ENTEEF
Fostering Entrepreneurship through Freelancing

Co-funded by the European Union

Freelancer Competences:

A Research Framework

Version 3.0

KRAKOW UNIVERSITY OF ECONOMICS

UNIVERSIDAD DE GRANADA

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UNIVERSITY OF KRAGUJEVAC

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Document details

Project title	Fostering Entrepreneurship through Freelancing
Project acronym	ENTEEF
Project number	2024-1-PL01-KA220-HED-000248152
Project website	https://enteef.uek.krakow.pl/
Project duration	24 months, 01.11.2024 – 31.10.2026
Project coordinator – institution	Krakow University of Economics 27 Rakowicka Street, 31-510 Kraków, Poland
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Title of the report	**Freelancer Competences: A Research Framework**
Work package	**WP3: Research on freelancer competences**
Activity	**A1: Preparing a research framework**
Report leading institution	Krakow University of Economics
Responsible persons	Grażyna Paliwoda-Pękosz, Piotr Soja
Version number	3.0
Status (Internal/Public)	Public
Date	17.04.2026

Version history

Version number	Date	Status (Internal/Public)	Description
0.8	22.04.2025	Internal	General framework of research.
1.0	03.06.2025	Internal	Preliminary version of the framework (including semi-structured interviews protocols and draft version of the questionnaires).
1.1	10.07.2025	Internal	Updates of the methodology and questionnaires after the analysis of interviews.
2.0	29.09.2025	Internal	Updates of the questionnaires after the pilot survey.
2.1	02.12.2025	Internal	Updates: inclusion of interview transcript template, information on data processing.
3.0	17.04.2026	Public	Updates of the methodology of survey data analysis. Review and editing.

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Introduction

Building on the foundations established in WP2/A2 and WP2/A3, particularly the identification of macro trends, digital platforms, and labour market dynamics, WP3 now advances towards a more detailed analysis of the key competences required by freelancers and the creation of a tool for competency assessment. These results will serve as a critical basis for the development of MOOCs in WP4.

WP3 has two main goals: (1) to identify essential competences for freelancers — including skills (universal, digital, other domain-specific skills,...), knowledge, attitudes, and experience for freelancing — and (2) to develop a reliable and valid assessment tool, that is, the Competency Assessment Tool (CAT) that allows freelancers to evaluate their competences and better align their learning needs with available training resources in the MOOCs. This dual objective responds to the increasing complexity and specialization of freelance work and the need for tools that facilitate tailored skills development and support professional decision-making.

The approach adopted in WP3 is guided by a mixed-methods framework that ensures the triangulation of data sources, collection instruments, and analysis strategies. In particular, the scope or **"preparing a research framework" (WP3-A1) is focused on the development of different instruments for measuring the digital skills and entrepreneurial capacities** in the freelance economy. **In the first phase, a qualitative exploration based on semi-structured interviews** with freelancers and company representatives in the six partner countries are designed. This method generated preliminary insights into skills needs, perceived gaps, and challenges in the freelance sector. These findings contributed to the development of **a structured quantitative survey or poll (in second phase)**, which was implemented across these countries to gather data from about 900 freelancers and company representatives. This sequential mixed-methods design strengthens both the depth and generalizability and validity of the findings (Creswell & Plano Clark, 2017).

Furthermore, **the document contain the description of the process of constructing the CAT**, which draws on the identified competences and will function as a placement test to guide freelancers and future freelancers in selecting the most appropriate MOOCs. The CAT development process follows psychometric principles and includes expert validation and pilot testing across partner institutions to ensure its reliability and practical relevance.

Therefore, **this document provides an overview of the methodological underpinnings of the work conducted in WP3, including a summary of tasks, data sources, and research tools**. The results obtained from carrying out these methods were captured in a comprehensive report on freelancer competences and a validated assessment tool (see Freelancer Competences report). These deliverables will not only support the design and personalization of future training (WP4), but also contribute to a greater awareness of freelance skills among companies, professionals, and policy-makers (Gandini, 2016; Kitching & Smallbone, 2012).

Based on the objectives, methodology, and scope of WP3, the three research questions (RQs) are established to guide the study.

RQ1: ***What are the key competences (skills, knowledge, attitudes, and experience) required by freelancers across different sectors and countries?***

This RQ seeks to identify and to categorise the essential competences for freelance market internationally, including both universal, identified in the last WP, and specific skills (digital, technical, etc.). It aligns with the first main objective of WP3 and captures the diversity of profiles and requirements across industry, region, and professional experience.

RQ2: ***How do freelancers and hiring companies perceive skill gaps and competence mismatches in the freelance economy?***

This RQ explores the differences and similarities in the perceptions of freelancers as well as hiring companies, helping to understand not only which competences are valued but also where training gaps or misunderstandings between talent supply and demand are identified. In particular, universal competences will be identified and develop a relevant role as a base for effective work.

RQ3: ***How can a competency assessment tool (CAT) be designed and validated to support freelancers in identifying their training needs and selecting MOOCs aligned with their professional development goals?***

This RQ will address both the psychometric design of the CAT and its practical usefulness in guiding MOOC-based training (second objective of WP3). It will involve issues of reliability, validity, and usability of the tool.

The first chapter of this document contains the description of the methodology of conducting the surveys. The second chapter describes the methodology of the survey result analyses whereas the third chapter outlines the methodology of CAT development. Appendix contains the survey protocol, the guided questions to the deep interviews, and the questionaries items.

1 Methodology of Surveys Development

1.1 Scope of mixed-methods approach

The adoption of a mixed-methods approach is particularly well-suited to investigating the complex and evolving dynamics between companies and freelancers in the platform economy. In the first phase of this study, semi-structured in-depth interviews with both freelancers and company representatives provided rich, exploratory insights into key themes such as required and perceived competences, attitudes toward freelance work, and freelancer experiences across six countries-partners.

The analysis of responses from in-depth interviews will be approached using an interpretivist paradigm, which emphasizes the subjective meanings that individuals assign to their experiences and social realities. This method is particularly suitable for exploring complex phenomena such as the hidden reasons, inherent motivations, perceptions, and contextual factors shaping freelancers' interactions with digital labour platforms. These interviews allow for flexibility and depth, enabling participants to express their views in their own terms while maintaining thematic coherence across interviews (Kvale, 2007).

This approach assumes that reality is socially constructed and context-dependent, making it appropriate for uncovering nuanced insights that may not emerge through more quantitative or purely positivist methodologies or approaches. Through this perspective, data analyses involve an iterative process of thematic interpretation, seeking to understand the underlying patterns and meanings in participants' narratives. Rather than testing predefined hypotheses, the interpretivist approach facilitates the co-construction of knowledge between researcher and participant, acknowledging the influence of both in the research process (Schwartz-Shea & Yanow,

2012). This is essential for capturing the richness and diversity of lived experiences in freelance work, particularly in rapidly evolving digital environments. Ultimately, this methodological choice enhances the study's ability to produce contextually grounded and theoretically informed understandings of the phenomena under investigation.

In this endeavour, we will attempt to establish categories of responses based on Categorization Theory. Mervis & Rosch (1981, cited in Kronrod, 2022) propose categorization as a way to understand how humans interpret reality by searching for commonalities among objects that may initially appear distinct. The meaning of each word is constructed through the sum of various "specified dimensions" (Hörmann, Agud-Aparicio, & de Agapito, 1982). This classification system does not exist conceptually (it cannot be studied directly) but rather emerges as an intrinsic feature of human thought. It is not arbitrary, as patterns of classification tend to coincide (Rosch, 2002).

This basic cognitive function proposes a taxonomy of the world based on ideas or concepts with specific meanings, extensions, and locations, grouped with elements of the same class. This organization facilitates understanding and makes communication more efficient (Rosch, 2002), helping individuals perceive reality in a structured way. A person thus classifies concepts first at a broad level, and later at a more specific one (for example, first as a 'tree', then as an 'oak') (Rosch, 2002). Notably, this cognitive process of categorization is not exclusive to humans or bound by language; rather, it reflects a more universal mechanism of perception across species. Unlike the Sapir–Whorf hypothesis, that proposes that the structure and vocabulary of our language shape the way we think and perceive reality, Rosch's categorization theory (2002) argues that cognitive organization emerges intrinsically from the clustering of shared attributes, independent of linguistic structures.

This qualitative foundation will support the development of a more structured and generalizable quantitative instrument that can capture patterns and differences at scale (Creswell & Plano Clark, 2017), in the second phase. Conducting a quantitative survey after the qualitative phase allows for the validation and generalization of insights by measuring their prevalence across a larger population, ensuring both depth and breadth in understanding the phenomenon of freelancing.

1.2 Semi-structured interviews

1.2.1 Scope interviews and selection of participants

To explore the evolving dynamics of the freelance economy, this study adopts a qualitative, exploratory approach based on in-depth semi-structured interviews with two key stakeholder groups: companies that hire freelancers and freelancers themselves. The purpose of this initial phase is to gain diverse perspectives on freelancer competences and to inform the development of a subsequent quantitative survey instrument.

As part of a multi-country research initiative, semi-structured interviews will be conducted with three freelancers (preferably from different domains, see table 1; total: 18) and one company representative (total: 6) will be interviewed across six countries participating in the project: Ukraine, Poland, Spain, Indonesia, Serbia, and Romania. These interviews will help us gather preliminary insights and refine the focus of our research in the next survey. Freelancers are selected to reflect diverse experiences across platforms (if possible), while companies are chosen based on their relevance to the gig economy and their global or National operational scope (see Table 1). Organization representatives will be selected based on:

(a) working in companies that hire our local freelancers,

(b) their role in the company as HR, team leaders or managing board members,

(c) a representation across diverse industries, such as the technology, software, and data; translation, content creation; media, creativity, and marketing; etc.,

(d) and some representation of public service providers[1] and private sector companies, in order to capture differences in organizational models, governance structures.

[1] *In the case of public service provider, this will be the classifications according to NACE to use: Supply of electricity, gas, steam, and air conditioning (D); Water supply; waste management and decontamination (E), Transportation and storage (H); Public administration and defence; compulsory social security (P); Education (Q) or Health and social services activities (R).*

Group	Domains	Name of domain
Freelancer	Domain 1	Technical and IT services[a] (about 6 interviews)
	Domain 2	Content, translation, and creative work[b] (about 6)
	Domain 3	Business, marketing, and consulting[c] (about 6)
Total:	18 (3 interviews in each country)	

(a) This domain includes the OII categories (Stephany et al., 2021): "Software Development and Technology" and "Clerical and Data Entry", focused on digital competences, logical structures, and complex or repetitive tasks; (b) includes the OII categories: "Creative and Multimedia" and "Writing and Translation", focused on: content production, creativity, style, and cultural/aesthetic sensitivity, and (c) includes the OII categories: "Sales and Marketing Support" and "Professional Services", both categories are linked to business optimization, public relations, and consulting.

Table 1. Classification of freelancers that will be interviewed.

The study will begin with interviews with freelancers. At the end of each interview, participants will be asked about their current clients to facilitate subsequent recruitment of companies that hire freelancers. To ensure the effective recruitment of participants for both the qualitative interviews and the future survey, a multimethod or multichannel approach will be employed. This includes using local freelance web portals, university student and alumni networks, MBA and professional training programs, freelancer associations, or social media platforms, among others. The application of a multimethod recruitment strategy is particularly suitable when the target population is highly specific, geographically dispersed and/or difficult to access (Teddlie & Tashakkori, 2009).

