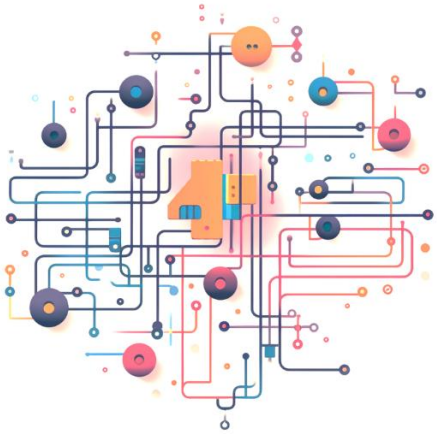
Co-funded by the European Union

Erasmus+ Programme
KA210-VET
Small-scale partnerships in vocational education and training



INTELLEGIZE

Project: "*Artificial Intelligence and Gamification in Vocational Training Guidance*"

Project Number: 2022-2-IT01-KA210-VET-000097851

CUP: G11B22002340006

"Activity 3 - Mapping of Guidance Process" Report

Authors:
Progressus Research & Counselling
Studio Risorse S.r.l.
iInformatica S.r.l.

September 2023

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

Table of contents

Introduction

Digital transformation is important today more than ever. In this context, all sectors are being influenced by technology and career guidance and counselling as well. So, the only way to get benefitted by the technological evolution is to introduce the use of digital technologies in our work and activities. And this is the reason that the ***Artificial Intelligence and Gamification in Vocational Training Guidance Project*** was designed: to innovate the operational tools of Guidance within the VET System and in particular in the partner organisations through the development of an expert system (web oriented App) that, takes advantage of artificial intelligence, enables operators to correctly and effectively assess the personal potential and skills of the users, improving the quality standards and the related Essential Performance Levels: user profiling check, evaluating potential and competences (soft and hard skills), skills needs analysis, definition of reintegration and/or upskilling and/or reskilling pathway.

Adapting the guidance practices to the digital changes and innovations of current society will modernize the VET practitioners' work and bring them closer to the needs of their target groups, so that it they can be effective and in line with current and future needs of the economy and society.
Additionally, our aims at strengthening the digital skills of VET practitioners, that will contribute to their personal and professional growth.

In order to adapt the career guidance practices to the digital changes, the partnership followed a three phases process to conclude to the final path/flow-chart of the guidance activities, that incorporates digital tools and methodologies.
The three phases refer to:

1. Description of the path/flow-chart and representation of each phase of the guidance process as actually carried out within the partner organizations. Starting from the current procedures existing within the partner organizations in the provision of the guidance process as well as from the procedures, tools and service standards made available by the National Plans for Guidance and Social Inclusion (GOL Program in Italy and National Plan "Support for employment and social inclusion" in Greece), the output of this stage is the description of the path/flow-chart, analyzed within the partners, with evidence of the flows of the work process, in terms of inputs, activities

Co-funded by the European Union

and outputs, human and material resources, produced documents and handled archives (See Unit 1).

2. SWOT analysis of the flow-chart of Guidance process. The aim of this phase was to highlight the strengths, weaknesses, opportunities and needs of the mapped process and define the possible areas for improvement and revision thanks to the introduction of digital methodologies and tools, in line with the procedures and tools established by the Institutions of Active Labor policies (See Unit 2).
3. Elaboration of the ideal and final path/flow-chart. The final flow-chart is a revision of the one shared by the partner organizations based though on the results of the SWOT analysis carried out and the inputs coming from outside (National Guidance Plans, Labor market, Organizations, Person/ User). The result of this phase represents the starting point for the identification of the digital methodologies, procedures, tools that will be incorporated in the process, to make it more effective and that will make the VET professionals work easier and in line with the epoch's demands. (See Unit 3).

Unit 1: Common Flowchart

In the first phase of the mapping process, the partners from Greece and Italy depicted the process of career guidance that they follow in their organisations, in terms of goals, content, tools, methodologies and outcomes. Taking into consideration the provided descriptions of the career guidance procedures in Greece and Italy, it came out that in both contexts there are 5 stages taking place in the process. After a thorough combination of the two national flow-charts, we concluded in a common flow-chart of the career guidance process consisted of 4 stages, analysed in terms of contents-activities, methodologies, tools and materials and outputs.

Stage 1: Reception and user data collection

Content

- Stage 1 aims at creating a warm climate, rapport and relationship building between the counselor and the client. The client is informed about the process and the objectives of the counseling process. This stage includes the development of an initial interview, the compilation of a complete professional and educational background of the client, and the signing of documents -"contract" between counsellor and client.

Methodologies

- Interviewing techniques
- Active listening – presentation skills
- Filling of predefined forms
- Use of communication media, computer etc.
- Drafting and processing of documents and completed forms.
- Signing and archiving of official documents

Tools and materials

- Means of communication (phones, e.mail, web platform, etc. in case of online session)
- Forms and activity reports: History, Personal Dossier, etc.

