based on student reflections on final posters*

Thematic analysis of the posters shows that students were not only able to identify a broad set of future-oriented competencies but also described them in reflective terms, suggesting deeper self-awareness of their personal and professional development. The prominence of human-

centered skills—such as empathy, active listening, and intercultural communication—suggests that the international and collaborative setting of the BIP fostered meaningful personal growth. At the same time, frequent references to AI and big data literacy indicate that students internalized the technological content and linked it to their employability potential. These findings demonstrate that short-term, blended, and experience-based learning formats can be practical tools for developing technical and transversal competencies in higher education.

3.2   Perceived Opportunities and Risks of AI

To address RQ2 (research question 2), students reflected on the pros and cons of AI implementation. Based on their final posters, these insights were synthesized into Table 1.

Tab. 1: *Student's reflections on the pros and cons of AI*

Poster Title	Pros of AI	Cons of AI
AI-driven supply chain intelligence	Prompting, tools, and automation.	Ethical concerns.
AI is smart, not wise	Human-like behavior, support of diversity and inclusion.	Black box, limited real understanding.
Linguaneisse	Data quality, critical thinking.	Cybersecurity, resistance, and education gaps.
AI-nization of Euro-Nysa	Accuracy, big data, analytics.	Hallucinations, overreliance.
StAI in the Euroregion Neisse	Predictive help, support roles.	Bias, data diversity issues.
AI: Is it making us faster...?	Efficiency, prompting.	Dependence on strategic AI.
AI across the border	Automatization, support tool.	Ethical issues, lack of transparency, and importance of data input.
AI travel agent in the Oder-Neisse Region	Cost reduction, automatization, and availability.	Job displacement, privacy concerns, and a lack of human judgment.

Source: Own processing based on student poster analysis

Each student team provided a unique perspective on their AI implementation case. The "Linguaneisse" team, for example, linked AI to language processing challenges, while the team with the topic "AI: Is it making us faster...?" focused on AI's impact on the speed and efficiency of humans and AI. Ethical concerns such as transparency, bias, and overreliance were noted across almost all teams, indicating a shared awareness of AI's limitations. At the same time, students valued automation, accessibility, and support functions, emphasizing AI's enabling role in augmenting rather than replacing human decision-making. These reflections indicate that students gained technical understanding and developed the capacity for critical thinking about societal and ethical dimensions of AI.

4   Discussion

The findings regarding RQ1 (research question 1) show that students developed a broad range of technical and transversal competencies, especially leadership, AI literacy, and empathy. Regarding RQ2 (research question 2), participants demonstrated increased awareness of the potential and challenges of AI through poster reflections that addressed ethical, practical, and societal dimensions. The findings demonstrate that participation in the BIP "AI in Practice" supported developing technical and transversal competencies aligned with global labor market trends. Students' most frequently reported competencies, such as AI and big data leadership, social influence, empathy, and active listening, correspond with the top-ranked skills listed in the Future of Jobs Report 2025 (World Economic Forum, 2025).

This indicates that international, interdisciplinary, and experiential learning formats such as BIP are highly effective in preparing students for the changing nature of work. In comparison with Laine et al. (2025), who emphasize BIP importance for shareholders such as universities, industry, or government, our findings suggest that BIP develops not only technical (AI and big data related competencies) but mainly personal competencies, such as leadership, communication, empathy, or analytical thinking. All relate to the requirements of employers for the current and future labor market (World Economic Forum, 2025). AI awareness also enhances career competencies (Kong et al., 2021).

While the variety of developed competencies reflects the holistic character of the BIP approach, it is important to note some limitations. First, the data were collected through qualitative reflections and may reflect individual subjective bias or variability in team dynamics. Second, the competencies were self-reported, not measured through external evaluation. Finally, the findings are limited to a single BIP case in the Euroregion Neisse and may not be generalizable to all student populations or disciplines.

Despite these limitations, the study offers valuable insights into how innovative formats like BIP can complement traditional university education and provide a responsive, practice-oriented framework for developing future-ready graduates.

Conclusion

This article presented a case study of a BIP as an innovative educational model to support university students in developing competencies relevant to the present labor market. The study identified diverse technical and human-centered skills developed during BIP through a qualitative content analysis of student-generated final outputs. These included AI and data literacy, leadership, empathy, critical thinking, and others, aligned with competencies currently prioritized by employers worldwide.

The results show that BIP can provide a meaningful platform for enhancing students' competencies in different disciplines, including technology-oriented topics. Students in this BIP explored AI's pros and cons and reflected on its ethical risks and sector-specific applications.

Future research should further explore the impact of BIP participation on students' career competencies and investigate how such programs can be adapted across different fields. Quantitative validation of competency development would also strengthen the integration of BIP into higher education.

In practice, universities are encouraged to implement BIP into their curricula, particularly in collaboration with external stakeholders. As AI continues to reshape the world of work, experiential and collaborative learning models like BIP will be increasingly essential in preparing graduates to adapt and lead.

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Příprava vysokoškolských studentů na trh práce jiným způsobem: poznatky z kombinovaného intenzivního programu (Blended Intensive Program – BIP)

Tento článek zkoumá, jak může kombinovaný intenzivní program (Blended Intensive Program – BIP) podpořit rozvoj klíčových kompetencí na trhu práce. Cílem je prozkoumat, jak účast v programu BIP přispívá k získávání dovedností studentů potřebných pro budoucnost. Autoři kvalitativně analyzovali závěrečné plakáty mezinárodních studentských týmů v programu BIP 2025 na téma „AI v praxi" v Euroregionu Nisa. Zaznamenané výsledky učení byly zmapovány podle taxonomie Světového ekonomického fóra „Budoucnost pracovních míst 2025". Výsledky ukazují souběžný rozvoj technických dovedností (umělá inteligence nebo AI a datová gramotnost) a transversálních schopností (analytické myšlení, leadership, empatie, mnohojazyčnost). Studie empiricky dokazuje, že krátké, mezinárodní, kolaborativní, kombinované formáty podporují kompetence připravené na budoucnost.

Die Vorbereitung von Hochschulstudierenden auf den Arbeitsmarkt anders: Erkenntnisse aus dem Blended Intensive Program (BIP)

Dieser Artikel untersucht, wie ein kombiniertes Intensivprogramm (BIP) die Entwicklung von Schlüsselkompetenzen auf dem Arbeitsmarkt fördern kann. Ziel ist es, zu untersuchen, wie die Teilnahme am BIP-Programm dazu beiträgt, dass Studierende die für die Zukunft erforderlichen Fähigkeiten erwerben. Die Autoren haben die Abschlussplakate internationaler Studententeams des BIP-Programms 2025 zum Thema „KI in der Praxis" in der Euroregion Neiße qualitativ analysiert. Die erfassten Lernergebnisse wurden anhand der Taxonomie „Die Zukunft der Arbeitsplätze 2025" des Weltwirtschaftsforums kartiert. Die Ergebnisse zeigen eine parallele Entwicklung von technischen Fähigkeiten (künstliche Intelligenz oder KI und Datenkompetenz) und transversalen Fähigkeiten (analytisches Denken, Führungsqualitäten, Empathie, Mehrsprachigkeit). Die Studie belegt empirisch, dass kurze, internationale, kollaborative, kombinierte Formate zukunftsfähige Kompetenzen fördern.

Przygotowanie studentów uniwersytetu do rynku pracy inaczej: wnioski z mieszanego kursu intensywnego (Blended Intensive Program – BIP)

Niniejszy artykuł analizuje, w jaki sposób mieszany kurs intensywny (Blended Intensive Program – BIP) może wesprzeć rozwój kluczowych kompetencji na rynku pracy. Celem jest zbadanie, w jaki sposób udział w programie BIP przyczynia się do zdobywania przez studentów umiejętności przydatnych w przyszłości. Autorzy przeprowadzili jakościową analizę plakatów stworzonych przez międzynarodowe zespoły studentów w programie BIP 2025 na temat „AI w praktyce" w Euroregionie Nysa. Odnotowane efekty kształcenia studentów zostały zmapowane zgodnie z taksonomią Światowego Forum Ekonomicznego „Przyszłość miejsc pracy 2025". Wyniki pokazują równoległy rozwój umiejętności technicznych (sztuczna inteligencja lub AI oraz kompetencje w zakresie danych) i umiejętności przekrojowych (myślenie analityczne, przywództwo, empatia, wielojęzyczność). Badanie empirycznie dowodzi, że krótkie, międzynarodowe, oparte na współpracy i mieszane formaty wspomagają kompetencje przygotowane na przyszłość.

SUSTAINABLE FINANCE AND CARBON NEUTRALITY IN THE BREWERY INDUSTRY: CHALLENGES AND OPPORTUNITIES

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Abstract

This article investigates barriers, risks, and opportunities in the transition of breweries to a low-carbon economy, focusing on the role of sustainable finance in enabling decarbonization. Drawing on a systematic literature review and sector-specific data, it analyses how Environmental, Social, and Governance (ESG) scores and financial performance interact, revealing short-term trade-offs for global majors and more diverse patterns among regional breweries. The findings suggest that profitability and sustainability performance are inconsistent, reflecting regulatory, technological, and market complexities. As exploratory work, this study offers initial insights and opens avenues for further research.

Keywords

Sustainable finance; Carbon neutrality; Financial performance; Brewery industry.