The interviews will follow a semi-structured guide (see Appendix 1), designed to elicit open-ended responses to key themes such as the demand for freelance work, competences perceived as lacking or essential, and the risks associated with freelance employment. This method allows for both consistency across interviews and flexibility to explore emerging themes (Longhurst, 2003; Kallio, Pietilä, Johnson, & Kangasniemi, 2016). Demographics will also be collected and tailored to the respondent group: for companies, other classification data such as country, industry, position, and company size will be recorded; for freelancers, variables such as experience, type of services, and client industry will be gathered. This qualitative design is aligned with best practices for pilot research, especially when aiming to understand underexplored phenomena

and to generate grounded insights that can support the construction of structured survey tools in later research phases (Morse, 1991), as in our case.

Item	Details
Study design	Qualitative, exploratory phase using in-depth semi-structured interviews
Target population	- Freelancers: individuals offering services via online platforms (e.g., tech, content, media) in different domains such as technology, marketing, and translation
	- Companies: businesses that hire freelancers regionally, operating in sectors (private vs. public service providers).
Sample size	- 18 freelancers
	- 6 company representatives
Countries involved	Indonesia, Poland, Romania, Serbia, Spain and Ukraine
Sampling method	Purposive sampling with multimethod recruitment strategies
Data recording mode	Video interviews via Google Meet, Zoom, or similar platforms (recorded with prior consent)
Data collection period	June 2025
Incentives	At discretion of each partner consortium's team

Table 2**. Technical sheet of quality phase**.

Video interviews will be carried out using online conferencing tools such as Google Meet or Zoom. Participants will be asked for their consent to record the sessions for transcription purposes (see interview protocol in Appendix). To encourage participation, company representatives and freelancers may receive university-branded items (such as USB drives or T-shirts), as well as digital incentives such as gift cards, vouchers, or subscription codes for popular online platforms (e.g., YouTube, Spotify). In the subsequent survey phase, participants might also have the opportunity to enter a prize draw for items such as a tablet or an Alexa device. Each partner consortium team will decide on the kind of incentives that they might provide to encourage the potential respondents to take part in the interviews and surveys.

1.2.2 Measurement instrument

The design of the interview questions related to competences and risks in freelance work (see Appendix) draws on a corpus of academic literature addressing the evolving characteristics of digital labour markets and the nature of platform-based employment. These themes are essential to understanding both the expectations of companies and the lived experiences of freelancers in a rapidly changing work environment.

The set of questions aimed at uncovering the most valued and most lacking competences among freelancers is grounded in research that emphasizes the transformation of knowledge work and the rise of a reputation-based economy. According to (Gandini, 2016), freelancers operating in digital contexts must constantly adapt their skillsets to remain visible and competitive, often relying on reputation systems and platform feedback. Similarly, (Lehdonvirta, 2018) highlights the importance of time management, adaptability, and client communication as critical competences in the gig economy.

From the company perspective, identifying skill gaps helps reveal mismatches between market demand and freelancer readiness. Kitching & Smallbone (2012) argue that freelancers, particularly in knowledge-intensive sectors, are increasingly expected to demonstrate not only technical expertise but also self-management, client handling, and project delivery skills. These expectations justify our questions regarding lacking and essential competences, as well as the inquiry into whether certain skills are perceived as universally necessary across freelance roles.

Interview questions on the perceived risks and advantages of freelance work are inspired by broader debates around labour precarity, autonomy, and algorithmic control in gig-based employment. From the freelancer's perspective, autonomy is often cited as a key benefit, yet it is frequently constrained by platform-imposed limitations and job insecurity (Wood, Graham, Lehdonvirta, & Hjorth, 2019). This duality is central to understanding freelancer motivation and challenges, and supports our questions regarding the risks freelancers experience and the factors influencing their choice of freelance work.

From the company side, De Stefano (2016) notes that while companies benefit from flexibility and cost-efficiency when hiring freelancers, this model also entails risks related to quality control, reliability, and the legal ambiguity of employment status. These issues are crucial to examine, particularly in light of increasing reliance on freelance labour across global supply chains. Therefore, questions aimed at identifying both perceived risks and key advantages of hiring freelancers are essential for capturing a comprehensive view of this evolving labour relationship.

1.3 Quantitative survey design

1.3.1 Sample and collection method characteristics

Based on the insights gathered during the previous qualitative phase, a pilot survey will first be administered (with five freelancer participants from each country; total: 30, and two company representatives from each country; total: 12) to pretest the questionnaires and in particular to assess their clarity, relevance, and reliability of the questionnaire items. The feedback collected through this pilot will help fine-tune the survey before it is launched on a larger scale. The survey among companies aiming to capture their perspectives on freelance collaboration, required competences, or hiring practices, among other topics.

The main quantitative phase will consist of an online survey of at least 900 freelancers and companies (a minimum of 150 per country) in the final sample, using a convenience sampling approach supported by snowball recruitment via social media and professional networks. Although this sampling strategy does not ensure strict randomness, it is commonly used and accepted in research involving hard-to-reach or decentralized populations such as freelancers (Etikan, Musa, & Alkassim, 2016). Moreover, social media has proven to be an effective and efficient recruitment tool in contemporary studies, thus constituting a method called 'respondent-driven sampling' (Salganik & Heckathorn, 2004). The composition of the final sample will be distributed as follows: more than 870 freelancers (at least, 145 per country) participating in the Survey 1, and at least, 30 companies (5 per country), in the exploratory Survey 2.

A total of approximately 900 respondents would yield an estimated margin of error of approximately ±3.3% at a 95% confidence level, assuming a simple random sampling approach and a conservative proportion estimate of 0.5 under a global perspective for all partner countries.

In general, this sample sizes are large enough to support meaningful subgroup analysis and to apply parametric statistical tests, which usually require larger datasets to meet assumptions such as normality and equal variance (Field, Discovering statistics using IBM SPSS statistics, 2024). This quantitative phase is therefore not only complementary to the qualitative insights already gathered, but also critical for establishing statistically grounded and generalizable conclusions (external validity) that can inform organizational practices and policy decisions across a variety of international contexts.

Item	Details
Study design	Cross-sectional online survey
Target Population	Freelancers providing services via digital platforms in six countries: Indonesia, Poland, Romania, Spain, Serbia, and Ukraine
Sampling method	Convenience sampling with snowball recruitment via social media, professional networks, and freelancer communities
Sample size	- Pilot phase: 30 freelancers (5 per country) and 12 companies (2 per country)
	- Main phase: at least 900 participants (minimum 150 per country) in the final sample: Survey 1: 870 freelancers (145 per country) Survey 2: 30 companies (5 per country)
Estimated sample error*	3.3%
Data collection mode	Self-administered online questionnaire (e.g vía Limesurvey/Google Drive survey platforms, distributed through targeted digital channels).
Data collection period	Main fieldwork planned for October 2025 (following pilot survey and refinement from July to September 2025)
Incentives	At discretion of each partner consortium's team (e.g. participants may enter a prize draw)

(*) At a 95% confidence level, based on global sample size of 900 and assuming p=0.5, under a simple random sampling assumption.

Table 3**. Technical sheet of the quantitative phase**.

1.3.2 Measurement scales

Understanding freelancers' competences, their self-perceived preparedness, and employers' expectations is central to designing relevant skills development policies. Several studies have shown that mismatches between freelancers' skills and market demand can create friction in gig work arrangements, potentially reducing job satisfaction and client retention (Gandini, 2016; Kitching & Smallbone, 2012).

The inclusion of both hard and soft skill assessments (see questionnaire in Appendix) responds to the growing recognition that successful freelance work increasingly requires a hybrid skillset (Lehdonvirta, 2018). Likewise, the self-assessment of digital literacy is grounded in its importance for remote collaboration

and platform use, which are central to freelance success (Van Deursen & van Dijk, 2014). In the last two decades, the focus of research on the digital divide has shifted from inequalities in access to digital skills and use, highlighting the limitations of early 21st-century research on the digital divide, which primarily considered binary classifications between rich and poor. Furthermore, descriptive inventories of internet use by major demographic categories, conducted over those years, have evolved toward more analytical considerations (Van Deursen & van Dijk, 2014). Digital literacy items present in the questionnaire were derived on the basis on DigCom 2.2 report of (Vuorikari, Kluzer i Punie, 2022), p.10, 18.

Questions on platform use, income structure, and AI impact allow us to contextualize the evolving nature of digital labour markets (Berg, Furrer, Harmon, Rani, & Silberman, 2018). Meanwhile, exploring the motivations and barriers from both freelancer and company perspectives helps identify structural challenges, such as precarity, competition, or skills obsolescence (Wood, Graham, Lehdonvirta, & Hjorth, 2019; De Stefano, 2016).

1.4 Notes – survey items development

Translate the survey into a national language.

Back translation – translate the survey from a national language to English and check the consistency with the original English version.

If needed, update the translation of the survey.

Pilot survey:

5 freelancers, 2 companies

Any feedback from the pilot surveys / suggestions for improvements, please put as comments in the file with the English version of the survey.

2 Methodology of Semi-Structured Interviews Analysis

2.1 Analysis of the interview data

The analysis of the interview data will follow a thematic interpretative approach, aimed at discovering recurrent or more frequent patterns, meanings, and discursive constructions within and across participant groups. The analytical process will begin with verbatim transcription of all 42 interviews, followed by iterative coding using a combination of inductive and deductive strategies.

Initially, open coding will be applied to uncover emerging themes related to skills, knowledge, experiences, and attitudes expressed by freelancers and hiring companies. These codes will then be grouped into higher-order categories informed by both the research objectives and the conceptual framework. The use of cross-case analysis will allow for the identification of similarities and differences between freelancers and companies, as well as between countries and sectors (public vs. private). In order to ensure consistency and traceability, all transcripts will be managed and coded using qualitative data analysis software (e.g., MAXQDA or Nvivo) and/or other AI tools (Napkin, QuillBot AI, Notta.ai, ...). Throughout the process, reflexivity and researcher triangulation will be applied to enhance credibility, while memo writing and audit trails will support the transparency and rigor of the interpretative process. As Braun & Clarke (2006) note, thematic analysis provides a flexible yet systematic framework for identifying meaning across a dataset, particularly useful for exploring perspectives and experiences in applied research contexts such as the current one.

3 Methodology of Survey (Questionnaire) Analysis

3.1 Objectives

This methodological guideline provides a harmonized analytical framework for all national research teams engaged in the ENTEEF project.

The LBUS team conducts the quantitative analysis of each national dataset collected through the *Questionnaire for Freelancers* and the *Questionnaire for Companies*. All national teams apply the same statistical design, coding conventions, and reporting structure to enable national-level interpretation and cross-country synthesis. Each country team interprets the results presented in its national data analysis and prepares a national analysis report using the standardized ENTEEF Word template.

The analytical stages address the following research questions:

- **RQ1**: What are the key competences (skills, knowledge, attitudes, and experience) required of freelancers, and to what extent are these competencies possessed by them across different sectors and countries?
- **RQ2**: How do freelancers and hiring companies perceive skill gaps and competence mismatches in the freelance economy?
- **RQ3:** (adapted for data analysis purpose): How can freelancers' training needs be determined, aligned with their professional development goals?

All teams use this shared methodology to:

- Analyse national datasets independently (companies + freelancers).
- Produce comparable national summaries.
- Report standardized outputs suitable for cross-country aggregation.