Output

- Registration – completed forms.
- Client's professional and educational record

Stage 2: Competence and Interests mapping

Content

Stage 2 refers to the personal competence mapping, aiming to define the profile of the "client", that will enable him/her to make appropriate career or educational choices. Through specific methodologies, the professional profile is depicted in terms of soft and hard skills, interests, values, and training or professional experiences. According to the results, a matching with professional pathways is provided and possible skill gaps and/or need for upskilling is defined.

Methodologies

- Competence Mapping
- Skills gap analysis
- Matching of profile to jobs or educational pathways

Tools and materials

- Competence Mapping Form
- Competence Profile (digital) Form

Outputs

- Guidance Report including users' competence profile and suggested educational or career pathways.

Stage 3: Professional and personal development plan

Content

The objective of stage 3 is mainly the personal and career development of the client through the creation of an individualized action plan. The process helps to identify any barriers or factors that may influence his/her decision, while further career or education information is gathered before taking the final decision.

Within this stage the client is called to make educational and professional decisions. The ultimate goal is the development of a personal action plan, including all the steps the person needs to take to reach his/her goals. The career counselor may also offer practical help to the individual, such as creating a resume, learning job search techniques, or assistance in making a letter for the university etc.

Methodologies

- Interview techniques
- Personal coaching, Counselling
- Provision of career and/or education information
- Role playing
- Technical support on job search

Tools and materials

- Job descriptions
- Databases with studies - training catalogues
- Databases of labour supply and demand

Output:

- Individualized career action plan

Stage 4: Monitoring and Evaluation

Content

Stage 4 aims to assess the results achieved by the client after an implementation period of about 6 months of their professional action plan. Also, an important part of this stage is to verify the user's degree of satisfaction with the assistance services received.

Development methodologies

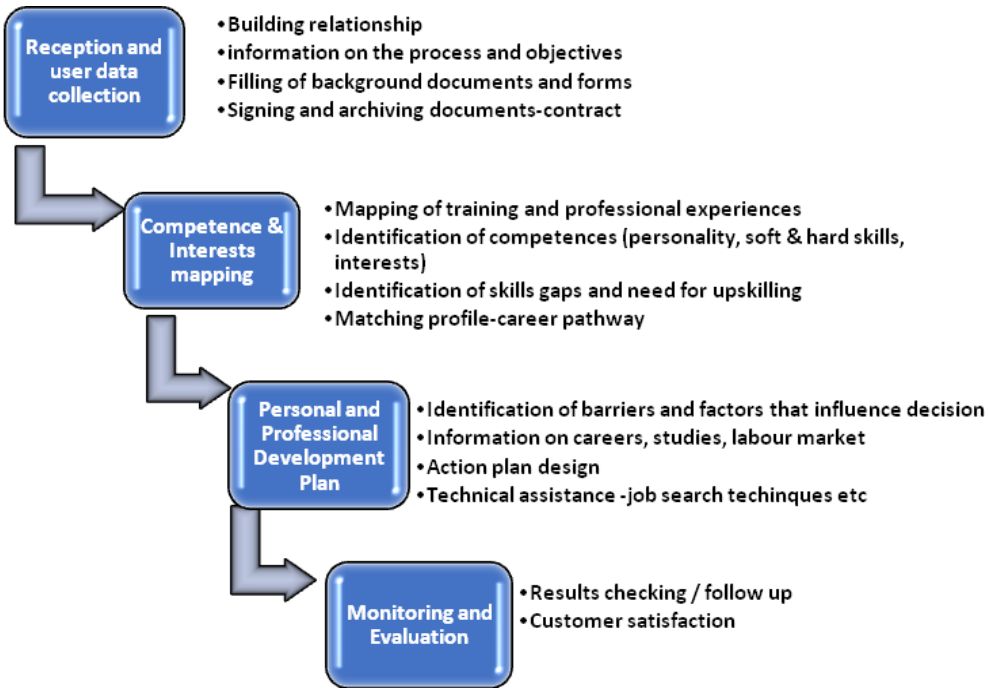
- Feedback collection
- Collection of evidence and informative data

- Analysis of data

Tools and materials

- Evaluation forms
- Monitoring forms

Graphic representation of the guidance pathway/**Flow-chart**



Unit 2: SWOT Analysis of the Flow-chart of the Guidance process

Taking into consideration the activities, methodologies and tools that are used in the Career Guidance process that AI & Gamification in Guidance project partners follow in their daily practice, we proceed in a SWOT analysis aiming to highlight the needs of the mapped process and evaluating the possible areas for improvement and revision getting benefited by the introduction of digital methodologies and tools, in line with the procedures and tools established by the active labour policy institutions.