Introduction

In accelerating climate change, increasing regulatory pressures, and raising stakeholder expectations, the transition toward carbon neutrality has emerged as a strategic priority across numerous industries. With its significant energy demands, reliance on agricultural inputs, and global supply chains, the brewery industry is under increasing pressure to address environmental impacts and pursue decarbonization pathways. Decarbonization refers to the systematic reduction of greenhouse gas (GHG) emissions, particularly carbon dioxide, through technological innovation, energy efficiency, and process transformation (OECD, 2023). As the benchmarking study by the Beverage Industry Environmental Roundtable (BIER, 2023) highlights, the brewery industry is a significant contributor to GHG emissions. GHG emissions in brewing originate across the whole value chain, with key sources including energy use, raw materials, packaging, and logistics. Scope 1 emissions include fuel combustion for brewing processes such as boiling, fermentation, and pasteurization, while Scope 2 covers electricity use primarily for refrigeration and lighting. However, many emissions fall under Scope 3, particularly from packaging materials and agricultural inputs. Packaging alone can contribute up to 40% of total emissions as reported by major brewery groups (Heineken, 2024; Carlsberg Group, 2024; Asahi Group Holdings, 2024; Kirin Holdings, 2024; Molson Coors, 2024; Anheuser-Busch InBev, 2024).

Therefore, its transition toward carbon neutrality is not only desirable but also inevitable. Nevertheless, the complexity of decarbonization, particularly in Scope 3 emissions, requires industry-specific strategies, technological innovation, and credible sustainability frameworks.

Fankhauser et al. (2023) note that achieving carbon neutrality cannot follow a one-size-fits-all approach. Strategies must be tailored to sectoral and regional contexts. Carbon neutrality is a state in which carbon dioxide emissions are balanced by their removal or offset through various environmental projects. It involves a significant reduction in emissions and the compensation of residual emissions, for example, through afforestation or investments in renewable energy sources (Zakari, 2024). This definition highlights the dual challenge for businesses to reduce emissions and ensure that any residual environmental impact is credibly addressed.

The primary goal of this article is to identify and critically examine the key challenges, risks, and opportunities associated with the brewery industry's transition to carbon neutrality, explicitly focusing on the extent to which sustainable finance contributes to achieving net-zero goals. The focus is not only on identifying barriers to decarbonization – such as technological limitations, operational complexity, and regulatory fragmentation – but also on highlighting opportunities related to innovation, market differentiation, and stakeholder engagement. The objective is to integrate academic perspectives with commercial data, offering a synthesis that enhances both theoretical understanding and practical application within the brewery sector.

This article investigates the brewery industry's transition to carbon neutrality from a business economic perspective, particularly emphasizing how sustainable finance can act as a strategic enabler of decarbonization. Sustainable finance encompasses financial practices that integrate ESG considerations into investment and funding decisions. It aims to allocate capital in ways that support long-term economic sustainability, environmental protection, and social responsibility (European Commission, 2025). In this article, sustainable finance is considered a strategic enabler of decarbonization, facilitating investment in climate mitigation technologies. The research is motivated by a growing need to understand how companies manage the practical and financial complexities associated with reducing GHG emissions while simultaneously responding to the evolving expectations of key stakeholders, as observed by Ong et al. (2024). Although carbon neutrality and sustainable finance are extensively acknowledged in high-emission sectors such as energy, transport, or heavy industry, the brewing industry remains underexplored, as revealed by the systematic literature review conducted in this study, despite its notable environmental footprint. By addressing sector-specific decarbonization challenges and the strategic role of sustainable finance, this study contributes new insights into how breweries can advance toward net-zero targets.

The methodology adopted in this article combines qualitative and quantitative approaches, primarily through a systematic literature review (SLR), which is complemented by a sector-specific analysis of ESG ratings and financial indicators of selected brewing groups. The data sources include academic literature, corporate sustainability reports, and information provided by ESG rating agencies. This integrated approach enables the connection of conceptual frameworks with real-world, industry-specific challenges.

The article has the following structure: After the opening Introduction Section, Section 1 presents the key theoretical foundations and findings from the systematic review of current academic and professional literature. Section 2 outlines the research design, including the structure of the literature review and the selection of relevant industry data. In Section 3 the article presents the core findings across three main areas: challenges and risks linked to decarbonization; opportunities and strategic pathways; and ESG and financial performance in selected brewing companies. Section 4 interprets the results using theoretical frameworks and current regulatory developments. Finally, the Conclusion Section summarizes the key insights, reflects on the article's limitations, and outlines directions for future research.

1 Literature Review

1.1 Key Challenges and Risks

Like many companies in the fast-moving consumer goods sector, Breweries face numerous obstacles to achieving carbon neutrality. One of the most significant is the complexity of managing emissions across the entire supply chain. "*Scope 3 metrics are most often unclear, incomplete [...], and poorly documented, due in part to the complexity of companies' supply chains, which involve many different actors.*" (Boiral et al., 2024, p. 5). This challenge is even more visible in brewing, where raw materials, distribution, and packaging are primary indirect emissions sources. Technological readiness is another concern. Smaller enterprises often lack the capital or expertise to implement low-carbon technologies or renewable energy infrastructure (Fankhauser et al., 2023). Resistance to change, established production practices, and limited access to innovation networks further compound these operational difficulties (Bag, 2024).

Company size also plays a role. Gotoh (2025) identified strategic differences across firms of varying sizes. Findings show that large enterprises emphasize climate-related risks and opportunities and business planning and materiality, while medium-sized firms focus on goal setting and climate measures. Smaller businesses, by contrast, tend to prioritize themes such as gender participation and parental leave or climate governance. From a governance perspective, integrating climate issues into materiality suggests that large firms adopt a more comprehensive approach to climate risk and opportunity management.

On the other hand, smaller companies are likely to perceive internal organizational changes as more challenging due to capacity, financial, and operational constraints. Progress is further hindered by the lack of decarbonization roadmaps tailored to specific industries. Yang et al. (2023) note that many companies still lack detailed implementation plans or clear standards for achieving carbon neutrality.

Reputational risk and credibility are also significant concerns. Setting clearly defined carbon neutrality targets is a key prerequisite for ensuring the credibility of corporate climate commitments. Boiral et al. (2024) warn of significant discrepancies in the quality of disclosed information – short-term and intermediate targets are often missing, and the scope of commitments is not clearly defined. Most declared targets aim for 2050, which may indicate insufficient recognition of the urgency of immediate decarbonization action. This can lead to stakeholder distrust: "*The targets set are often long-term, which tends to indicate that, despite the often-emphatic rhetoric about the seriousness of climate issues and the reassuring statements about management commitment, most of companies do not seem to recognize the urgency of acting in the short term.*" (Boiral et al., 2024, p. 6).

Finally, financial risks, which may arise from climate finance policies such as carbon taxes or the EU Emissions Trading System, must be mentioned. Zakari (2024) notes that inconsistent approaches among member states may lead to market distortions and increased regulatory burden for companies. This is further confirmed by Zhang et al. (2022), who point out that regulatory uncertainty poses a significant challenge for strategic planning - particularly in the context of transnational carbon tariffs and emissions reporting standards, whose variability and lack of harmonization significantly complicate companies' long-term decision-making processes.

1.2 Opportunities and Strategies

Despite these obstacles, pursuing carbon neutrality offers breweries notable opportunities for innovation and differentiation. Ong et al. (2024) find that firms with well-developed green

value chain profiles outperform competitors in market positioning and stakeholder engagement. Breweries that adopt transparent and verifiable emissions targets benefit from growing investor interest in ESG performance (Díaz-Peña et al., 2022).

In addition to reputational gains, there are economic incentives. Fankhauser et al. (2023) note that science-based targets (SBTs) make it possible to compare corporate decarbonization ambitions to climate goals and avoid arbitrary reduction pathways, helping firms build credibility in financial markets. Breweries that align with these frameworks gain access to green finance instruments such as sustainability-linked loans. Moreover, carbon neutrality initiatives can lead to improved operational efficiency. For instance, digital emissions tracking platforms enable more precise management of energy and resources, which is particularly relevant for energy-intensive processes (Wu & Song, 2024). This application is highly pertinent to the brewing industry.

Breweries are increasingly turning to structured methodologies to guide their transformation. The SBTs initiative has emerged as a key framework, helping companies define short- and long-term emissions reduction targets in line with climate science. "*Net zero offers a more robust and scalable solution to the complex challenges of supply chain sustainability.*" (Chen et al., 2024, p. 11). Regulatory alignment is also essential. The Corporate Sustainability Reporting Directive (CSRD) and the EU Taxonomy ensure that companies, including breweries, report on their progress toward climate goals. Boiral et al. (2024) emphasize that achieving compliance will require improved data systems and clearer internal accountability structures.

2   Methodology

The research framework adopted in this article is based on stakeholder and institutional theories. It analyzes the challenges, risks, opportunities, and strategic frameworks encountered by breweries in their efforts to achieve carbon neutrality. Stakeholder theory highlights the significant influence of stakeholders such as customers, competitors, regulatory authorities, and investors on companies' sustainability activities. In contrast, institutional theory emphasizes the role of external pressures in the form of norms, regulations, and the imitation of best practices (Zhang et al., 2022). Given the complexity of achieving carbon neutrality in the brewery sector, this framework stresses internal capacities and external pressures that influence strategic decision-making.