The quantitative analysis framework defined in this document is operationalized in national analyses using standardized procedures. Data preparation, coding, statistical testing, and result interpretation are conducted in accordance with the guidelines described in the next sections.

3.2 Statistical techniques – an overview

To analyse the data collected from freelancers and hiring companies, a combination of descriptive and inferential statistical techniques will be applied to gain both general insights and identify meaningful patterns within the sample. Initially, descriptive statistics (e.g., frequencies, percentages, means, and standard deviations) will be used to summarize the central tendencies and variability of both categorical and continuous variables (Field, Discovering statistics using IBM SPSS statistics, 2024). This step provides a foundational understanding of demographic distributions, key competences, digital literacy scores, and perceptions regarding the freelance economy, enabling a structured overview of the population under study.

To assess relationships between categorical variables, such as job category, gender, or country of residence, cross-tabulations will be employed alongside Chi-squared tests. These allow for the identification of statistically significant associations patterns or trends (Agresti, Statistical Methods for the Social Sciences, 2018). For instance, we can explore whether certain freelance sectors are more prevalent among specific age groups or genders, or whether perceptions of platform use vary across countries. Such analyses help uncover relational patterns that are not immediately evident through basic frequences or descriptive statistics alone.

In order to give participants more inclusivity or flexibility in their responses, open-ended questions will be included at the end of several question blocks. This allows respondents to add relevant answers that may not be listed among the predefined options (e.g., by selecting "Other" and providing a written response).

This mixed-method approach combines the strengths of both quantitative data (e.g., Likert-scale ratings) and qualitative insights (e.g., open comments or expressions), helping us capture not only the most common skill sets, but also new or emerging ones that can be not previously identified in the previous list.

Open responses will be categorized by independent coders, and inter-rater reliability will be assessed (e.g., using Cronbach's alpha). Besides these categorized responses can then be included in further analyses, such as exploring relationships

with other categorical variables (like job category or gender), using techniques such as cross-tabulations as well as Chi-square tests.

To assess relationships between categorical variables, such as job category, gender, or country of residence, cross-tabulations will be employed alongside Chi-squared tests. These allow for the identification of statistically significant associations patterns (Agresti, Statistical Methods for the Social Sciences, 2018). For instance, we can explore whether certain freelance sectors are more prevalent among specific age groups or genders, or whether perceptions of platform use vary across countries. Such analyses help uncover relational patterns that are not immediately evident through descriptive statistics alone.

Furthermore, one-way ANOVA will be applied to examine differences in mean scores for key variables measured using Likert-type scales (e.g., importance of competences or digital literacy levels) across different groups (e.g., job categories, countries, or company sizes). This approach is suitable for testing whether the mean perceived relevance of a specific skill significantly differs depending on respondents' country or freelance status (Field, Discovering statistics using IBM SPSS statistics, 2024). If significant differences are found, post-hoc comparisons will be conducted to further investigate where those differences are caused.

To explore more complex interactions and uncover subgroups within the sample, hierarchical segmentation methods such as tree-based classification (e.g., CHAID-based algorithm) will be implemented using software like SPSS or R programming software (Higueras-Castillo, Alves, & Liébana-Cabanillas, 2025). This approach allows for recursive partitioning of the sample based on the most influential predictors, such as country, age, freelance experience, or skill self-assessments (Kass, 1980). A specification of these techniques can force country to act as the initial splitting variable, followed by skillsets or platform usage, enabling the identification of coherent segments with distinct freelance profiles. Additionally, clustering algorithms (e.g., hierarchical clustering and/or k-means clustering) may complement this approach by grouping respondents based on multidimensional similarity, offering valuable insights for market segmentation or policy implications.

3.3 Data Export, Preparation and Coding

3.3.1 Data Export

For each country team, respondents are identified based on their country of origin, and the exported dataset is supplemented with an additional column containing the country's ISO code (ISO, 2020).

3.3.2 Data Cleaning and Preprocessing

At this stage, the following actions are performed:

- Incomplete or inconsistent responses are excluded (e.g., responses with more than 50% missing values).
- Variable names and coding schemes are harmonized across datasets.
- Categorical variables are recoded numerically (e.g., gender, education level);
- Each country is associated with its ISO standard code (e.g., POL, ROU, ESP, IDN, UKR, SRB).
- Responses provided in national languages are mapped to the corresponding English survey items.

Open-ended responses are categorized, and inter-rater reliability is assessed using appropriate reliability measure (e.g., Cohen's Kappa).

3.3.3 Derived and composite variable

To enable aggregated competence analysis, standardized indicators are computed.

Composite competence scores are calculated by averaging Likert-scale items within the following classes of competences:

– Personal profile competences,

– Communication and teamwork competences,

– Digital literacy competences.

Competence gap scores are computed for each competence class *C* listed above:

$$\text{Gap Score}_C = (\text{Importance Mean}_C - \text{Proficiency Mean}_C) * \text{Importance Mean}_C$$

where freelancers report *self-assessment* and companies report *meeting standards*.

Higher positive values indicate greater unmet training potential.

3.4 Descriptive Statistics - Profiling Respondents

3.4.1 Demographics and Professional Profile

The following indicators are computed and/or visualized:

- Frequencies and percentages for demographic variables (age, gender, education).
- Professional profile variables: area of activity, years of experience, company size, market reach, role/position.

Bar charts and pie charts are used as recommended visualization formats (recommended standardized layout / colour scheme).

3.4.2 Competence Importance and Performance

- Mean values, standard deviations, and rankings are computed for each competence item, including importance and proficiency (freelancers) or meeting standards (companies).
- The top five most important competences are presented for each respondent group (age, gender, education, area of activity, years of experience, etc).
- Mean values for "importance" are compared with corresponding values for "proficiency/meeting standards."

Statistical methods: descriptive statistics (mean, SD, frequency).

This stage addresses **RQ1** by identifying competences perceived as most relevant across respondent groups.

3.5 Comparative and inferential statistics

3.5.1 Relationships between categorical variables

Significant associations between demographic/professional variables and competence importance/performance categories are examined using cross-tabulations and Chi-squared tests (Agresti, An Introduction to Categorical Data Analysis, 2019). Example tests:

- Age × Area of activity,
- Gender × Use of digital labour platforms,
- Company size × Hiring freelancers,
- Education × AI usage,
- etc.

The following statistics are reported:

- Chi-square value (χ^2),
- Degrees of freedom (df),
- p-value,
- Cramer's V as a measure of association strength.

This analysis addresses **RQ1** by detecting what are the key competencies in relation to specific categorical variables. Also addresses **RQ2** by identifying potential cultural/educational differences affecting perceptions.

3.5.2 Mean-difference analysis

Mean differences in competence importance or proficiency ratings across groups (e.g. area of activity or company size) are tested using one-way ANOVA or Welch's ANOVA, depending on variance homogeneity assumptions (Field, Discovering Statistics Using IBM SPSS Statistics, 2018; Delacre, Lakens, & Leys, 2017).

Example:

- Importance of "digital literacy" by country,

– Perceived “teamwork ability” by company size.

When statistically significant results are obtained, post-hoc tests (Tukey HSD / Games–Howell) are applied to identify specific group differences.

Reported metrics include (Lakens, 2013):

– F-statistic,

– p-value,

– Partial eta squared (η^2) as an effect size indicator.

This stage addresses **RQ2** by identifying mismatches in perceived performance vs. required levels.

3.5.3 Gap Analysis (Paired Comparisons)

Competence gap scores are analysed using paired t-tests comparing importance and proficiency ratings within respondents.

Effect size is assessed using Cohen’s d for dependent samples (Lakens, 2013).

Visualization: radar plots or heatmaps showing magnitude of gaps.

This analysis addresses **RQ2** by identifying competence domains characterized by significant mismatches between perceived importance and performance (skills needing training emphasis).

3.6 Segmentation and profile analysis

3.6.1 Cluster analysis for freelancer typologies

Cluster analysis (**k-means**) is applied to identify distinct freelancer profiles based on competence levels, professional experience, digital literacy, AI usage, and upskilling frequency (Hair, Black, Babin, & Anderson, 2019).

Resulting clusters are labelled descriptively and are interpreted substantively as distinct freelancer profiles, for example:

- “Digital-Native Innovators” – high digital literacy, frequent upskilling.

- “Traditional Experts” – high domain expertise, low AI adoption.
- “Early-Career Learners” – low across most competences, seeking growth.
- “AI-oriented experts” - high AI adoption.

3.6.2 CHAID decision-tree segmentation for companies

CHAID (Chi-square Automatic Interaction Detection) analysis (James, Witten, Hastie, & Tibshirani, 2021) is conducted to identify organizational variables (size, area of activity, AI adoption, perceived risks) influencing freelancer hiring decisions or investment in training partnerships.

- Dependent variable: Availability of freelancers with required competences.
- Predictors: company size, activity sector, competence evaluation, perceived risks.

This analysis addresses **RQ3** by identifying typologies and potential target groups for tailored training strategies.

3.7 Identifying training needs and alignment with professional goals

Competences characterized by high importance and low proficiency or performance are identified from both freelancer and company perspectives. Findings are integrated into a training-needs matrix that informs evidence-based training design (see example in Table 4).

Competence	Freelancers' Gap (Mean)	Companies' Gap (Mean)	Core training priority
Digital literacy	1.2	1.5	High
Communication	0.8	0.9	Medium
Financial literacy	0.6	1.1	High

Table 4. Illustrative training-needs matrix.

This analysis addresses **RQ3**, as direct support is provided for the design of training modules aligned with freelancers' self-development goals and company demand.

3.8 Reporting structure (standardized output)

For each country, clean and standardized national data are provided, in an Excel file called NationalData_Country, with two sheets: Freelancers and Companies. In addition, the Excel file includes dedicated dictionary sheets (Freelancers_variables and Companies_variables) documenting the coding of survey variables for both freelancers and companies, specifying the original questionnaire items and their corresponding variable names. Additionally, for each country, the results of the data analysis are provided in an archive called DataAnalysis_Country.zip, with the following content:

1. Descriptive
2. ChiSquared
3. ANOVA
4. GapAnalysis
5. ClustersCHAID
6. TrainingNeed

Each country is expected to interpret the results contained in its respective DataAnalysis_Country document and deliver a national analysis report formatted according to the ENTEEF project's standard Word template.

Each report should include at least the sections listed in Table 5.

Section	Description	Key Statistics	Related RQ
1. Descriptive Statistics: Respondent Profiling	Demographics, company/freelancer profile	N, %, charts	–
2. Competency Analysis: Importance and Proficiency	Means, SDs, Top 5 important competences / respondent group	Mean, SD, charts	RQ1
3. Cross-Tabulation Analysis of Competency Importance, Proficiency, and Gaps (χ^2 Tests)	Relationships (e.g., gender, country, sector)	χ^2, p, Cramer's V	RQ1–RQ2
4. Group Mean Differences in Competency Importance, Proficiency, and Gaps (ANOVA)	Mean differences across groups	F, p, η^2	RQ1–RQ2
5. Gap Analysis (Paired t-tests)	Competence gap scores	Paired t-tests, Cohen's d	RQ2
6. Segmentation and Profile Analysis (k-means and CHAID)	Cluster and CHAID profiles	Cluster centroids, χ^2 splits	RQ3
7. Identifying Training Needs	Dual-level training-needs matrix	Ranked priorities	RQ3

Table 5. Recommended structure for the national analysis report.

The following section documents the practical implementation of the quantitative analysis framework defined in the previous sections. The procedures described herein reflect the methodology applied to the national datasets and serve as a reference for reproducibility.