Table 1: STRENGTHS of the Career Guidance process

STAGES	STRENGTHS	Comments	UPGRADE POTENTIAL WITH AI
Stage 1: Users' data reception and collection.	Adequate client data gathering. Adequate spaces/environments and tools/equipment for client reception and data gathering.	Done mostly through interviewing, filling in predefined forms and development of the client's professional and educational record.	Improvement in information checking using Web scraping OSINT integration (*text mining*)
Stage 2: Competence and Interests mapping.	Strong profiling methodologies Professionals experts in profiling methodologies	Refers to the profiling of soft skills/ personality traits and hard skills, interests, values etc. Profiling aims to discover whether a person can fit into a specific professional environment and act according to societal rules and values.	Profiling using survey related to a semantic and logic knowledge base (*semantic AI*) Definition of clusters related to profiles and automatic association of the profile to one or more clusters (*data mining*)
Stage 3:	Information material	Refers to Job	Extraction of

Co-funded by the European Union

Professional and personal development plan	/ internet LMI resources / internet resources on public incentives and grants for business start-up and/or company recruitment and/or training	descriptions, information on learning and professional opportunities, labour supply and demand and occupational trends, public incentives, and grants at regional, national and EU level for business start-up, for training and company recruitment.	trends and information using Web scraping OSINT approach (*text mining*)
Stage 4: Monitoring and Evaluation	Methodologies for individual action planning and follow up counseling	Refers to a model of a personal action plan, including all the steps the person needs to take to reach his/her goals as well as follow up activities to assess the progress and achievements.	Development of a graph models of steps about goal/activities (*graph theory*)

Table 2: Weaknesses of the Career Guidance process

STAGES	WEAKNESSES	Comments	UPGRADE POTENTIAL WITH AI
Stage 1: Users' data reception and collection	Mostly paperwork / record files / everyday archiving processes	Need for systematic maintenance of a physical archive.	Blockchain approach for data storage also using web3 potentiality
Stage 2: Competence and Interests mapping	Lack of standardized psychometric assessment tools, that assess the client at a behavioral level, to understand attitudes and	Standardized psychometric assessments constitute a scientific method widely used to *objectively* measure individuals' mental abilities, skills, intelligence, personality traits, motivations, interests, and behavioural style. Standardized assessments are	Relational nexus extraction using discovery algorithms (data mining) Analysis of nonverbal components on

Co-funded by the European Union

	inclinations, digital skills, propensities and attention to ethical and environmental sustainability issues Use of tools that do not adapt to the dynamics that characterize the client, the labor market, and local actors/stakeholders	designed, administered, and scored in a standard, or consistent, manner. A standardized test requires all test takers to answer the same questions, or a selection of questions from a common bank of questions, in the same way, and is scored in a "standard" or consistent manner, which makes it possible to compare the relative performance of individuals. Questionnaires and subscales consist of verbal and non-verbal situations e.g., simulation scenarios, images, schemes etc., for each of which the user will be called upon to make decisions in order to capture the way he or she handles the different issues or situations. Paper-based methods are widely used, where the person completes written questionnaires, or writes narrative accounts of his/her progress or several skills. Although this is appropriate for some target groups, there are circumstances in which the use of other assessment formats may be more suitable. Persons with numeracy, literacy or learning difficulties may experience problems in undertaking written assessments. Understanding aptitudes and inclinations, and specifically	multimedia streams (computer vision) Extraction of new approaches using generative engines (Generative Pre-trained Transformer)

		surveying digital skills and checking propensity and attention to ethical and environmental sustainability issues, is crucial in an increasingly digital-oriented and eco-sustainable labour market.	
Stage 3: Professional and personal development plan	Difficulties in finding and interpreting updated career information / LMI Difficulty in managing direct communication networks with companies and economic operators, schools, universities, employment agencies, third sector bodies.	Contemporary labour market information and intelligence (LMI), advanced LMI systems and data interpretation & visualisation (jobs, skills, and qualifications dynamics) is crucial. The creation and management of networks with companies, schools, universities, employment agencies, etc... is essential for acquiring information on the labor market and facilitating the matching between job supply and demand.	Extraction of actual trends and information using Web scraping OSINT approach (*text mining*)
Stage 4: Monitoring and Evaluation	Mostly paperwork / record files / every day follow up processes.	It is important to move away from simply gathering information about an individual jobseeker's employment record, work experience, and formal qualifications to additionally capturing and describing a jobseeker's full potential in terms of "generic" and "soft" skills (Savickas et al., 2009). A more holistic approach is required for the development of tools and methodologies that include skills profiling, assessment and appraisal,	Definition of clusters related to profiles and automatic association of the profile to one or more clusters (*data mining*) Development of a weighted graph models of curriculum (*graph theory*)

		that allows for the construction of standardized lists of skills and competences that should be linked, to some extent, to existing occupational classifications (Blázquez, 2014).	