The key areas include:

- **Key Challenges and Risks** – Identification of major barriers companies face in their pursuit of carbon neutrality targets, with a focus on technological, financial, and regulatory aspects. An analysis of potential risks associated with the transition to carbon neutrality, such as operational, reputational, and market risks.

- **Opportunities and Strategic Frameworks** – The potential for innovation, market differentiation, improved stakeholder relations, and economic incentives resulting from carbon neutrality strategies. Evaluate the strategies and framework approaches companies employ to achieve their carbon neutrality and decarbonization goals.

Research in the form of SLR was chosen to provide a structured overview of recent academic discourse on carbon neutrality and sustainable finance. Literature from 2021 to 2025 was selected to capture the most recent developments in response to rapidly evolving climate policies and regulatory frameworks. Relevant literature was identified using the Web of Science database and selected for its relevance to sustainable finance, carbon neutrality, and net zero strategies. The subsequent thematic analysis focused on key challenges, emerging

opportunities, financial instruments, and their implications for both operational and financial performance.

For this systematic literature review, the following research questions (RQ) were formulated:

RQ1: What are the main challenges and risks companies face in achieving carbon neutrality?

RQ2: What opportunities can carbon neutrality strategies bring to companies?

The Web of Science database was selected for the SLR because using a single database minimizes the risk of retrieving duplicate publications. The detailed search protocol is provided in Table 1.

Tab. 1: Protocol for academic article search

Database	Web of Science
Type of article	Article
Language	English
Time frame	2021-2025
Search field	TS = ("financial performance") AND ((TS = ("carbon neutrality") OR TS = ("net zero") OR TS = ("carbon neutral")))
Date of search	21.4.2025

Source: Own

The literature screening procedure is outlined in Figure 1. Based on the set criteria, 72 academic articles were identified. Two of them were review articles and were therefore excluded from further evaluation. Subsequently, an abstract screening was conducted to assess their quality and thematic relevance. Given the article's focus primarily on the European context, due to Europe's leadership in shaping global sustainability policies (particularly through regulatory instruments such as the EU Green Deal and the CSRD), publications exclusively related to other geographic regions were excluded at this stage. Only articles whose abstracts contained relevant keywords and were entirely or at least partially related to the food industry were included in the final selection phase. None of the articles specifically addressed the brewing sector. Studies focusing on heavy industry, mining, or energy that did not align with the thematic scope of this article were also excluded. As a result of this process, 60 articles were excluded, and 17 relevant studies were selected for detailed analysis.
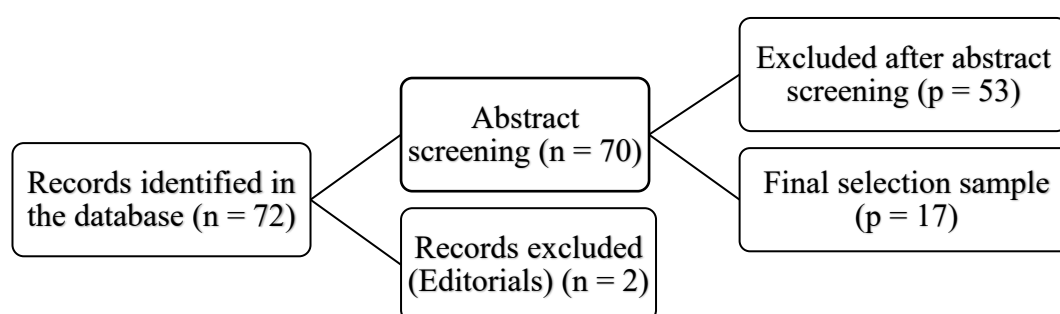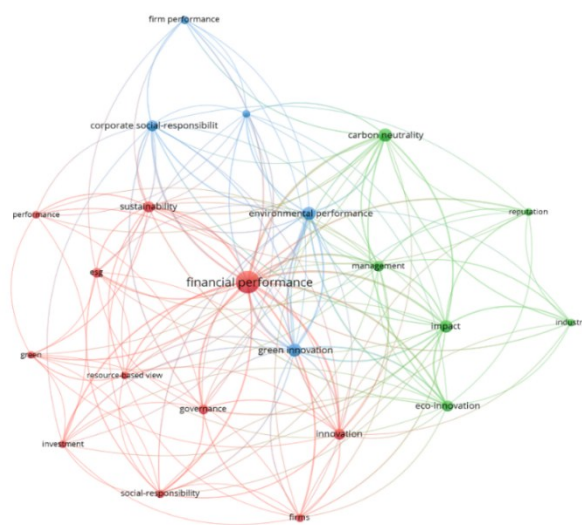

Source: Own

Fig. 1: *Literature screening flowchart*

For keyword occurrence analysis, the software VOSviewer was used, applying the full counting method, see Figure 2. The minimum number of keyword occurrences was set at 4, which identified 22 keywords that met this threshold (out of a total of 343 recorded occurrences). The analysis covered publications from 2021 to 2025, reflecting the defined time frame of the literature review. A clear upward trend in articles was observable, suggesting growing academic interest in recent years. As the search was conducted early in

2025, the number of publications and citations is expected to continue to rise throughout the year. The total number of citations recorded was 451, with the majority occurring in 2024, indicating the increasing relevance and visibility of the topic. The nature and academic impact of the selected articles likely influence the observed fluctuations in citation counts.

Source: Own using VOSviewer software
Fig. 2: *Visualization of key words*

This systematic review demonstrates that while carbon neutrality and sustainable finance, including decarbonization strategies, are widely recognized across various industries, the brewing sector remains underexplored in academic literature despite its considerable environmental footprint and exposure to increasing regulatory and stakeholder pressures. The subsequent discussion synthesizes the findings from the reviewed literature in direct response to the defined research questions.

In addition to academic articles, professional studies and public resources were incorporated, to enrich the analysis with industry-specific insights. The analysis draws on ESG ratings because they provide standardized and externally validated indicators of corporate sustainability performance (S&P Global, 2025). While ESG scores are not a direct measure of decarbonization, they serve as a standardized and comparable proxy at the global level. In this study, their use reflects both the availability of consistent cross-company data and the influence of ESG frameworks in shaping investors and regulatory perceptions of corporate sustainability.

Key sources include sustainability reports, ESG disclosures, and financial statements of leading global brewery groups. The core analytical sample focuses on six key multinational leaders (Anheuser-Busch InBev, Heineken N.V., Asahi Group Holdings, Molson Coors, Carlsberg Group, and Kirin Holdings), which together account for over half of global beer production and generate an estimated EBITDA exceeding EUR 33 billion. This group provides a representative basis for examining the global brewing industry's financial relevance, market position, and strategic role. To test the robustness of these findings, the analysis is further extended to a broader set of breweries, including regional players such as Thai Beverage, Anadolu Efes, and Royal Unibrew. This extended sample, representing a diverse mix of geographies and market positions, allows for assessing whether observed patterns among global majors also hold across mid-sized and regional brewers. Geographically, the sample covers all key beer production and consumption regions such as North America, Europe, and the Asia-Pacific. This ensures diversity in operational conditions,

regulatory frameworks, and stakeholder expectations, which are critical for comprehensively assessing carbon neutrality strategies. Moreover, as publicly traded entities, these companies are subject to high levels of transparency and alignment with international non-financial reporting standards.

Data from leading ESG rating agencies were also utilized for further comparison, namely (S&P Global, 2025; ESG Score and Sustainalytics, 2025). Although both agencies provide reputable ESG assessments and are widely used by investors, they differ significantly in scope, scoring and underlying assumptions, which has implications for data interpretation and comparability. S&P Global takes a performance- and disclosure-oriented approach, assessing companies based on how well they manage ESG issues across standardized criteria relevant to their sector. Its ESG scores reflect a company's level of ESG integration, transparency, and alignment with the best practices of industry, and are derived from extensive questionnaires, corporate disclosures, and third-party data. Another distinctive feature of the S&P Global ESG methodology is its application of the double materiality principle, which evaluates both financial materiality and impact. The resulting scores, on a 0 - 100 scale, where 100 represents the maximum score, are designed to be cross-sector comparable and useful for benchmarking ESG maturity across firms (S&P Global, 2025). This aligns closely with institutional theory, which emphasizes conformity with external expectations, such as disclosure norms, voluntary standards, and regulatory frameworks (Zhang et al., 2022). To examine the relationship between ESG performance and financial outcomes in the brewery sector, a correlation analysis was conducted using S&P Global (2025) ESG scores and EBITDA values of the selected companies. In contrast, Sustainalytics adopts a risk-based methodology focused on a company's exposure to material ESG issues and its ability to manage those risks. Its ESG Risk Ratings measure the degree of unmanaged ESG risk, with lower scores indicating stronger ESG performance, offering risk scores ranging from negligible to severe. These assessments are particularly valued for their rigorous analysis of industry-specific risks, enabling stakeholders to identify potential long-term financial impacts ESG factors (Sustainalytics, 2025).

S&P Global (2025) is particularly valuable for comparative ESG benchmarking and cross-sector analysis. Sustainalytics (2025) delivers in-depth assessments of ESG risks and management effectiveness at the company level. This comprehensive methodological approach is intended to ensure the robustness of the findings and provide clear insights and reliable conclusions that contribute to both practical implementation and theoretical advancement in sustainable finance and carbon neutrality in the brewery industry.