3.9 Implementation of the quantitative analysis framework

3.9.1 Data preparation as applied

All responses that required entering a country name were associated with ISO 3166-1 alpha-3 codes (ISO, 2020). For all country names, the English translation was used.

3.9.2 Coding and reliability assessment as applied

Open-ended responses were inductively coded into categories. To ensure coding reliability, two independent coders classified the responses, and inter-rater reliability was assessed using Cohen's Kappa (McHugh, 2012).

To support the interpretation of inter-coder reliability, Table 6 presents the standard interpretation scale for Cohen's κ. Values above **0.70** indicate reliable and robust coding suitable for quantitative analysis (Hallgren, 2012).

κ value	**Interpretation**
< 0.00	Less than chance agreement
0.00 – 0.20	Slight agreement
0.21 – 0.40	Fair agreement
0.41 – 0.60	Moderate agreement
0.61 – 0.80	Substantial agreement
0.81 – 1.00	Almost perfect agreement

Table 6. Interpretation scale for Cohen's κ (Landis & Koch, 1977).

For each survey question that includes an open-ended option, the initial set of predefined categories, the additional categories identified through inductive coding, and the inter-coder reliability (Cohen's κ) are presented in Table 7, Table 8, Table 9, Table 10, Table 11, Table 12, Table 13.

Initial set of predefined categories	Clerical and Data Entry Creative and Multimedia Professional Services (e.g. consulting, accounting, finance, legal, …) Sales and Marketing Support Software Development and Information Technology Teaching Technical Engineering Writing and Translation
Additional categories	Agriculture and Animal Services Construction and Manual Trades Generic / Self-Employment Healthcare, Wellness and Beauty Hospitality, Tourism and Events Service and Support Work Sports, Recreation and Performing Arts
Cohen's κ	κ = 0.91, 95% CI [0.84, 0.98], indicates a highly reliable encoding scheme

Table 7. Survey for freelancers: Main area of activity – coding of the open-ended option.

Initial set of predefined categories	Digital labour platforms Using social networks Via agency I cooperate with Via personal recommendation or contacts Via professional networking sites Via personal website
Additional categories	Not searching for clients Own business location / workplace Other advertising channels
Cohen's κ	κ = 0.88, 95% CI [0.77, 0.99], indicates a highly reliable encoding scheme

Table 8. Survey for Freelancers: How do you find jobs – Coding of the open-ended option.

Initial set of predefined categories	Upwork Freelancer.com Fiverr Toptal PeoplePerHour Guru.com Workana
Additional categories*	LinkedIn Useme Other digital labour platforms
Cohen's κ	κ = 1

**For new digital labour platforms, the minimum threshold was set at four appearances.*

Table 9. Survey for freelancers: Digital labour platforms – coding of the open-ended option.

Initial set of predefined categories	LinkedIn Facebook TikTok
Additional categories*	Instagram WhatsApp Other social network
Cohen's κ	κ = 1

**For new social networks, the minimum threshold was set at four appearances.*

Table 10. Survey for freelancers: Social networks – coding of the open-ended option.

Initial set of predefined categories	Fixed price per project Hourly rate
Additional categories	Unit-based Monthly Mixed Other
Cohen's κ	κ = 0.87, 95% CI [0.77, 0.97], indicates a highly reliable encoding scheme

Table 11. Survey for freelancers: Charge your freelance work – coding of the open-ended option.

Initial set of predefined categories	Changes in customer expectations and contracts Market changes that could reduce demand or replace us To secure consistent, constant income Increasing project complexity Need to upskill and keep up with trends To keep resilience, discipline, and mindset needed to thrive long-term
Additional categories	AI & automation Competition & client access Economic & regulatory instability No challenge Work-life balance & well-being
Cohen's κ	K = 1, since every item received exactly the same category from both coders.

Table 12. Survey for Freelancers: Top 3 challenges – coding of the open-ended option.

Categories identified through inductive coding	Automation reduces routine tasks Higher demand for AI skills Increased global competition Faster project delivery expectations New AI-driven service opportunities Shrinking freelance opportunities No influence
Cohen's κ	K = 1, since every item received exactly the same category from both coders.

Table 13. Survey for companies: How is the use of AI technology influencing the freelancing market – coding of the open-ended option.

According to established interpretation thresholds, the obtained Cohen's κ values indicate substantial agreement between coders, demonstrating that the categorization of open-ended responses is reliable and suitable for further statistical analysis.

3.9.3 Statistical procedures as applied

Chi-square analysis

Chi-square (χ^2) analysis was applied to examine whether statistically significant associations existed between categorical variables derived from the freelancer and company surveys. This procedure was used to assess relationships between demographic or professional characteristics (e.g., gender, education level, area of activity, company size) and categorized competence-related variables (e.g., levels of importance, proficiency, competence gap score).

The numeric variable was transformed into an ordinal categorical variable with three levels: **Low**, **Medium**, and **High,** based on predefined threshold values. The categorization was performed as follows:

- Values ≤ 2 were classified as **Low**, indicating a low level of the measured attribute.
- The value 3 was classified as **Medium**, representing an intermediate level.
- Values > 3 were classified as **High**, reflecting a high level of the attribute.

For each analysis, contingency tables were constructed, and the Chi-square test of independence was performed to evaluate whether the observed distribution of frequencies differed significantly from the distribution expected under the assumption of independence. The degrees of freedom (df), Chi-square statistic (χ^2), and corresponding p-value **were reported** for each tested association.

Null hypothesis (H_0)

There is no association between the two categorical variables; they are statistically independent.

Statistical significance was evaluated using the following thresholds:

- $p \geq 0.05 \rightarrow$ no statistically significant association is detected (the null hypothesis is not rejected).
- $p < 0.05 \rightarrow$ statistically significant association (the null hypothesis is rejected).
- $p < 0.01 \rightarrow$ statistically strong association (the null hypothesis is rejected).

To complement statistical significance testing, Cramer's V was computed as a measure of association strength between categorical variables. Cramer's V quantifies the strength of association between two categorical variables and complements the Chi-square test, which assesses the existence of an association. To ensure consistent interpretation of association strength, Cramer's V was interpreted according to the established benchmarks presented in Table 14. Given that the interpretation of Cramér's V depends on table dimensionality, df-adjusted effect size benchmarks were applied following Cohen's power-analysis framework for χ^2 statistics, as recommended in categorical data analysis literature (Agresti, An Introduction to Categorical Data Analysis, 2019).

Degrees of freedom (df)	Interpretation of association strength / Cramer's V value		
	Weak	**Moderate**	**Strong**
1	0.10	0.30	0.50
2	0.07	0.21	0.35
3	0.06	0.17	0.29
4	0.05	0.15	0.25
5+	0.04	0.13	0.22

Table 14. Interpretation of Cramer's V (Effect Size for Chi-square Tests).

This approach ensured that statistically significant results were also evaluated in terms of practical relevance, thereby reducing the risk of over-interpretation of effects driven primarily by sample size.

Where statistically significant Chi-square results were obtained, standardized residuals were examined to identify the specific cells contributing most to the overall association. Residuals with absolute values greater than 2 were interpreted as indicating meaningful deviations from expected frequencies:

– standardized residuals > 2 → over-representation relative to expectation,

– standardized residuals < −2 → under-representation relative to expectation.

The combined use of Chi-square significance testing, Cramer's V effect size estimation, and standardized residual analysis supported a nuanced interpretation of categorical relationships and ensured methodological robustness and interpretability.

ANOVA (mean-difference analysis)

Analysis of Variance (ANOVA) was applied to examine whether mean differences in numeric competence variables existed across two or more groups defined by categorical variables. This procedure was used to test differences in competence importance, proficiency, and gap scores across groups such as gender, age, education level, main area of freelancer activity, years of professional experience, expected future use of AI, and upskilling frequency.

Competence variables were identified based on standardized naming conventions, using the prefixes PP_, CWT_, and DL_ and the suffixes _imp, _prof, and _gap. For each combination of categorical grouping variable and competence variable, variance homogeneity was assessed prior to mean-difference testing.

Homogeneity of variances was evaluated using Levene's test (mean-centered) and the Brown–Forsythe test (median-centered). When the Brown–Forsythe test indicated homoscedasticity ($p \geq 0.05$), classical one-way ANOVA was performed. When variance homogeneity was violated ($p < 0.05$), Welch's ANOVA was applied to ensure robustness of the results (Delacre, Lakens, & Leys, 2017).

For each ANOVA model, the F-statistic, degrees of freedom, and p-value were reported.

Null hypothesis (H_0)

There is no statistically significant difference between the group means of the analysed numeric variable across the tested categorical groups.

Statistical significance was evaluated using the following thresholds:

- $p \geq 0.05 \rightarrow$ no statistically significant association is detected (the null hypothesis is not rejected).
- $p < 0.05 \rightarrow$ statistically significant association (the null hypothesis is rejected), indicating that at least one group mean differed significantly from the others.

When statistically significant effects were identified, post-hoc comparisons were conducted to determine which specific groups differed. Tukey's Honest Significant Difference (HSD) test was used when variance homogeneity was assumed, while the Games-Howell test was applied when variances were unequal.

To assess the practical relevance of statistically significant results, partial eta squared (η^2) was computed as a measure of effect size.

Partial eta squared (η^2) represents the proportion of variance in the dependent variable explained by the categorical grouping factor. It complements the ANOVA significance test by indicating the practical relevance of observed mean differences.

Partial η^2 was interpreted as the proportion of variance in the competence variable explained by the categorical grouping factor. Interpretation followed established benchmarks presented in Table 15: values below 0.01 were considered trivial, values between 0.01 and 0.06 were considered small, values between 0.06 and 0.14 were considered medium, and values equal to or greater than 0.14 were considered large effects.

Partial η^2 value	**Interpretation of effect size**
< 0.01	Trivial / very small effect
0.01 – < 0.06	Small effect
0.06 – < 0.14	Medium effect
≥ 0.14	Large effect

Table 15. Interpretation of Partial Eta Squared (η^2) for ANOVA.

ANOVA results were documented in a structured output format, with separate result files generated for each categorical grouping variable and individual competence variable, alongside global summaries including all tested models and statistically significant results. Post-hoc test outputs were reported separately to support detailed interpretation and cross-country comparability.

Paired t-test (gap analysis)

Paired t-tests were applied to examine whether statistically significant differences existed between competence importance ratings and corresponding proficiency (freelancers) or meeting-standards (companies) ratings reported by the same respondents. This procedure was used to identify within-subject competence gaps and to assess whether the observed mean differences differed significantly from zero.

For each competence item and competence domain, paired observations were analysed, and the paired t-test statistic (t), degrees of freedom, and corresponding p-value were reported.

Null hypothesis (H_0)

There is no statistically significant difference between the paired means of the two related measurements.

Statistical significance was evaluated using the following thresholds:

- $p \geq 0.05 \rightarrow$ the difference is not statistically significant detected (the null hypothesis is not rejected)
  We cannot conclude that proficiency differs from importance.
- $p < 0.05 \rightarrow$ the difference is statistically significant (the null hypothesis is rejected)
  Proficiency and Importance are not equal; a real gap exists.

When p-values were below 0.05, the null hypothesis of no mean difference was rejected, indicating the presence of a statistically significant gap between perceived importance and reported proficiency or performance. When p-values were equal to or greater than 0.05, no statistically significant difference was concluded.

To complement significance testing and assess practical relevance, **Cohen's d** for dependent samples was computed as a measure of effect size (Lakens, 2013). Cohen's d was interpreted as an indicator of the magnitude of the competence gap, reflecting how large the difference between importance and proficiency ratings was in practical terms. Cohen's d values were interpreted according to the established benchmarks presented in Table 16.

Cohen's d value	Interpretation of effect size
0.00 – 0.19	Very small / negligible effect
0.20 – 0.49	Small to medium effect
0.50 – 0.79	Medium to large effect
≥ 0.80	Large / very large effect

Table 16. Interpretation of Cohen's d for Paired t-tests (Dependent Samples).

This combined interpretation of statistical significance and effect size ensured that competence gaps were evaluated not only in terms of their existence but also in terms of their substantive importance. Larger Cohen's d values were interpreted as indicating

stronger mismatches between perceived importance and current proficiency or performance, thereby highlighting competences requiring priority attention in training design.

Paired t-test results were documented in structured output files, including detailed tables reporting mean importance scores, mean proficiency or performance scores, mean differences, t-statistics, p-values, and effect sizes. These results were subsequently used as key inputs for competence gap ranking and for the identification of training priorities within the ENTEEF analytical framework.

Cluster analysis

A k-means cluster analysis was conducted to identify latent freelancer typologies based on self-assessed competence proficiency variables (all items ending in _prof, including digital literacy competences DL_*_prof), domain experience (PP_Exper_Domain_prof), freelance experience (Years_Experience_Freelancer), AI orientation (AI_Use_Future), and upskilling behavior (Upskilling_Frequency). The categorical variable Main_Freelancer_Activity was excluded to ensure that clusters reflect competence, experience, and technology-adoption patterns rather than occupational labels.

Ordinal variables for AI use and upskilling frequency were mapped onto a five-point scale (Never–Regularly), while freelance experience categories were converted to approximate numeric values (<1 year = 0.5; 1–5 years = 3; 6–10 years = 8; >10 years = 12.5). All variables were standardized (z-scores) prior to clustering.

Based on interpretability and internal validity diagnostics, a five-cluster solution (k = 5) was retained. This solution provides a more fine-grained differentiation of freelancer profiles compared to the four-cluster model, particularly by isolating a distinct group of moderately skilled, stable freelancers.

Cluster separation and validity were assessed using both the **Calinski–Harabasz (CH)** index and the **Davies–Bouldin (DB)** index, providing complementary perspectives on cluster quality (Tan, Steinbach, Kumar, & Karpatne, 2019).

The **Calinski–Harabasz (CH)** index was used to evaluate the ratio of between-cluster separation to within-cluster compactness, with higher values indicating more

distinct and well-separated clusters. Elevated CH values indicated that the identified freelancer profiles were clearly differentiated in terms of competences, professional experience, AI usage, and upskilling behaviour, and that the resulting clusters reflected meaningful structural differences rather than arbitrary partitions.

In parallel, the **Davies–Bouldin (DB)** index was employed to assess cluster compactness and separation by measuring the average similarity between each cluster and its most similar neighbouring cluster. Lower DB values were interpreted as indicating tighter intra-cluster cohesion and greater inter-cluster separation. Low DB index values suggested that the identified freelancer typologies exhibited limited overlap and captured distinct profiles in terms of skills, experience, and AI adoption patterns.

Taken together, the combined use of CH and DB indices supported the robustness and interpretability of the k-means clustering solution by simultaneously confirming strong cluster separation and low inter-cluster similarity.

Cluster profiles were visualized using radar diagrams.

CHAID analysis

CHAID analysis (James, Witten, Hastie, & Tibshirani, 2021) was employed to identify statistically significant organizational profiles associated with anticipated challenges in accessing skilled freelancers (for Indonesia: anticipated challenges related to rising freelancer engagement costs). By applying chi-square tests of independence within a recursive decision-tree framework, the method partitions organizations into homogeneous segments based on combinations of structural characteristics, hiring motivations, perceived risks, and AI-related factors. The resulting tree provides an interpretable segmentation of firms, highlighting interaction effects and enabling the identification of organizational profiles most exposed to future skill availability constraints.

Overview of the CHAID Method

Chi-square Automatic Interaction Detection (CHAID) is a decision-tree–based analytical technique designed to identify statistically significant relationships and interaction effects between a categorical outcome variable and a set of explanatory

variables. The method is particularly suited to survey-based and organizational research, where predictors are predominantly categorical and interpretability is a primary objective.

CHAID recursively partitions the dataset into increasingly homogeneous subgroups with respect to the dependent variable by applying chi-square (χ^2) tests of independence. At each step, the algorithm selects the predictor that exhibits the strongest statistically significant association with the outcome and splits the data accordingly.

CHAID allows multi-way splits and includes an automatic category-merging procedure, ensuring that categories that do not differ significantly with respect to the outcome are combined prior to splitting.

Variables Used in the Analysis

The dependent variable is categorical and represents a future-oriented organizational challenge:

- Availability of freelancers with required competences

This variable captures whether organizations anticipate difficulties in accessing adequately skilled freelance workers in the near future.

The explanatory variables comprise several conceptually distinct groups:

1. **Organizational characteristics**
    - Main activity area (NACE classification)
    - Company size
    - Years active on the market
    - Market scope of operations
    - Ownership structure
2. **Freelance engagement characteristics**
    - Years of hiring freelancers
    - Number of freelancers hired in the last 12 months

- Types of freelance services used (TFS_*)

3. **Motivations for hiring freelancers** (MH_*)
4. **Perceived risks of relying on freelancers** (RSK_*)
5. **Future challenges** (CH_*)
6. **Perceived impact of AI on freelancing market** (AI_*)

Continuous variables were discretized into ordinal categories prior to analysis to comply with CHAID's requirement for categorical predictors.

Interpretation of CHAID Results

CHAID results are interpreted in terms of segmentation patterns, not causal effects.

Each terminal node represents:

- a specific combination of organizational attributes, and
- the observed proportion of organizations exhibiting the outcome of interest.

The tree structure reveals:

- the relative importance of predictors (based on split order),
- interaction effects between variables,
- distinct organizational profiles associated with higher or lower likelihoods of the outcome.

Given that CHAID is sensitive to sample size and categorical distributions, the results should be interpreted as exploratory because the data sample is small.

3.9.4 Identifying Training Needs

General approach for a training-needs matrix

A training-needs matrix transforms measured skill gaps into actionable training priorities through the following steps:

1. **Select the competencies** to be evaluated (e.g., all variables that explicitly represent skill gaps).

2. **Compute a comparable gap score** for each competency and stakeholder group (freelancers vs. companies), using mean gap values.
3. **Integrate the two stakeholder perspectives** into a single matrix, enabling comparison between the *supply side* (freelancers) and the *demand side* (companies).
4. **Assign training priority levels** (e.g., LOW / MEDIUM / HIGH / CRITICAL) using predefined rules for combining stakeholder gaps (such as Max-gap or Joint-gap criteria).
5. **Aggregate priorities at a higher level** (e.g., by competency families such as PP, CWT, and DL) to support reporting, curriculum design, and policy decision-making.

Method for constructing the training-needs matrix

The training-needs matrix was constructed to translate measured competency gaps into actionable training priorities by jointly considering the perspectives of freelancers (supply side) and companies (demand side). For each competency, gap scores were computed as the difference between perceived importance and self-reported proficiency, and mean gap values were calculated separately for freelancers and companies to obtain comparable indicators of unmet training needs.

Concretely, only competency variables explicitly defined as gap measures (identified by the suffix _gap and the prefixes PP_, CWT_, and DL_) were included. For each competency, the average gap among freelancers and the average gap among companies were computed and combined in a single matrix. Training priorities were then derived using two complementary rules. First, a **Max-gap rule** assigns priority based on the larger of the two mean gaps, reflecting the highest unmet need observed on either side of the market. Second, a **Joint-gap rule** was applied in a conservative manner for critical needs: the highest priority level is assigned only when both freelancers and companies exhibit simultaneously high gaps, while medium and high priorities are assigned when at least one side reports a substantial gap. Priority levels were encoded on an ordinal scale (1 = LOW, 2 = MEDIUM, 3 = HIGH, 4 = CRITICAL) using predefined thresholds on the gap scale.

To support strategic interpretation, competency-level results were further aggregated by competency families: Personal Profile (PP), Communication - Work in a Team (CWT), and Digital Literacy Skills (DL), by averaging gap means within each group and reapplying the same priority rules. This dual-level matrix (competency-level and group-level) enables both fine-grained identification of specific training needs and higher-level guidance for curriculum design and policy intervention.

3.10 Conclusions

The quantitative analysis framework defined in these guidelines ensures methodological rigor, transparency, and cross-country comparability across all national datasets within the ENTEEF project. Through standardized data preparation, statistical testing, and interpretation procedures, consistent and reliable evidence is generated to support project objectives.

The analytical procedures directly address the formulated research questions. **RQ1** is addressed through descriptive and comparative analyses that identify key competences required by freelancers across sectors, countries, and professional profiles. **RQ2** is addressed through gap analysis and inferential statistical testing, which reveal mismatches between perceived competence importance and actual proficiency or performance as reported by freelancers and companies. **RQ3** is addressed by integrating freelancer and company perspectives into structured training-needs matrices, enabling the prioritization of competences requiring targeted intervention.

The results produced through this analytical framework directly support the development of the **Competence Assessment Tool (CAT)**. Empirically derived competence profiles, gap scores, and segmentation outcomes are used to inform the logic, scoring mechanisms, and personalization rules embedded in the CAT tool, ensuring that assessments are evidence-based and aligned with real market needs.

Furthermore, the identified competence gaps and training priorities provide a validated foundation for the design and structuring of **Massive Open Online Courses (MOOCs)**. The analysis ensures that MOOC content is aligned with freelancers' self-

development goals and company demand, while also enabling differentiation across learner profiles and professional contexts. In this way, the quantitative analysis serves as a critical bridge between empirical evidence, digital assessment tools, and targeted educational interventions within the ENTEEF project.

4 Methodology of the Competency Assessment Tool Development (CAT)

4.1 Outline

WP2 and WP3-A2-A9 will lead to identifying key competences required from freelancers. Identified competences will be used to create the general competence framework for a freelancing position, and as such will serve as a base for WP4. The framework will consist of:

- universal competences – a base for effective work, such as problem solving, critical thinking, communication or time management,
- digital competences – connected with tasks performed as a freelancer,
- specific competences - connected with requirements for freelancers (from different, most popular domains).

The Competency Assessment Tool (CAT) will be based on the framework. Its purpose is to serve as a placement test for people who would like to start or enhance their career as freelancers by supporting the selection by them and effective use of prepared MOOCs.

4.2 Theoretical background

To determine causal relationships among the competences required in job postings, algorithms such as HillClimbSearch and NOTEARS might be used.

Identifying the most important relationships between competences involves retaining in the Bayesian networks only those arcs that have associated weights

exceeding a relevant threshold value. Extracting subgraphs centred around the most in-demand skills leads to grouping those skills and identifying the causal relationships on which learning pathways can be built. These learning pathways can be materialized into study plans based on MOOCs, in which the acquisition of skills follows the sequence encoded in the Bayesian network. This method both groups the MOOCs according to related competences and allows the automatic determination of learning pathways (the sequence in which the MOOCs could be taken).