3   Results

This section presents the article's main findings. While the literature review primarily addresses the defined research questions, the sectoral analysis of ESG and financial performance in the brewery industry builds on this foundation by integrating conceptual insights with practical challenges related to the industry. This article applies stakeholder and institutional theory to examine how internal capacities and external expectations shape breweries' decarbonization efforts. Together, these frameworks offer a helpful lens through which to examine how internal capacities and external expectations shape decarbonization pathways in the brewery sector. Common barriers include the complexity of Scope 3 emissions accounting, particularly in areas such as raw material sourcing, packaging, and distribution (Boiral et al., 2024), along with limited access to technology and innovation in smaller firms (Fankhauser et al., 2023; Bag, 2024). Weak or unclear targets and a lack of sector-specific roadmaps further hinder progress (Boiral et al., 2024; Yang et al., 2023). In Europe, regulatory variation, such as uncertainty around the Green Deal, compounds these

challenges (Baicu et al., 2022), while decarbonization strategies carry supply chain and operational risks (Cheng et al., 2021).

Nevertheless, carbon neutrality presents strategic advantages. Firms adopting SBTs improve market credibility and gain access to sustainable finance (Fankhauser et al., 2023), while emissions-tracking technologies enhance efficiency (Wu & Song, 2024). Alignment with regulatory frameworks like CSRD and the EU Taxonomy supports transparency. As Ong et al. (2024) and Chen et al. (2024) argue, breweries that commit to robust, verifiable strategies are likelier to thrive in a sustainability-driven economy.

3.1 Sectoral Analysis of ESG and Financial Performance in the Brewery Industry

The ESG ratings in Table 2 reveal pronounced variation across the global brewing industry. Asian firms, particularly Thai Beverage (92) and Kirin Holdings (59), score the highest, whilst in contrast, Chinese breweries (Tsingtao, 30; China Res. Beer, 40) or US-based brewers (Constellation Brands, 35; Anheuser-Busch InBev, 40; Molson Coors, 48) rank among the lowest. European-based firms such as Carlsberg (54), Heineken (52), and Royal Unibrew (47) fall in the middle range. These results indicate that ESG performance is unevenly distributed, with leaders and laggards present across regions and company sizes.

Tab. 2: *ESG ratings of major firms in brewery industry*

Brewery	ESG score
Thai Beverage Public Company Limited	92
Kirin Holdings	59
Budweiser APAC	57
Asahi Group Holdings, Ltd.	55
Carlsberg A/S	54
Anadolu Efes	53
Heineken N.V.	52
Molson Coors	48
Royal Unibrew A/S	47
Sapporo Holdings Ltd.	44
Anheuser-Busch InBev	40
China Resources Beer	40
Constellation Brands, Inc.	35
Tsingtao Brewery Co., Ltd.	30
United Breweries Limited	30

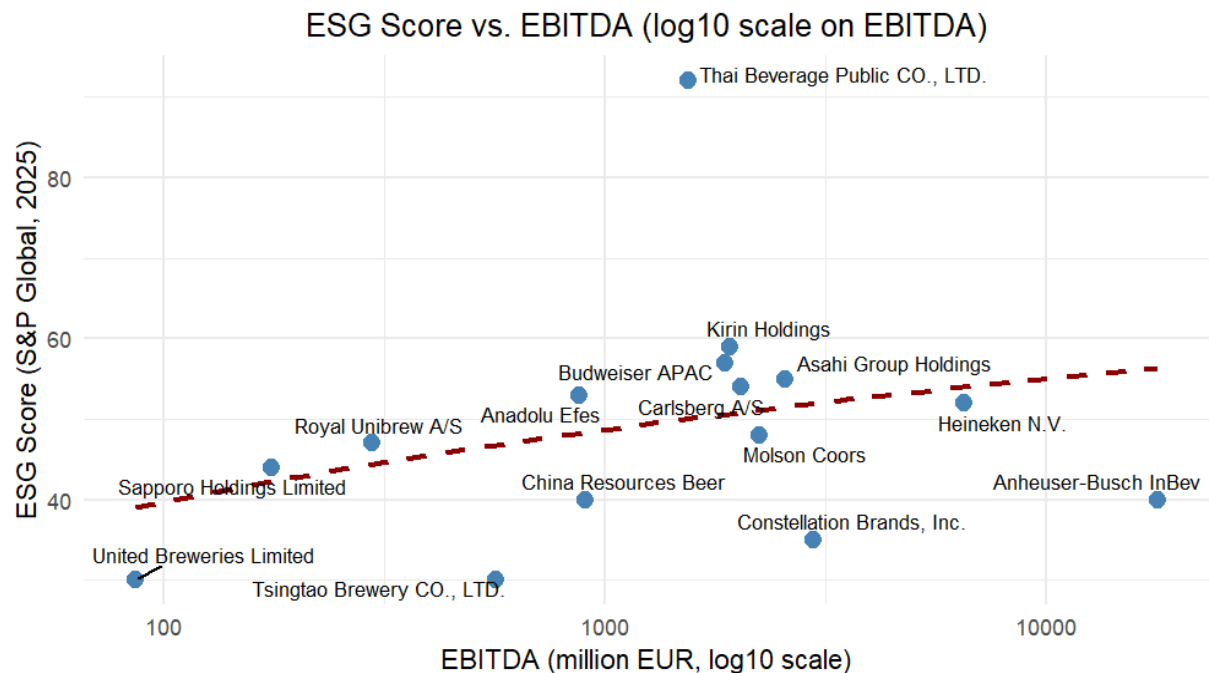*Source: Own using (S&P Global, 2025)*

To examine the relationship between ESG performance and financial results in the brewery sector, a correlation analysis was conducted using S&P Global (2025) ESG scores and EBITDA values (in million EUR) for six major brewing groups. The analysis in Figure 3 reveals a strong negative correlation ($r = –0.84$, $p = 0.034$), indicating that higher ESG scores are associated with lower EBITDA. The statistically significant p-value (< 0.05) suggests that this relationship is likely not due to chance, even with the limited sample size. Anheuser-Busch InBev (2024) is a notable outlier, reporting the highest EBITDA and the lowest ESG score. In contrast, Kirin Holdings demonstrates the opposite trend, achieving the highest ESG score alongside relatively lower profitability. This finding suggests a temporal trade-off between investing in sustainability and financial returns especially in capital-intensive sectors like brewing, where decarbonization requires long-term investments in energy systems and process or product innovation.
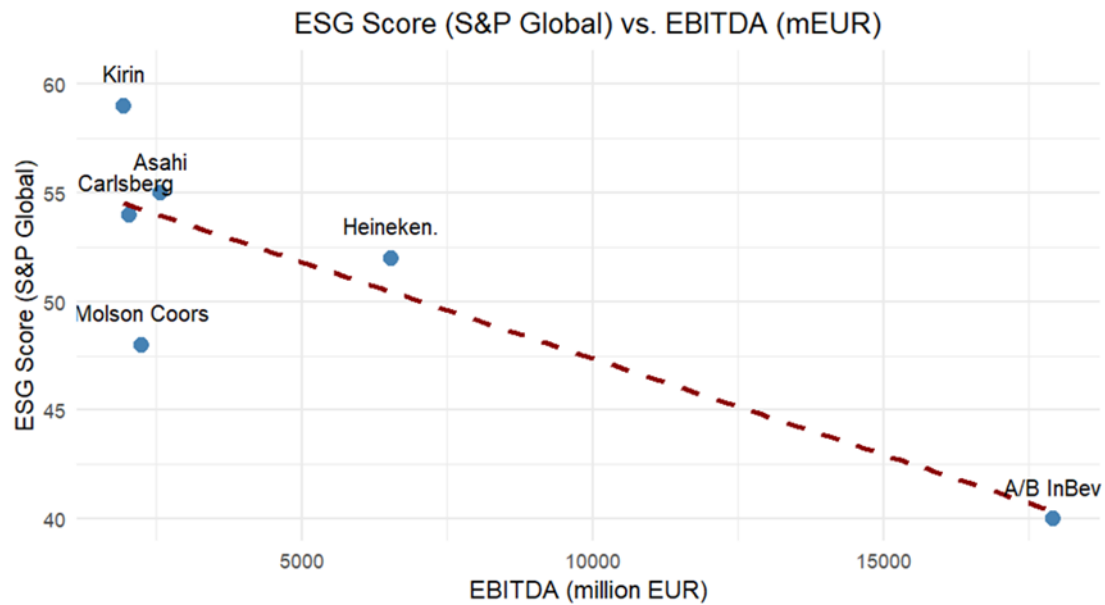
ESG Score (S&P Global) vs. EBITDA (mEUR)

Source: Own using (S&P Global, 2025; Heineken, 2024; Carlsberg Group, 2024; Asahi Group, 2024; Kirin Holdings, 2024; Molson Coors, 2024; Anheuser-Busch InBev, 2024)
Fig. 3:   *Correlation of ESG score vs. EBITDA*

However, when the analysis is extended to a broader sample of fifteen breweries, the relationship disappears ($r = –0.08$, $p = 0.76$), with no significant correlation between ESG performance and EBITDA as can be seen in Figure 4.