Conclusions

WP3 builds on the progress done in earlier stages of the project (WP2/A2 and WP2/A3), and now moves forward to identify wich competences are most needed by freelancers, while also creating a Competency Assesment Tool (CAT) in the last phase. This part of the work answers to the growing need to help freelancers improve professionally by giving them access to training that's more ajusted to their needs, like MOOCs. The two main goals of WP3 are: (1) figure out the most important skills, knowledge, attitudes and experience for freelance work, from the perspective of the supply of these services, but also of the demand from the companies that hire it, and (2) design a reliable tool that freelancers can use to see where they stand and what they should learn next.

The methodology here presented mixes both qualitative and quantitative aproaches, in order to make sure the results are both valid and rich. First, interviews were carried out with freelancers and people from companies in the 6 countries-partners of the ENTEEF prohect. Those conversations gave useful insights about needs, challenges and what people really think about freelance work. On the qualitative side, the analysis follows a more interpretive view, trying to understand what each person really means when they talk about their experience. Instead of just looking at numbers or fixed categories, the researchers looked for common themes and patterns in what people said. This method is based on Categorization Theory by Rosch, and helps organise the responses in a way that makes sense, starting from general ideas and getting more specific.

Conducting a quantitative survey after the qualitative phase allows for the validation and generalization of insights by measuring their prevalence across a larger population of freelancers, ensuring both depth and breadth in understanding the phenomenon.

Lastly, the process of creating and developing of the CAT was explained. This tool is meant to be practical and will go through expert checks and tests in different

institutions. It's designed to help freelancers see their own training needs and choose the right MOOCs to improve.

Beyond WP3, the methodology has several significant implications:

- Strategic Input for MOOCs Design (WP4): The granular insights into hard and soft skills, as well as digital literacy gaps, directly inform the structure and content of the MOOCs to be developed. The competence data ensures that the courses are not only pedagogically sound but also demand-driven.
- Policy and Workforce Planning: The triangulated data approach provides rich evidence base for policymakers seeking to support freelance labour markets. The research can inform interventions aimed at improving freelancer protections, enhancing skill development funding, or guiding educational reforms.
- Scalability and Replicability: The modular design of the methodology allows for replication in other regions or sectors, contributing to longitudinal research on freelance dynamics. It can also serve as a blueprint for other projects aiming to assess competences in decentralized or informal labour markets.
- Empowerment through Self-Assessment: The creation of the CAT not only benefits freelancers in aligning their skills with labour market needs but also empowers them to take ownership of their professional development. This self-assessment model supports lifelong learning and adaptability in volatile employment contexts.
- Fostering Multi-Stakeholder Dialogue: Finally, the research fosters dialogue between academic institutions, industry actors, and freelance professionals. This triangulated engagement enhances mutual understanding and supports the co-creation of training and policy interventions.

So, the results from WP3 are not only useful to shape better training in WP4, but also help raise awareness about freelance skills among companies, professionals and policy makers.

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List of Tables

Appendixes

Appendix 1: Semi-structured interview guide

A. For freelancers

Section 1: Introductory questions

1. Age.
2. Country of residence.
3. Years of experience as a freelancer.
4. What type of services do you offer as a freelancer?
5. In what industries or domains are your clients usually operating?
6. What are the typical characteristics of your client companies (e. g., size, department you work with, location)?
7. Through what channels do you usually find freelance work?

Section 2: Main interview questions

8. What competences or skills do you consider most important in your freelance work?
9. Do you believe there are competences that are essential for all freelancers, regardless of their field?
10. Have any clients ever mentioned skills you were lacking or areas for improvement?
11. How do you keep your skills up to date or stay competitive in the freelance market?
12. How is the use of AI technology changing your work?
13. What are the biggest challenges or risks you face as a freelancer?

14. What motivates you to continue freelancing instead of seeking full-time employment?
15. How has your experience as a freelancer evolved over time?
16. Have you noticed an increase in demand for your freelance services in recent years?
17. Have you worked with global clients or companies with international scope? If so, how does that differ from working with local clients?

B. For company representatives

Section 1: Introductory questions

1. Country of operation.
2. Industry sector.
3. Your role/position in the company.
4. Department in which you work.
5. How many years has your company been in the market?
6. Approximate size of the company (number of employees including freelancers).
7. Does your company regularly hire freelancers? If so, in what areas or for what types of tasks?

Section 2: Main interview questions

8. Which competences do you consider most important when selecting a freelancer?
9. What competences or skills do you find are most lacking among freelancers you have hired?
10. Are there any competences that you believe are universally important across different freelance roles?
11. How do you usually find and select freelancers (what are the main criteria of selection; do you use agents/intermediaries for finding freelancers)?

12. How is the use of AI technology influencing the engagement of freelancers?
13. What are the advantages and disadvantages of working with freelancers compared to full-time employees?
14. What are the main benefits, from your perspective, associated with hiring freelancers?
15. What are the main risks, from your perspective, associated with hiring freelancers?
16. Has your company developed any specific strategy or policy related to freelance hiring?
17. Have you observed an increase in the demand for freelance work in your field in recent years? Why or why not?
18. What internal or external factors have most influenced the growth of freelance hiring in your company?
19. What internal or external barriers have most impeded the growth of freelance hiring in your company?

C. Interviews' protocol

C.1. INITIAL CONTACT & PREPARATION

C.1.1. Invitation template (to send to participants via email/whatsapp/post in community, local portal or social network)

Subject: Invitation to participate in a short research interview on freelancers' competences and challenges (ENTEEF Project)

Dear [[Participant's name]],

*We are contacting you as part of the **ENTEEF Project** (enteef.uek.krakow.pl), an international research project aiming to **Foster Entrepreneurship through Freelancing** and more specifically, for better understanding the key competences, skills, and challenges of freelancers in today's labour market.*

We would be grateful if you could take part in a short, 15-minute video online interview where we will ask a few guided questions. Your insights, as a [[freelancer / representative of a company that works with freelancers]], are invaluable to our study.

Participation is entirely voluntary, and your responses will be analysed in an aggregate manner, ensuring full confidentiality and anonymity. As a token of appreciation, participants will receive a small incentive after the interview (e.g. ~to be added by each partner of the consortium, see examples in section 2.2.1).

If you agree, you will be asked to sign a brief consent form for data protection purposes (generated from https://consent.dariah.eu/).

Please let us know your availability for this short video call in the coming days; and then We send you the link to G. Meet/Zoom room.

Thank you very much for your consideration!

Best regards,
[[Your name & institution/ENTEEF project]]
[[Contact information]]

C.1.2. Link/Attachments

- Consent form link or PDF

C.1.3. Additional notes on general legal requirements

- At the beginning of the interview, and also noted in the questionnaire and consent form, please **emphasize**:
    - The **anonymity** and **confidentiality** of responses.
    - The fact that **data will be analysed in aggregate**.
    - That **data processing complies with the GDPR** and local regulations.
    - Participation is **voluntary** and can be withdrawn at any moment.

C2. DURING THE INTERVIEW (VIDEO CALL STAGE)

C2.1.1. Opening the interview and legal aspects

Introduce yourself:

*Hello, thank you very much for agreeing to speak with us today and participating in the study. My name is [[your name]], and I am part of the research team for **ENTEEF Project**, an international research project aiming to **Foster Entrepreneurship through Freelancing**.*

Confirm consent and legal aspects:

- *Before we start, I want to remind you that your responses will be treated completely anonymously and treated confidentially.*

- *This interview is being conducted in accordance with the European GDPR and [[country]] data protection law. Your participation is voluntary, and you can stop at any moment.*
- *Do you mind if I record this interview to ensure we capture your insights accurately. The recording will only be used for transcription and will be stored securely. Do you consent to the recording? [Wait for verbal consent before starting.]*

C.2.2. Interview flexibility and research aims

- *This interview is part of a broader effort to understand the competences, challenges, and relationships between freelancers and companies. Your input will help inform our recommendations.*
- *Please feel free to share openly. We are also open to new/different insights that might not be directly addressed in the questions.*
- *We may slightly change the order of questions depending on how the conversation flows, and may ask follow-up questions if something interesting comes up.*

C.2.3. Ending the interview: (a) final thanks and (b) contact details for incentive and other contacts. Closing statements such as:

- *Thank you very much for your contribution to this research/your time and for sharing your experiences.*
- *Just to confirm, your answers will be anonymized, and only aggregate results will be reported in our research outputs.*
- *To send you the incentive, may I kindly ask for your preferred contact details (email or postal address)?*
- *Could you please provide the contact information of other persons who might participate in this study?*

C.2.4. Notes for interviewers

- *Language of the interview*: preferably in the national/native language of the participant, but can be adapted depending on his/her preference and decision of the country team.
- *Environment*: ensure a quiet, professional setting and stable internet for the video-call.
- *Flexibility*: although the most important questions are at the beginning, be open to changing question order and probing further when needed
- *Documentation*: store recordings and data securely, following ethical standards.
- *Check the adequacy of the recording:* At the very least, we should make sure we can record the audio. If the recording of image and video is a problem, the audio is essential for subsequent transcription.

C.3. TRANSCRIPTION

- Please transcribe the interview into the MS Word template titled "Freelancer initials – interview template.docx" highlighting the main ideas and new insights (document should be in English with questions and answers).

D. Information on data processing and declaration of consent

Introduction

Fostering Entrepreneurship through Freelancing values your privacy and processes your personal data in compliance with the EU General Data Protection Regulation (GDPR).

Your Personal Data is any information related to you. Processing is any operation performed on the data.

According to the Transparency Principle, this document will provide you with information about the processing of your personal data as required by Art. 12, 13, and 14 of the GDPR.

Who am I and how can you contact me?

Name: …

Address: …

E-mail: …

acting as the data controller within the meaning of the GDPR.

For what purpose do I process your data?

Your data will be processed within the Fostering Entrepreneurship through Freelancing project (hereinafter: the project).

Project description:

Competences needed for freelancers.

To learn more about the Fostering Entrepreneurship through Freelancing project, please see https://enteef.uek.krakow.pl/

Please be informed that your data may also be used in different research projects in the domain of Digital Entrepreneurship in accordance with the GDPR.

What information about you do I collect and process?

The following types of information about you are collected and processed within the project:

- Gender
- Educational background / title
- Affiliation / professional situation / occupation

The data are collected directly from you through

Oral or video interview (transcription)

Legal basis for the processing of your data

Your data is processed on the basis of your consent (Art. 6.1(a) of the GDPR) which you give by accepting this notice.

Exceptionally, where consent is not an appropriate legal basis, your personal data can also be processed on the basis of our legitimate interest in carrying out the project, or further research in the field of Digital literacy. Then, the processing is based on Art. 6.1(f) of the GDPR.

For how long do we keep your data?

Your data will be stored for as long as necessary for the fulfilment of the defined research purposes.

Will your data be shared with anyone?

Your personal data will not be shared with or disclosed to anyone.

Will your data be transferred outside the European Economic Area (EEA)?

Your data will not be transferred outside the European Economic Area. ~ To be deleted if not relevant

No profiling or automated decision-making

Your data will not be used for profiling or automated decision-making purposes.

Your rights with regards to the processing of your data.

The GDPR grants you certain rights with regards to the processing of your personal data. These rights include:

Access (Art. 15 of the GDPR): you have the right to obtain confirmation as to whether I have your personal data, as well as information about how I process it. You can also request a copy of your personal data, for which I may charge you a reasonable fee based on administrative costs. In order to exercise your right of access, contact me at *email*.