ESG Score vs. EBITDA (log10 scale on EBITDA)

Note: EBITDA values are plotted on a log10 scale to reduce outlier effects and improve readability
Source: Own using (S&P Global, 2025; Heineken, 2024; Carlsberg Group, 2024; Asahi Group, 2024; Kirin Holdings, 2024; Molson Coors, 2024; Anheuser-Busch InBev, 2024; Anadolu Efes, 2024; United Breweries, 2024; Tsingtao, 2024; Constellation Brands, 2024; China Resources Beer, 2024; Sapporo, 2024; Royal Unibrew, 2024; Budweiser, 2024; Thai Beverage, 2024)
Fig. 4:   *Correlation of ESG score vs. EBITDA on extended sample*

Smaller and mid-sized firms such as Thai Beverage and Anadolu Efes achieve relatively high ESG scores despite moderate profitability. At the same time, while Constellation Brands

illustrates weaker ESG maturity at a higher profit level. This broader comparison suggests that ESG leadership is not determined by financial scale, but by company strategy and market context. The two analyses indicate that while global majors may experience short-term tensions between profitability and ESG, the broader industry landscape reveals a more heterogeneous alignment of sustainability and financial performance. Regional differences further clarify these patterns. Asian breweries consistently achieve higher ESG scores, reflecting stronger regulatory drivers and earlier adoption of sustainability frameworks. In contrast, US-based brewers (Anheuser-Busch InBev, Constellation Brands, Molson Coors) score substantially lower, indicating slower alignment with ESG objectives despite their global scale. Chinese breweries also remain at the bottom of the distribution. These geographic differences reinforce the conclusion that sustainability maturity is shaped less by company size than by regional institutional environments and corporate governance priorities.

From a stakeholder theory perspective, this relationship reflects the complex and often conflicting demands placed on firms by various stakeholders. Investors may prioritize profitability and cost-efficiency, while regulators, consumers, and civil society increasingly expect companies to meet stringent environmental and social standards (Zhang et al., 2022). Institutional theory adds another layer of explanation by emphasizing the role of regulations and institutional pressures. Companies that proactively align with institutional requirements such as the EU Green Deal, or CSRD may incur upfront costs to build ESG capacity or restructure operations. These efforts, while not immediately profitable, are part of a longer-term strategy to enhance institutional legitimacy and license to operate in increasingly regulated and stakeholder-sensitive markets (Fankhauser et al., 2023).

Tab. 3: *ESG risk scores of major firms in brewery industry*

Brewery	ESG risk scores
Asahi Group Holdings, Ltd.	16.3
Budweiser APAC	17.9
Royal Unibrew A/S	19.5
Carlsberg A/S	21.2
United Breweries Limited	21.3
Kirin Holdings	22.3
Thai Beverage Public Company Limited	22.4
Anadolu Efes	23.3
Heineken N.V.	24.2
Anheuser-Busch InBev	24.7
Constellation Brands, Inc.	26.9
Molson Coors	27.6
Sapporo Holdings Ltd.	29.7
Tsingtao Brewery Co., Ltd.	30.4
China Resources Beer	34.1

Source: Own using (Sustainalytics, 2025)

These findings suggest that profitability and ESG performance are not yet fully aligned in the brewing industry. Among the largest global brewers, a negative correlation points to short-term tensions between financial returns and sustainability investment, while the broader industry sample shows that ESG leadership can also emerge among mid-sized firms. This indicates that financial performance alone is not a reliable predictor of ESG outcomes; instead, the relationship is mediated by factors such as firm size, reporting quality, regional regulatory intensity, and the time-lagged nature of returns on sustainability investments. To further support the robustness of the findings, a correlation analysis was also conducted using

ESG risk scores from Sustainalytics (2025) in Table 3 and EBITDA values in million EUR. Sustainalytics scores are interpreted such that a lower score indicates better ESG performance (i.e., lower risk).

When using Sustainalytics ratings, the analysis of six major brewers shows a weak but statistically insignificant negative correlation with EBITDA ($r = –0.30$, $p = 0.57$). This suggests that the link between ESG risk (where lower scores indicate stronger performance) and profitability is less pronounced in this dataset. When the sample is extended to fifteen breweries, the relationship disappears entirely ($r = 0.02$, $p = 0.95$), with no significant correlation between ESG risk scores and financial performance. This pattern reinforces the view that ESG leadership is not determined by financial scale but reflects corporate strategy, governance priorities, and regional regulatory environments. Moreover, the divergence in findings between Sustainalytics and S&P Global highlights that ESG ratings are not methodologically interchangeable, as they capture different conceptual dimensions of sustainability performance.

4   Discussion

This article examined how breweries address decarbonization's strategic and financial complexities in response to growing regulatory and stakeholder pressures. By integrating insights from stakeholder and institutional theories, the article highlights the complexity of the sustainability transition breweries face. According to stakeholder theory (Zhang et al., 2022), businesses are under constant pressure from various stakeholder groups, such as customers, investors, regulators, and competitors, each imposing specific demands and expectations in the field of sustainability.

The institutional theory further deepens this understanding by emphasizing the influence of external pressure, e.g. regulatory frameworks, standards, and other legislative forces that are essential in shaping brewery strategies towards carbon neutrality. The findings of this article demonstrate how legislative frameworks such as the EU Green Deal and related directives (e.g., CSRD and EU Taxonomy) impact strategic planning and operational practices in breweries, prompting the adoption of more systematic approaches. Fankhauser et al. (2023) underscore that aligning corporate decarbonization ambitions with science-based standards enhances credibility and fulfills institutional demands for transparency and accountability, thus connecting theoretical frameworks to the real-world practices of industry leaders.

Although sustainability and climate targets are frequently discussed across various sectors, the brewing industry remains underrepresented in academic research on decarbonization. As other authors have not addressed this topic in depth, findings of this study cannot be directly compared with prior research, which is why the primary focus was on applying theory to practice.

The findings suggest that financial performance and ESG outcomes are not consistently aligned. While the multinational brewery leaders show evidence of short-term trade-offs between profitability and sustainability commitments, mid-sized firms demonstrate that strong ESG performance can be achieved without scale advantages. This supports stakeholder theory's assertion of potential conflicts between investor priorities and broader societal expectations, particularly in capital-intensive sectors where sustainability investments yield long-term rather than immediate returns.

The differences between the ESG evaluations of S&P Global (2025) and Sustainalytics (2025) also confirm institutional theory's claim that diverse institutional frameworks and measurement standards lead to varying outcomes. This highlights the need for multi-level

assessment frameworks that allow breweries to develop more comprehensive ESG reporting and respond more effectively to diverse institutional expectations.

Despite its contributions, the study is subject to certain limitations, such as restricted and limited data frame and the evolving nature of ESG regulations, all of which may constrain the long-term validity of the findings.

Conclusion

This article contributes to a theoretical and practical understanding of integrating sustainable finance and carbon neutrality strategies in the brewery industry by linking stakeholder theory, institutional theory, and industry-based insights. Theoretically, the article highlights the complex relationship between financial performance and ESG maturity, confirming that short-term economic success does not necessarily correlate with long-term sustainability objectives. Stakeholder theory explains the critical role of pressure from key interest groups - especially consumer demand and investor expectations in shaping corporate sustainability decisions. Institutional theory further emphasizes the influence of external rules, standards, and norms on organizational practices. The integration of these perspectives shows that effective carbon neutrality strategies must balance stakeholder demands with institutional frameworks to ensure that breweries remain competitive and adaptable in an evolving sustainability landscape.

From a practical standpoint, the study highlights that long-term resilience in the brewing industry will depend less on company size and more on the ability to anticipate stakeholder expectations and regulatory trends. Breweries that commit to transparent, science-based ESG strategies strengthen legitimacy and create opportunities for future growth and differentiation. The results also suggest that delayed or partial adoption of sustainability standards carries significant risks, particularly as the institutional landscape evolves and stakeholder scrutiny intensifies.

The article acknowledges several limitations. The rapid evolution of regulatory frameworks, particularly in the European context, may limit the long-term applicability of specific findings. Additionally, variability in ESG reporting quality and data availability across companies presents a methodological challenge when comparing ESG performance and financial outcomes.

While this study extends the analysis beyond multinational leaders to include regional breweries, future research should broaden geographic coverage and employ longitudinal designs to capture time-lagged financial impacts. Greater attention to small and craft breweries would also be valuable to reflect the full diversity of the industry and its sustainability practices.

Overall, the findings affirm that sustainability in the brewing industry is not simply a matter of compliance but a strategic imperative for long-term competitiveness and resilience. The observed correlation between ESG scores and financial outcomes is treated as an exploratory insight rather than a definitive result, intended to highlight potential tensions in aligning sustainability performance with profitability.

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Udržitelné financování a uhlíková neutralita v pivovarnickém průmyslu: Výzvy a příležitosti

Tento článek zkoumá překážky, rizika a příležitosti při přechodu pivovarů na nízkouhlíkovou ekonomiku, přičemž se zaměřuje na roli udržitelného financování při umožnění dekarbonizace. Na základě systematického přehledu literatury a odvětvových údajů analyzuje, jak spolu souvisí skóre v oblasti životního prostředí, sociálních otázek a správy a řízení (ESG) a finanční výkonnost, a odhaluje krátkodobé kompromisy pro globální velké společnosti a rozmanitější vzorce mezi regionálními pivovary. Zjištění naznačují, že ziskovost a udržitelnost nejsou v souladu, což odráží složitost regulace, technologie a trhu. Jako průzkumná práce nabízí tato studie první poznatky a otevírá cesty pro další výzkum.

Nachhaltige Finanzierung und CO_2-Neutralität in der Brauereiindustrie: Herausforderungen und Chancen

Dieser Artikel untersucht die Hindernisse, Risiken und Chancen beim Übergang von Brauereien zu einer kohlenstoffarmen Wirtschaft und konzentriert sich dabei auf die Rolle nachhaltiger Finanzierungen bei der Ermöglichung der Dekarbonisierung. Auf der Grundlage einer systematischen Literaturrecherche und von Branchendaten analysiert er, wie Umwelt-, Sozial- und Governance-Kriterien (ESG) und die finanzielle Performance zusammenhängen, und deckt kurzfristige Kompromisse für globale Großunternehmen und vielfältigere Muster bei regionalen Brauereien auf. Die Ergebnisse deuten darauf hin, dass Rentabilität und Nachhaltigkeit nicht im Einklang stehen, was die Komplexität von Regulierung, Technologie und Markt widerspiegelt. Als explorative Arbeit liefert diese Studie erste Erkenntnisse und eröffnet Wege für weitere Forschungen.

Zrównoważone finansowanie i neutralność węglowa w przemyśle piwowarskim: Wyzwania i szanse

Artykuł analizuje bariery, ryzyka i szanse związane z transformacją browarów w kierunku gospodarki niskoemisyjnej, ze szczególnym uwzględnieniem roli zrównoważonego finansowania w procesie dekarbonizacji. Opierając się na systematycznym przeglądzie literatury i danych branżowych, bada zależności między kwestiami środowiskowymi, społecznymi i zarządczymi (ESG) a wynikami finansowymi, wskazując na krótkoterminowe kompromisy dla globalnych dużych spółek oraz bardziej zróżnicowane wzorce działania wśród browarów regionalnych. Ustalenia wskazują, że rentowność i zrównoważony rozwój nie zawsze idą z sobą w parze, co odzwierciedla złożoność regulacyjną, technologiczną i rynkową. Niniejsze opracowanie jako praca badawcza dostarcza wstępnych wniosków i otwiera pole do dalszych badań.

DIGITAL FATIGUE AND GAMIFICATION: A SYSTEMATIC LITERATURE REVIEW

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Abstract

Digital fatigue may be mitigated through gamification by improving user engagement and motivation, reducing the adverse effects of extended screen time. Gamification, integrating game design elements into non-game contexts, has emerged as a promising strategy to enhance user engagement, motivation, and behavioral outcomes in digital health interventions. In this article, a systematic literature review aimed to explore gamification's role in digital health interventions. Results show that gamification improves motivation, adherence, and outcomes by using game elements. However, the true potential of gamification in mitigating digital fatigue remains highly unexplored. Differences in the data of the study populations and methods limit direct comparisons.

Keywords

Game elements; Information and knowledge systems; Digital burnout; Reading fatigue.

Introduction

Digital fatigue, exhaustion, and cognitive strain resulting from prolonged interaction with digital technologies are growing concerns in digital health and learning environments. The author of this article in (Ziaei Nafchi, 2024) emphasizes that digital fatigue undermines cognitive engagement, defined as the sustained mental effort required for deep processing and meaningful learning. This makes it crucial to explore strategies that can counteract their adverse effects. One such strategy is gamification, which involves applying game design elements in non-game contexts to enhance user engagement, motivation, and behavioral outcomes. While a substantial body of research has examined gamification and digital fatigue separately, there is limited evidence on how gamification can be explicitly employed to alleviate digital fatigue and the methods available to evaluate its effectiveness. This gap highlights the importance of further investigation into the potential role of gamification in reducing digital fatigue.

This article aims to explore how gamification may be leveraged to mitigate the negative impacts of digital fatigue and whether existing research provides methods to measure its effectiveness in this context. To address this, a systematic literature review was conducted, analyzing recent peer-reviewed studies indexed in Scopus and the Web of Science (WoS) scientific databases.

The review investigates whether current literature has examined gamification's role in alleviating digital fatigue and identifies any proposed frameworks or methodologies for evaluating its impact. While gamification is widely studied for engagement and motivation,

no established method exists to assess its effectiveness specifically against digital fatigue. Existing research on gamification often focuses on general behavioral outcomes, but seldom on cognitive or emotional exhaustion tied to prolonged digital use.

The study begins by introducing the key concepts and definitions that provide the foundation for the research in Section 1. It then outlines the methodology and criteria applied in selecting the relevant literature in Section 2. Following this, the main results of the literature search are presented in Section 3, after which the findings are analyzed and compared in Section 4. The work concludes by summarizing the principal conclusions and offering recommendations from the systematic literature review.

1   Literature Review

Digital lifestyle interventions delivered through various digital platforms have demonstrated small to moderate positive effects on symptoms of depression, anxiety, and stress across diverse populations (Brinsley et al., 2025). However, excessive and compulsive engagement with such lifestyles can also have negative consequences. For example, engaging with social networking sites can cause users to experience exhaustion from social media activities, manifesting as both physical and psychological fatigue (Zheng & Ling, 2021). Digital lifestyle interventions can support mental health, but may also contribute to fatigue and exhaustion when overused.

Reading and digital fatigue are interrelated phenomena that frequently overlap, yet each originates from distinct sources and presents unique characteristics. Digital fatigue is the physical, cognitive, and emotional exhaustion from extended and intensive interaction with digital devices (Arican, 2025). This condition has become particularly salient in online learning, where sustained exposure to digital content can lead to a marked decline in learners' motivation and engagement (Maloney et al., 2023). Digital fatigue differs from reading fatigue but strongly affects online learning by reducing motivation and engagement.

The implications of digital fatigue extend beyond educational outcomes, posing serious concerns for individual well-being and operational safety. Fatigue of this nature has been associated with decreased alertness, diminished performance, and a heightened risk of accidents and injuries. These outcomes underscore the need for targeted interventions to mitigate their effects (Arican, 2025). Digital fatigue negatively affects performance, safety, and well-being, making intervention essential.

More broadly, fatigue (whether digital or otherwise) has been linked to a range of adverse physical and psychological consequences. Consequently, researchers have emphasized developing more effective fatigue monitoring and management methods, particularly in high-risk occupational settings (Imran et al., 2024). Fatigue carries serious health risks, requiring better monitoring and management strategies.

Within organizational environments, the efficacy of knowledge transfer is influenced by various factors, including the availability of skilled knowledge managers and the robustness of information systems. However, an often-overlooked impediment is online reading fatigue, which can significantly impair the functionality of digital knowledge systems. Employees experiencing this form of fatigue may find it challenging to engage with textual content, often due to reduced cognitive energy or interest. This disengagement negatively affects cognitive engagement, the sustained mental effort required for deep processing and comprehension, which is critical for effective knowledge acquisition and transfer (Ziaei Nafchi, 2024). Online reading fatigue reduces employees' cognitive engagement, weakening organizational knowledge transfer.

Gamification can be understood as a set of activities and processes that use game-like elements and mechanics to address and solve real-world problems (Santos et al., 2024). It integrates features commonly found in games, such as points, challenges, rewards, and feedback loops, into non-game contexts to enhance user engagement, motivation, and participation. Gamification leverages game elements to increase engagement, motivation, and problem-solving in real-world contexts.

According to Rodrigues et al. (2019), gamification represents a novel approach to designing and implementing software applications to influence and transform individuals' attitudes and behaviors. This approach goes beyond traditional software development by focusing on functionality and creating meaningful and enjoyable user experiences that encourage positive behavioral change over time. Gamification aims not only to improve functionality but also to drive long-term behavioral change through engaging experiences.

Recent systematic reviews have emphasized that gamification extends beyond simple points and rewards, functioning as a motivational information system that integrates both hedonic and utilitarian affordances to sustain engagement (Koivisto & Hamari, 2019). The field has expanded rapidly across domains such as education, health, and management, reflecting its growing appeal as a tool to enhance user motivation and performance. However, the evidence remains fragmented, with outcomes ranging from strongly positive to mixed ones depending on contextual factors, population characteristics, and design quality. A consistent theme across studies is that playful or immersive experiences activate intrinsic drivers such as autonomy, competence, and relatedness, which align with Self-Determination Theory (Deci & Ryan, 2000) and are crucial for counteracting disengagement caused by fatigue (Elsawah, 2025; Misara et al., 2025). For instance, Elsawah's qualitative case study in adult education (Elsawah, 2025) showed that gamification supported sustained motivation and engagement while revealing the risk of "gamification fatigue" when competitive elements were poorly structured. These findings suggest that gamification is most effective when carefully designed to balance motivational benefits with fatigue risk. While it can foster engagement through autonomy, competence, and relatedness, poorly aligned elements may undermine these gains, highlighting the need for context-sensitive and sustainable design approaches.

Similarly, Misara et al. (2025), applying the TCCM framework, argue that gamification must progress from superficial reward-based strategies toward richer, experience-driven approaches that address psychological needs and reduce cognitive strain. In line with these perspectives, a scientometric analysis highlights the rapid growth of gamification research worldwide but also identifies persistent gaps, particularly in understanding long-term effects, the role of individual game elements, and the potential of poorly implemented designs to provoke fatigue alongside engagement (Gini et al., 2025). These insights underscore the importance of integrating motivational affordances and fatigue risks into theoretical and empirical gamification models in digital health and learning environments.