Rectification (Art. 16 of the GDPR): if your personal data that I process are incomplete or inaccurate, you have the right to request rectification of such data without undue delay. In order to exercise your right to rectification, contact me at *email*.

Erasure ("right to be forgotten" – Art. 17 of the GDPR): in certain circumstances (e.g. if your data are processed unlawfully or unnecessarily) you may request erasure of your personal data.

Restriction of processing (Art. 18 of the GDPR): in certain circumstances (e.g. if you contest accuracy of your data that we process or lawfulness of the processing) you may request restriction of processing of your data. Such data will not be erased, but in principle can only be processed with your consent;

Data portability (Art. 20 of the GDPR): in certain circumstances, you may request transmission of your data to another controller in a structured, commonly used and machine-readable format;

Right to object (Art. 21 of the GDPR): if you did not consent to the processing, or if it is not necessary to comply with a legal obligation, you may always object to it, in which case I shall no longer process your data.

Moreover, you have the right to:

withdraw your consent to the processing of your personal data at any time (Art. 7(3) of the GDPR) by contacting us at paliwodg@uek.krakow.pl. The withdrawal of consent will not affect the lawfulness of processing based on consent before its withdrawal; lodge a complaint with a supervisory authority.

E. Semi-structured interview transcript template

Study: Skills and Competencies in Freelance Work – Perspectives from Freelancers and Hiring Companies

Interviewee Code: [e.g., JH (for Freelancer, where JH are the initials of freelancer's name) // JH-RT (for Company Representative, where JH are the freelancer's initials and RT are the company's initials) – And this code should also be the file name, for example: JH.docx]

Plus acronym of a country at the beginning:

ES, ID, PL, RO, RS, UA

e.g. ES-JH.docx for Spain

Date: [DD/MM/YYYY]
Location: [e.g., Online-Zoom, Online-Meet, In-person, etc.]
Interviewer: [Full Name or Initials]

SECTION 1: INTRODUCTORY QUESTIONS

INTERVIEWER: Thank you for taking the time to participate in this study. I'll begin with a few introductory questions to understand your background.

INTERVIEWER: Q1. Age? // Country of operation?

[INITIALS]: Response to Q1

INTERVIEWER: Q2. Country of residence? // Industry sector?

[INITIALS]: Response to Q2

INTERVIEWER: Q3. Years of experience as a freelancer? // Your role/position in the company?

[INITIALS]: Response to Q3

INTERVIEWER: Q4. What type of services do you offer as a freelancer? // Department in which you work?

[INITIALS]: Response to Q4

INTERVIEWER: Q5. In what industries or domains are your clients usually operating? // How many years has your company been in the market?

[INITIALS]: Response to Q5

INTERVIEWER: Q6. What are the typical characteristics of your client companies (e. g., size, department you work with, location)? // Approximate size of the company (number of employees including freelancers)?

[INITIALS]: Response to Q6

INTERVIEWER: Q7. Through what channels do you usually find freelance work? // Does your company regularly hire freelancers? If so, in what areas or for what types of tasks?

[INITIALS]: Response to Q7

SECTION 2: MAIN QUESTIONS OF THE SEMI-STRUCTURED INTERVIEW

INTERVIEWER: Q8. Question 8?

[INITIALS]: [Response to Q8]

INTERVIEWER: Q9. Question 9?

[INITIALS]: [Response to Q9]

End of interview. Thank you for your time and insights.

Appendix 2: Survey questionnaire for freelancers

We are pleased to invite you to take part in a survey on freelancing, conducted as part of the ENTEEF project - Fostering Entrepreneurship through Freelancing. This initiative aims to strengthen students' entrepreneurial skills by preparing them for freelance careers, while also promoting lifelong learning. You can find a detailed overview of the project here: https://enteef.uek.krakow.pl

Please note that the survey is completely anonymous. All responses will be published in aggregate form only, ensuring that no individual participant can be identified. The survey should take no more than 15 minutes to complete.

A1. Are you working or have worked as a freelancer in the past five years?

- [ ] Yes
- [ ] No

B1. Please, indicate your country of origin / nationality

B2. Please, indicate your country of residence

B3. Age

- [ ] Under 24
- [ ] 24-28
- [ ] 29-36
- [ ] 37-44
- [ ] 45-52
- [ ] 53-60
- [ ] 61 or more

B4. Gender

- [ ] Male
- [ ] Female
- [ ] Prefer not to say

B5. Highest level of education

- [ ] High school or less
- [ ] Bachelor's degree
- [ ] Master degree
- [ ] Doctorate or equivalent

B6. Area of education

- [ ] Education
- [ ] Arts and humanities (including languages, history, philosophy)
- [ ] Social Sciences, Journalism and Information
- [ ] Business, Administration and Law
- [ ] Natural Sciences, Mathematics and Statistics
- [ ] Information and Communication Technologies (ICTs)
- [ ] Engineering, Manufacturing and Construction
- [ ] Agriculture, Forestry, Fisheries and Veterinary
- [ ] Health and Welfare
- [ ] Services (e.g., tourism, sports, beauty)
- [ ] No formal education / Self-taught

B7. Number of languages spoken fluently (excluding mother tongue):

- [ ] none
- [ ] 1
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5
- [ ] more than 5

B8. Main area of freelancer activity

- [ ] Creative and Multimedia
- [ ] Software Development and Information Technology
- [ ] Sales and Marketing Support
- [ ] Professional Services (e.g. consulting, accounting, finance, legal, …)
- [ ] Writing and Translation
- [ ] Clerical and Data Entry
- [ ] Technical Engineering
- [ ] Teaching
- [ ] Other

Other

B9. Years of experience as a freelancer

- [ ] Less than 1 year
- [ ] 1–5 years
- [ ] 6–10 years
- [ ] More than 10 years

B10. Freelancer status

- [ ] Main job (more than 30h per week)
- [ ] Part time job (less than 30h per week)
- [ ] Occasional activity (from time to time)

B11. Number of clients in the past 12 months

B12. How do you find jobs?

- [ ] Digital labour platforms
- [ ] Using social networks
- [ ] Via agency I cooperate with

- [ ] Via personal recommendation or contacts
- [ ] Via professional networking sites
- [ ] Via personal website
- [ ] Other

Other

B13. Digital labour platforms used to find jobs

- [ ] Upwork
- [ ] Freelancer.com
- [ ] Fiverr
- [ ] Toptal
- [ ] PeoplePerHour
- [ ] Guru.com
- [ ] Workana
- [ ] Other

Other

B14. Social networks used to find jobs

- [ ] LinkedIn
- [ ] Facebook
- [ ] TikTok
- [ ] Other

Other

C1. Please assess your proficiency (1 – beginner, 5 - master) and the importance (1 – not important, 5 – extremely important) of skills related to your personal profile.
Self-assessment

	1	2	3	4	5
Self-organization and work discipline	☐	☐	☐	☐	☐
Dealing with uncertainty and stress	☐	☐	☐	☐	☐
Ability to engage in and maintain relationships	☐	☐	☐	☐	☐
Ability to learn quickly and expand knowledge	☐	☐	☐	☐	☐
Experience in the work domain	☐	☐	☐	☐	☐
Ability to identify, analyse and solve problems	☐	☐	☐	☐	☐
Knowledge of and compliance with formal regulations (e.g. law, taxes, accounting)	☐	☐	☐	☐	☐
Ability to manage personal finance (budgeting, savings, investing)	☐	☐	☐	☐	☐

C2. Please assess your proficiency (1 – beginner, 5 - master) and the importance (1 – not important, 5 – extremely important) of skills related to your personal profile.
Importance

	1	2	3	4	5
Self-organization and work discipline	☐	☐	☐	☐	☐
Dealing with uncertainty and stress	☐	☐	☐	☐	☐
Ability to engage in and maintain relationships	☐	☐	☐	☐	☐
Ability to learn quickly and expand knowledge	☐	☐	☐	☐	☐
Experience in the work domain	☐	☐	☐	☐	☐
Ability to identify, analyse and solve problems	☐	☐	☐	☐	☐
Knowledge of and compliance with formal regulations (e.g. law, taxes, accounting)	☐	☐	☐	☐	☐
Ability to manage personal finance (budgeting, savings, investing)	☐	☐	☐	☐	☐

C3. Please assess your proficiency (1 – beginner, 5 - master) and the importance (1 – not important, 5 – extremely important) of skills related to communication and work in a team.

Self-assessment

	1	2	3	4	5
Clarity of expression while communicating with others	☐	☐	☐	☐	☐
Courage and assertiveness in communication	☐	☐	☐	☐	☐
Self-promotion and brand building	☐	☐	☐	☐	☐
Understanding of multi-cultural environment	☐	☐	☐	☐	☐
Ability to keep good relationships in business collaboration	☐	☐	☐	☐	☐
Right prioritization and task management	☐	☐	☐	☐	☐
Ability to work in a team	☐	☐	☐	☐	☐
Negotiation skills	☐	☐	☐	☐	☐

C4. Please assess your proficiency (1 – beginner, 5 - master) and the importance (1 – not important, 5 – extremely important) of skills related to communication and work in a team.

Importance

	1	2	3	4	5
Clarity of expression while communicating with others	☐	☐	☐	☐	☐
Courage and assertiveness in communication	☐	☐	☐	☐	☐
Self-promotion and brand building	☐	☐	☐	☐	☐
Understanding of multi-cultural environment	☐	☐	☐	☐	☐
Ability to keep good relationships in business collaboration	☐	☐	☐	☐	☐
Right prioritization and task management	☐	☐	☐	☐	☐
Ability to work in a team	☐	☐	☐	☐	☐
Negotiation skills	☐	☐	☐	☐	☐

C5. Please assess your proficiency (1 – beginner, 5 - master) and the importance (1 – not important, 5 – extremely important) of skills in digital literacy skills.
Self-assessment

	1	2	3	4	5
Ability to assess the relevance of online information	☐	☐	☐	☐	☐
Ability to use cloud-based project management tools (e.g., Trello, Asana)	☐	☐	☐	☐	☐
Use of a cloud-based storage system (e.g. Dropbox, Google Drive) to share material with other members of my group	☐	☐	☐	☐	☐
Choosing right tools for effective collaboration (e.g. online spaces for co-creation, shared project management tools)	☐	☐	☐	☐	☐
Use of search engines, social media and content platforms	☐	☐	☐	☐	☐
Use of digital labour platforms (choice of the right platform, registration, search and application for job, communication over platform, etc.)	☐	☐	☐	☐	☐
Use of AI tools	☐	☐	☐	☐	☐

C6. Please assess your proficiency (1 – beginner, 5 - master) and the importance (1 – not important, 5 – extremely important) of skills in digital literacy skills.
Importance

	1	2	3	4	5
Ability to assess the relevance of online information	☐	☐	☐	☐	☐
Ability to use cloud-based project management tools (e.g., Trello, Asana)	☐	☐	☐	☐	☐
Use of a cloud-based storage system (e.g. Dropbox, Google Drive) to share material with other members of my group	☐	☐	☐	☐	☐
Choosing right tools for effective collaboration (e.g. online spaces for co-creation, shared project management tools)	☐	☐	☐	☐	☐
Use of search engines, social media and content platforms	☐	☐	☐	☐	☐
Use of digital labour platforms (choice of the right platform, registration, search and application for job, communication over platform, etc.)	☐	☐	☐	☐	☐
Use of AI tools	☐	☐	☐	☐	☐

D1. How do you usually charge for your freelance work?