2 Methodology

According to Snyder (2019), a systematic review is a structured research method used to identify, evaluate, and synthesize all relevant studies on a specific topic. It involves a rigorous process of locating and critically appraising research that meets predefined inclusion criteria to address a particular research question or hypothesis.

By employing transparent and systematic procedures throughout the review, the risk of bias is reduced, leading to more reliable and evidence-based conclusions that can inform decision-making. Thus, this article uses a systematic literature review following the Preferred

Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement in (Page et al., 2021).

This review had the following research questions (RQ) about gamification and digital fatigue:

RQ1: How can gamification in digital health tools help people get better and feel healthier?

RQ2: How does feeling tired from digital tools (digital fatigue) affect how people use and benefit from gamified health apps?

Scopus and WoS databases were chosen to search for literature as they provide high-quality articles in the field. These databases were accessed in June 2025, and the keywords used in both databases to search the articles were „gamification", „digital", and „fatigue". Since the application of gamification in the context of digital fatigue is relatively new, it was necessary to filter out studies that focused solely on general gamification or general fatigue, and instead concentrate specifically on the digital dimension of both concepts. Hence, the databases were filtered to include only articles published after 2021.

The selection of studies started with a search for „gamification AND digital AND fatigue," the search results were filtered further by the criteria in Table 1. The Inclusion and Exclusion criteria are based on publication date, access type, and language.

Tab. 1: *Inclusion and exclusion criteria for the selection of studies for this systematic review*

| Criteria	Inclusion	Exclusion
Timeline	2021 to 2025	All published before 2021
Access type	Open access	Other types of access
Language	English	All other languages
Document type	Research articles	None

Source: Own

3　　　　Results

An initial search across both Scopus and WoS yielded 33 articles. After removing seven duplicates, the remaining 26 articles were screened according to the inclusion and exclusion criteria outlined in Table 1.

During the screening process, three articles were excluded for falling outside the specified publication timeline, six were excluded due to language incompatibility (non-English), and 11 were removed due to lack of access to the full text. This resulted in a final selection of 6 articles, which were all research articles, so further filtering was not needed.

These studies were then carefully reviewed to ensure they met all relevant criteria and contributed valuable insights into the research topic. After reviewing their titles and abstracts, these articles were deemed appropriate and eligible for inclusion in this study. The flow diagram in Figure 1 illustrates the selection process.

The six studies included in this review were selected based on specific eligibility criteria to ensure relevance and quality. Each study focused on applying gamification within digital health interventions, targeting diverse populations. Studies must be published within a defined timeline, in English, and accessible in full text through the selected databases.

Additionally, the included studies employed measurable outcomes related to cognitive or psychological health, allowing for an assessment of gamification's impact. Although the heterogeneity of the populations and methodologies presents challenges for direct comparison, all selected studies met the core criteria necessary to provide meaningful insights into the role of gamification in health-related digital interventions. The results are explored in greater detail in the following subsection.
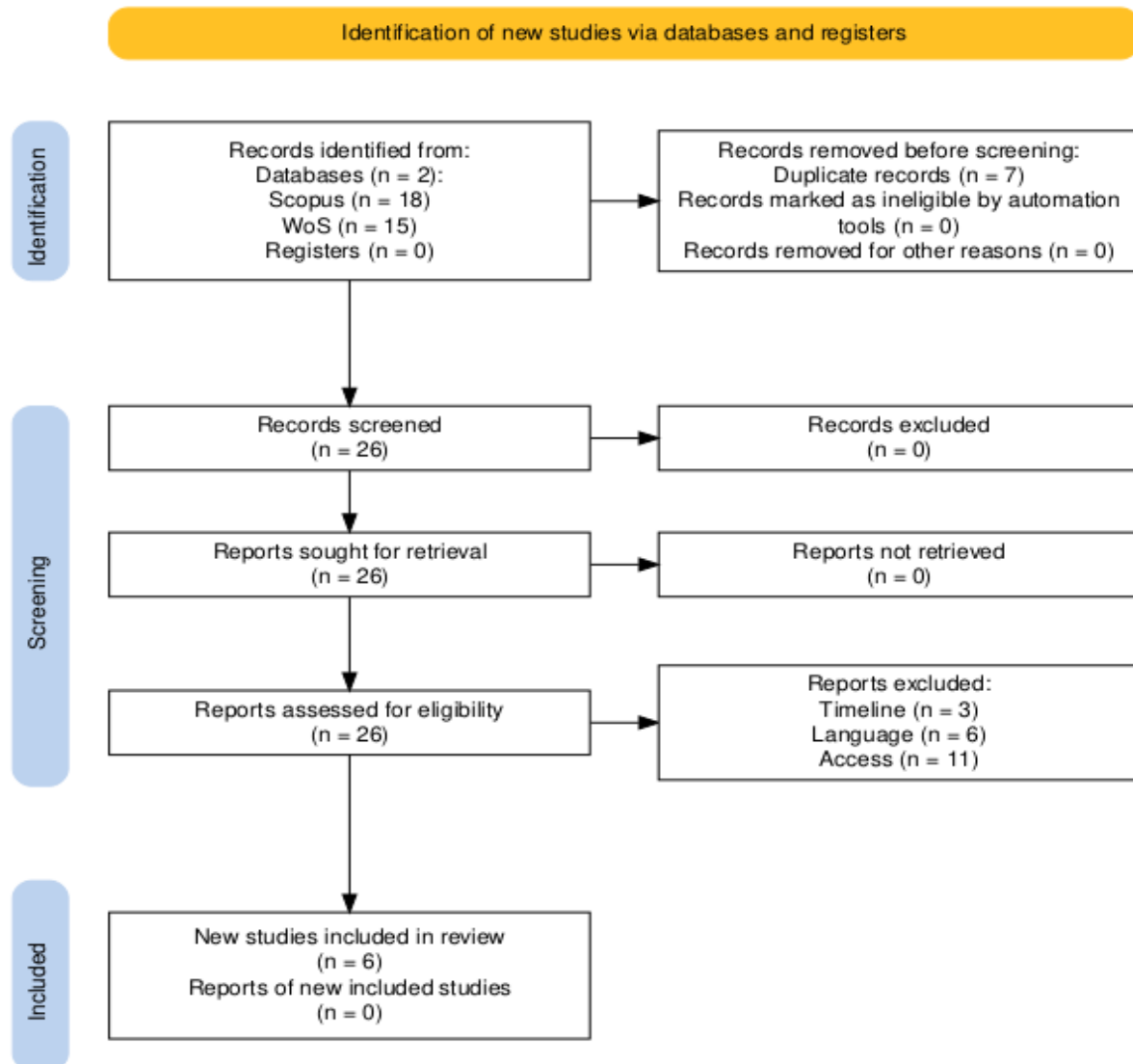
Source: Own based on (Haddaway et al., 2022)
Fig. 1:   *Flow diagram of identification and inclusion articles*

4   Discussion

This section systematically summarizes and compares key findings from the six selected articles to provide a comprehensive overview of the current research landscape. By examining similarities and differences across the studies, this comparison aims to identify common themes, highlight gaps in the literature, and evaluate the consistency of results related to using gamification to address digital fatigue and promote well-being. This synthesis informs future research directions and supports the development of more effective, evidence-based digital interventions.

According to Wojciechowski & Korjonen-Kuusipuro (2022), digital technologies offer promising cognitive and motor rehabilitation alternatives. In particular, gamification mechanisms, which are widely used in digital games to sustain user engagement through challenges of adjustable difficulty, present significant potential for enhancing rehabilitation outcomes. Nonetheless, integrating gamification and digital technologies into rehabilitation must be carefully calibrated to align with the user's physical and cognitive capabilities. Without such alignment, the intervention risks becoming counterproductive, potentially causing harm rather than promoting recovery. While this study confirms the potential benefits

of gamification in biophysical rehabilitation, its findings are not directly comparable to those of other studies due to differences in methodology, measurement tools, or study populations.

The pilot study by Weller et al. (2022) was conducted with 32 participants experiencing depression and demonstrates that the integration of gamification and informational elements can significantly enhance the effectiveness of cognitive control training in reducing depressive symptoms. An especially noteworthy aspect of the study is the use of the WHO-5, a brief self-report questionnaire of five items designed to assess overall well-being. Given its simplicity and focus on psychological well-being, this instrument may hold the potential for evaluating the impact of gamification on digital fatigue.

The study protocol introduced by Hershey et al. (2023) outlines the planned usability testing and pilot evaluation of a newly developed healthy lifestyle smartphone application, Surviving and Thriving, personalized for young US firefighters. The app is designed to deliver interactive educational content focused on four key lifestyle domains: nutrition, sleep, physical activity, and resilience. It features a personalized user journey, a habit tracker, and various gamification elements to enhance user engagement and promote sustainable behavior change. This study illustrates the implementation of gamification elements and highlights their potential benefits for health and well-being by adopting a holistic, integrative approach.

The review by Brinsley et al. (2025) focuses on the positive effects of digital lifestyle interventions on anxiety, stress, and well-being. Their findings indicate that such interventions have a significantly small-to-medium impact on reducing depression, a negligible effect on alleviating anxiety and stress, but no measurable impact on overall well-being. Gamification elements are also highlighted in this review and may be considered a contributing factor to reducing anxiety and stress.

According to Westergaard et al. (2021), their study demonstrates high adherence to self-reporting through digital tools among individuals with multiple sclerosis. However, it also highlights the need to address potential unintended consequences of these tools' self-monitoring and gamification features. Notably, the gamification elements commonly integrated into digital platforms may enhance user motivation, improving response and reporting rates.

Ozgur et al. (2022) investigated the effects of gamified, robot-assisted upper limb motor training on motor performance, skill acquisition, and transfer, compared to a non-gamified control condition, among a group of chronic stroke survivors. The findings indicate that the gamified training approach led to more controlled motor performance during the training phase, as evidenced by greater accuracy and smoother movements, although at a slower execution speed. Responder analysis revealed that participants with mild impairments experienced the most significant benefits from the gamified intervention. In this study, two groups participated in movement exercises, and the results indicated that the group exposed to gamification strategies demonstrated improved performance compared to the control group.

Recent studies highlight the promising role of gamification and digital technologies in enhancing cognitive and motor rehabilitation, mental health interventions, and lifestyle management. Gamification mechanisms, commonly employed in digital games, help sustain engagement by offering challenges tailored to individual abilities, thereby improving outcomes in diverse populations, including stroke survivors, people with multiple sclerosis, and individuals experiencing depression. While such interventions show significant benefits in reducing symptoms of depression, anxiety, and stress, their effectiveness depends on careful alignment with users' physical and cognitive capacities to avoid potential adverse effects.

Digital tools incorporating gamification also demonstrate high adherence and motivation, though attention must be paid to possible unintended consequences of self-monitoring features. Furthermore, personalized apps targeting holistic health factors like nutrition, sleep, physical activity, and resilience leverage gamification to promote long-term behavior change. Despite methodological differences across studies, the overall evidence supports gamification as a valuable element in digital health interventions to improve well-being and rehabilitation outcomes.

The findings of this review resonate with broader gamification research, which consistently underscores the role of motivational affordances in sustaining user engagement across domains. For instance, Koivisto & Hamari's large-scale review (Koivisto & Hamari, 2019) emphasizes that gamified systems succeed when they balance utilitarian goals with hedonic enjoyment, echoing the positive outcomes seen in studies of rehabilitation and mental health reviewed here. Similarly, Elsawah (2025) demonstrates that while gamification can enhance learning motivation, it may also trigger fatigue if overused or poorly designed, a dynamic directly relevant to digital fatigue in health interventions. Misara et al. (2025) further suggest that gamification must move toward experience-driven strategies that motivate and safeguard psychological well-being. This aligns with the gap identified in this review: none of the six studies explicitly measured digital fatigue, despite its potential to undermine long-term engagement. By situating our findings within these broader theoretical discussions, it becomes clear that integrating digital fatigue assessments into gamification research is essential for advancing theory and practice.

Gini et al. (2025) also note that gamification outcomes are highly context-dependent, with positive effects when well aligned to learners but mixed or negative results when poorly designed. This echoes the heterogeneity in the six studies reviewed here and supports the need to integrate digital fatigue into gamification research.

A key limitation of this review is the lack of comparability among the six studies, as each focuses on distinct populations (including individuals with limited mobility, those experiencing depression, firefighters at risk of post-traumatic stress disorder, and biophysical patients recovering from stroke), resulting in heterogeneous samples that limit direct cross-study comparisons.

Another limitation of this review is the relatively small number of studies retrieved exclusively from two databases. This limited scope may have excluded relevant research in other sources, potentially affecting the comprehensiveness and generalizability of the findings.

A notable limitation across these studies is the absence of explicit discussion or measurement of digital fatigue. Given the growing concern about the effects of prolonged digital device use, especially in gamified interventions, this gap may limit understanding of potential negative impacts on user engagement and well-being. Despite these encouraging findings, the review is limited by the heterogeneity of study populations. Furthermore, the few studies from only two databases may have constrained the breadth of evidence considered, potentially overlooking relevant research.

To answer RQ1 (research question 1), gamification enhances health activities by introducing game-like rewards and challenges, increasing user engagement and motivation. This helps users maintain healthy habits and treatments, ultimately improving their health and well-being. Regarding RQ2 (research question 2), digital fatigue lowers attention and motivation, making it more difficult for people to use and benefit from gamified health apps. When users feel tired, they may reduce or stop using these tools, which decreases their effectiveness.

Conclusion

This review aimed to examine whether gamification can serve as a strategy to alleviate digital fatigue in digital health interventions and to determine whether existing research provides methods to measure its effectiveness. The systematic review included six studies from Scopus and WoS, which applied gamification across diverse populations such as stroke survivors, individuals experiencing depression, firefighters at risk of post-traumatic stress disorder, and patients with multiple sclerosis. While the studies differed in methodology and focus, the findings indicate that gamification can potentially enhance cognitive and motor rehabilitation, mental health interventions, and lifestyle management.

This review highlights the promising potential of gamification and digital technologies in enhancing cognitive and motor rehabilitation, mental health interventions, and overall lifestyle management. Additionally, digital tools with gamification features promote high adherence and motivation, although careful consideration of self-monitoring consequences is necessary. Moreover, the WHO-5, a brief five-item self-report questionnaire assessing overall well-being, can be considered a tool to measure the effects of gamification.

The evidence suggests that the effectiveness of gamified interventions depends on their alignment with users' cognitive and physical capacities. The absence of explicit attention to digital fatigue in existing research indicates a critical gap, as fatigue can reduce cognitive engagement and motivation, ultimately limiting the benefits of digital interventions. Integrating measures of digital fatigue into future studies is therefore essential for evaluating both the positive and negative impacts of gamification on user experience and well-being.

Future research should expand the scope of investigations to include more diverse populations and utilize standardized methodologies to enable better comparability across studies. Additionally, it should incorporate digital fatigue assessments to better evaluate gamification's sustainability and overall effectiveness in digital health.

By addressing these gaps, future studies can generate more comprehensive and reliable evidence, supporting the design of gamified interventions that increase engagement while minimizing the risk of cognitive and emotional strain. Overall, the findings address RQ1 by showing that gamification enhances engagement and promotes health outcomes, and RQ2 by indicating that digital fatigue may reduce attention and motivation, limiting the effectiveness of gamified digital interventions if not correctly managed.

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DIGITÁLNÍ ÚNAVA A GAMIFIKACE: SYSTEMATICKÝ PŘEHLED LITERATURY

Digitální únavu lze zmírnit pomocí gamifikace, která zvyšuje zapojení a motivaci uživatelů a snižuje nepříznivé účinky dlouhodobého používání obrazovky. Gamifikace, tedy integrace herních prvků do neherních kontextů, se jeví jako slibná strategie pro zvýšení zapojení uživatelů, motivace a behaviorálních výsledků v oblasti digitálních zdravotních intervencí. Cílem tohoto článku je systematický přehled literatury zaměřený na zkoumání role gamifikace v digitálních zdravotních intervencích. Výsledky ukazují, že gamifikace zlepšuje motivaci, dodržování a výsledky pomocí herních prvků. Skutečný potenciál gamifikace při zmírňování digitální únavy však zůstává do značné míry neprozkoumán. Rozdíly v datech studovaných populací a metodách omezují přímá srovnání.

DIGITALE MÜDIGKEIT UND GAMIFICATION: EINE SYSTEMATISCHE LITERATURÜBERSICHT

Digitale Müdigkeit kann durch Gamifizierung gemildert werden, die das Engagement und die Motivation der Nutzer erhöht und die negativen Auswirkungen einer langfristigen Bildschirmnutzung verringert. Gamifizierung, also die Integration von Spielelementen in Nicht-Spielkontexte, scheint eine vielversprechende Strategie zu sein, um die Beteiligung, Motivation und Verhaltensergebnisse der Nutzer im Bereich der digitalen Gesundheitsinterventionen zu steigern. Ziel dieses Artikels ist ein systematischer Literaturüberblick, der sich mit der Untersuchung der Rolle der Gamifizierung in digitalen Gesundheitsinterventionen befasst. Die Ergebnisse zeigen, dass Gamifizierung durch Spielelemente die Motivation, die Einhaltung und die Ergebnisse verbessert. Das tatsächliche Potenzial der Gamifizierung zur Verringerung der digitalen Ermüdung ist jedoch noch weitgehend unerforscht. Unterschiede in den Daten der untersuchten Populationen und Methoden schränken direkte Vergleiche ein.

ZMĘCZENIE CYFROWE I GAMIFIKACJA: SYSTEMATYCZNY PRZEGLĄD LITERATURY

Zmęczenie cyfrowe można złagodzić przy pomocy gamifikacji, która podnosi zaangażowanie użytkowników i obniża niekorzystne skutki długiego czasu spędzanego przez monitorem. Gamifikacja, czyli integracja elementów gier w konteksty niebędące grami, jawi się jako obiecująca strategia zwiększania zaangażowania użytkowników, motywacji i wyników behawioralnych w obszarze cyfrowych interwencji zdrowotnych. Celem niniejszego artykułu jest systematyczny przegląd literatury poświęcony zbadaniu roli gamifikacji w cyfrowych interwencjach zdrowotnych. Wyniki wskazują, że gamifikacja poprawia motywację, przestrzeganie zaleceń oraz rezultaty dzięki wykorzystaniu elementów gry. Prawdziwy potencjał gamifikacji w łagodzeniu cyfrowego zmęczenia pozostaje jednak w dużej mierze niezbadany. Różnice w danych dotyczących badanych populacji i stosowanych metod ograniczają możliwość bezpośrednich porównań.