- [ ] Hourly rate
- [ ] Fixed price per project
- [ ] Other

Other

D2. Typical hourly rate

- [ ] Less 10 €
- [ ] €10–19
- [ ] €20–29
- [ ] €30–39
- [ ] €40–49
- [ ] 50 € or more
- [ ] Prefer not to say

D3. Taking into account one-year period, compared to a salaried job, do you earn

- [ ] More
- [ ] About the same
- [ ] Less

D4. Top 3 challenges you face in the near future

- [ ] Changes in customer expectations and contracts
- [ ] Market changes that could reduce demand or replace us
- [ ] To secure consistent, constant income
- [ ] Increasing project complexity
- [ ] Need to upskill and keep up with trends
- [ ] To keep resilience, discipline, and mindset needed to thrive long-term

Other ☐

Other

E1. **What factors do you think are driving the growth of freelancing? (select up to 3)**

Technological advances ☐

Worker lifestyle preferences ☐

Business flexibility need ☐

Economic shifts ☐

Globalization ☐

Other ☐

Other

E2. **How do you feel about the future of freelancing in your field?**

Very optimistic ☐

Somewhat optimistic ☐

Neutral ☐

Somewhat pessimistic ☐

Very pessimistic ☐

E3. **How often will you use AI in your work as a freelancer in the next 5 years?**

Regularly ☐

Often ☐

Occasionally ☐

Rarely ☐

Never ☐

E4. How often do you invest in upskilling or reskilling?

- [ ] Regularly
- [ ] Often
- [ ] Occasionally
- [ ] Rarely
- [ ] Never

E5. How do you improve or acquire new skills?

- [ ] Online sources
- [ ] Offline courses
- [ ] From universities / formal education
- [ ] Work experience
- [ ] Other

Other

F1. If you would like to be informed about the research results, please provide your email address.

By providing us with your email address, you consent to the processing of your personal data. Information regarding the controller of your personal data is included in the Privacy Policy available here: Privacy Policy – Krakow University of Economics.

Appendix 3: Survey questionnaire for companies

We are pleased to invite you to take part in a survey on freelancing, conducted as part of the ENTEEF project — Fostering Entrepreneurship through Freelancing. This initiative aims to strengthen students' entrepreneurial skills by preparing them for freelance careers, while also promoting lifelong learning and the use of microcredentials. You can find a detailed overview of the project here: https://enteef.uek.krakow.pl

Please note that the survey is completely anonymous. All responses will be published in aggregate form only, ensuring that no individual participant can be identified. The survey should take no more than 15 minutes to complete.

A1. **Has your company ever hired a freelancer (particularly a self-employed person who works remotely part-time or full-time)?**

- [ ] YES
- [ ] NO

B1. **Country of headquarters:**

B2. Choose the main area of your activity (following NACE statical classification)

- [ ] Agriculture, forestry and fishing
- [ ] Mining and quarrying
- [ ] Manufacturing
- [ ] Electricity, gas, steam and air conditioning supply
- [ ] Water supply
- [ ] Construction
- [ ] Wholesale and retail trade
- [ ] Transportation and storage
- [ ] Accommodation and food service activities
- [ ] Publishing, broadcasting, and content production and distribution activities
- [ ] Telecommunication, computer programming, consulting, computing infrastructure and other information service activities infrastruktura i ostale informacione uslužne delatnosti
- [ ] Financial and insurance activities
- [ ] Real estate activities
- [ ] Professional, scientific and technical activities
- [ ] Administrative and support service activities
- [ ] Public administration and defence
- [ ] Education
- [ ] Human health and social work activities
- [ ] Arts, sports and recreation
- [ ] Other service activities
- [ ] Activities of households as employers and undifferentiated goods- and service-producing activities of households for own use
- [ ] Activities of extraterritorial organisations and bodies

B3.

Size of a company

- [ ] Micro (1–9 employees)
- [ ] Small (10–49)
- [ ] Medium (50–249)
- [ ] Large (250+)

B4. Years active in the market:

B5. Market of operations

- [ ] Local (e.g. country)
- [ ] Regional (e.g. Europe, Asia)
- [ ] Global

B6. Form of company ownership

- [ ] Domestic
- [ ] Foreign ownership

B7. Which is your role/department in the company:

- [ ] Executive (CEO, CFO, etc.)
- [ ] Manager
- [ ] Team Lead / Supervisor
- [ ] Specialist / Analyst
- [ ] Administrative / Support Staff
- [ ] Technician / Developer
- [ ] Sales / Marketing
- [ ] Customer Service
- [ ] Other

Other

C1. Has your company hired freelancers in the past 12 months?

- [ ] Yes
- [ ] No

C2. How long has your company been hiring freelancers (in years)?

C3. Type of freelance services hired (select all that apply):

- [ ] Creative and Multimedia
- [ ] Software Development and Information Technology

- [ ] Sales and Marketing
- [ ] Professional Services
- [ ] Writing and Translation
- [ ] Clerical and Data Entry
- [ ] Technical Engineering
- [ ] Teaching and Training
- [ ] Other

Other

D1. Please assess the degree to which freelancers you hire meet your standards (1 – do not meet your standards at all, 5- meet all your standards) and the importance (1 – not important, 5 – extremely important) of skills related to personal profile.
Degree of meeting standards

	1	2	3	4	5
Self-organization and work discipline	☐	☐	☐	☐	☐
Dealing with uncertainty and stress	☐	☐	☐	☐	☐
Ability to engage in and maintain relationships	☐	☐	☐	☐	☐
Ability to learn quickly and expand knowledge	☐	☐	☐	☐	☐
Experience in the work domain	☐	☐	☐	☐	☐
Ability to identify, analyse and solve problems	☐	☐	☐	☐	☐
Knowledge of and compliance with formal regulations (e.g. law, taxes, accounting)	☐	☐	☐	☐	☐
Ability to manage personal finance (budgeting, savings, investing)	☐	☐	☐	☐	☐

D2. Please assess the degree to which freelancers you hire meet your standards (1 – do not meet your standards at all, 5- meet all your standards) and the importance (1 – not important, 5 – extremely important) of skills related to personal profile.
Importance

	1	2	3	4	5
Self-organization and work discipline	☐	☐	☐	☐	☐

	1	2	3	4	5
Dealing with uncertainty and stress	☐	☐	☐	☐	☐
Ability to engage in and maintain relationships	☐	☐	☐	☐	☐
Ability to learn quickly and expand knowledge	☐	☐	☐	☐	☐
Experience in the work domain	☐	☐	☐	☐	☐
Ability to identify, analyse and solve problems	☐	☐	☐	☐	☐
Knowledge of and compliance with formal regulations (e.g. law, taxes, accounting)	☐	☐	☐	☐	☐
Ability to manage personal finance (budgeting, savings, investing)	☐	☐	☐	☐	☐

D3. Please assess the degree to which freelancers you hire meet your standards (1 – do not meet your standards at all, 5- meet all your standards) and the importance (1 – not important, 5 – extremely important) of skills related to communication and work in a team. Degree of meeting standards

	1	2	3	4	5
Clarity of expression while communicating with others	☐	☐	☐	☐	☐
Courage and assertiveness in communication	☐	☐	☐	☐	☐
Self-promotion and brand building	☐	☐	☐	☐	☐
Understanding of multi-cultural environment	☐	☐	☐	☐	☐
Ability to keep good relationships in business collaboration	☐	☐	☐	☐	☐
Right prioritization and task management	☐	☐	☐	☐	☐
Ability to work in a team	☐	☐	☐	☐	☐
Negotiation skills	☐	☐	☐	☐	☐

D4. Please assess the degree to which freelancers you hire meet your standards (1 – do not meet your standards at all, 5- meet all your standards) and the importance (1 – not important, 5 – extremely important) of skills related to communication and work in a team. Importance

	1	2	3	4	5
Clarity of expression while communicating with others	☐	☐	☐	☐	☐
Courage and assertiveness in communication	☐	☐	☐	☐	☐

	1	2	3	4	5
Self-promotion and brand building	☐	☐	☐	☐	☐
Understanding of multi-cultural environment	☐	☐	☐	☐	☐
Ability to keep good relationships in business collaboration	☐	☐	☐	☐	☐
Right prioritization and task management	☐	☐	☐	☐	☐
Ability to work in a team	☐	☐	☐	☐	☐
Negotiation skills	☐	☐	☐	☐	☐

D5. Please assess the degree to which freelancers you hire meet your standards (1 – do not meet your standards at all, 5- meet all your standards) and the importance (1 – not important, 5 – extremely important) of skills in digital literacy skills.
Degree of meeting standards

	1	2	3	4	5
Ability to assess the relevance of online information	☐	☐	☐	☐	☐
Ability to use cloud-based project management tools (e.g., Trello, Asana)	☐	☐	☐	☐	☐
Use of a cloud-based storage system (e.g. Dropbox, Google Drive) to share material with other members of my group	☐	☐	☐	☐	☐
Choosing right tools for effective collaboration (e.g. online spaces for co-creation, shared project management tools)	☐	☐	☐	☐	☐
Use of search engines, social media and content platforms	☐	☐	☐	☐	☐
Use of digital labour platforms (choice of the right platform, registration, search and application for job, communication over platform, etc.)	☐	☐	☐	☐	☐
Use of AI tools	☐	☐	☐	☐	☐

D6. Please assess the degree to which freelancers you hire meet your standards (1 – do not meet your standards at all, 5- meet all your standards) and the importance (1 – not important, 5 – extremely important) of skills in digital literacy skills.
Importance

	1	2	3	4	5
Ability to assess the relevance of online information	☐	☐	☐	☐	☐
Ability to use cloud-based project management tools (e.g., Trello, Asana)	☐	☐	☐	☐	☐
Use of a cloud-based storage system (e.g. Dropbox, Google Drive) to share material with other members of my group	☐	☐	☐	☐	☐

	1	2	3	4	5
Choosing right tools for effective collaboration (e.g. online spaces for co-creation, shared project management tools)	☐	☐	☐	☐	☐
Use of search engines, social media and content platforms	☐	☐	☐	☐	☐
Use of digital labour platforms (choice of the right platform, registration, search and application for job, communication over platform, etc.)	☐	☐	☐	☐	☐
Use of AI tools	☐	☐	☐	☐	☐

E1. Why does your company choose to hire freelancers? (Select up to 3):

- ☐ Cost-effectiveness
- ☐ Faster delivery
- ☐ Access to skills not in-house
- ☐ Flexibility
- ☐ Legal/employment structure
- ☐ Other

Other

E2. What are the risks of relying on freelancers?

- ☐ Integration & communication challenges (with team, clients)
- ☐ Risk of project delays / unreliability
- ☐ Lack of control and transparency
- ☐ Unavailability
- ☐ Inconsistent work quality and rework needs
- ☐ Data breaches and leaks
- ☐ Intellectual property breaches
- ☐ Tax and labour law violations
- ☐ Payment disputes

Other ☐

Other

E3. **Top 3 challenges you face in the near future**

Changes in freelancers' expectations ☐

Market / social changes that could reduce availability of freelancers ☐

Increased costs of freelancers' engagement ☐

Increasing project complexity ☐

Availability of freelancers with required competences ☐

New generation attitude to work-life balance ☐

Other ☐

Other

E4. **How will the use of AI influence hiring freelancers in your company?**

Hiring more freelancers ☐

No effect ☐

Hiring less freelancers ☐

E5. **How is the use of AI technology influencing the freelancing market?**

F1. **If you would like to be informed about the research results, please provide your email address**