Table 3: OPPORTUNITIES of the Career Guidance process

STAGES	OPPORTUNITIES	Comments	UPGRADE POTENTIAL WITH AI
Stage 1: Users' data reception and collection	Digitalized archive & data collection processes Digital & multi-channel delivery	The innovative approach using artificial intelligence is very important to capture all the necessary information about the user, to define his/her master data. Expert systems can also be used in the absence of the *physical* career advisor. The career advisor will have to intervene to conduct analyses in specific cases in which the chatbot detects unsuitable interactions, such as bad language, inadequate use of vocabulary, violent language, but also in cases in which the analysis of the user's writing detects specific learning disorders such as dyslexia or dysgraphia. This approach is therefore supervised only when made necessary by the users' behaviour, or for certain phases of the analysis to detect learning disorders.	Expert systems and humanoid chatbot based on ontologies
Stage 2: Competence and Interests mapping	Automated process of skills gaps analysis and profiling/ development of	ICT-enabled solutions in career guidance processes to enable blended service delivery, including digital communication	Extraction of actual trends and information about education and job

	psychometric testing Digital guide and manuals for practitioners involved in the analysis and profiling process, to provide support in the use of ICT-enabled tool	and cooperation, networking, and outreach approaches to target audiences. The tools may include tools mainly facilitating self-career management, information provision, decision-making and distance counseling, profile-career pathway matching tools (see table 5). Apps that use the GPS capabilities of mobile smartphones and tablets to provide local employment and training information. Real-time information analysis for education and job market from online platforms (web scraping) extracted from reliable OSINT (Open-Source Intelligences) sources via crawler to keep up to date with market trends and new job opportunities (REAL TIME MARKET ANALYSIS). Digital gamification scenarios to understand users' attitudes and inclinations, digital skills, proclivities and attention to ethical and environmental sustainability issues using an anti-avoidance method, allowing for objective feedback through the performance of exercises, interaction through open-ended questions (allowing for the assessment of certain user characteristics through text mining and opinion mining), allowing for effective profiling in terms of character and propensity for certain activities.	market using Web scraping OSINT approach (*text mining*) Extraction of rules and definition of models to classify profiles (*data mining*

Stage 3: Professional and personal development plan	Digitalised action planning / gamification Advanced career information systems Use of ICT-enabled solutions for the creation and management of networks with companies and economic operators, schools, etc..	Virtual Career Chat Point or Metaverse Point where appropriately referred users can meet via chat and exchange targeted information of a work-related nature under the supervision of career advisors. Workplace simulations - experiential career education experiences, creating a "day in the life of..." through 360-degree interactive virtual tours within specific business scenarios to train and assess users and provide additional feedback on aptitude for specific jobs. Interactive boards as a toolbox with QRcodes and ARTags for augmented reality learning. Career Robot - Suggestions for education/job options based on machine learning techniques and digital footprint data: depending on the interactions made with the chatbot, it is possible to define a real report of the user's skills with associated ratings and suggest possible placements	Expert systems and humanoid chatbot based on ontologies also in metaverse/VR environments Definition of complex models to classify profiles (*data mining and machine learning*)
Stage 4: Monitoring and Evaluation	Advanced monitoring and evaluation processes.	ICT/ Automated tools (e.g., apps) to enable individualized career action plan development, as well as monitoring and evaluation processes involving data and feedback analysis and reporting, user's satisfaction assessment Tools for the development of digital career management	Definition of visual models to classify processes (*process mining*) Expert systems and based on ontologies Suggestions and

		skills, such as digital job search, social media use, building and maintaining professional digital identity, multitasking, remote working, crowd working, and job sharing, digital e-portfolio. Platform for monitoring the user's skills and related career paths over time, thereby assessing their risk of burnout: the nature of the work performed can affect the worker and lead to burnout, especially if the worker performs activities with a high level of responsibility, but also if the work is not monotonous, repetitive or with little opportunity for development. Some of the most obvious alarm bells that can be intercepted to detect burnout are workplace behaviours such as avoiding responsibility, loss of motivation and procrastinating. The platform also monitors the user's career path and correlates it with the user's skills, providing accurate information on the relevance between his/her skills and career path and improving the user's attractiveness in the world of work.	evaluation of profiles considering actual trends and information about job market, contexts and brand reputations using Web scraping OSINT approach (*text mining*)

Table 4: THREATS of the Career Guidance process

STAGES	THREATS	Comments	UPGRADE POTENTIAL WITH AI
Stage 1: Reception and user data collection	Accessibility limitations to face to face services. Digital inequalities / digital divide. Lack of digital skills of guidance practitioners	The digital transition of career guidance services may increase the accessibility for all end-users, and, with the reality of the digital divide, the necessary special focus on disadvantaged groups. Need for adequate digital infrastructure, equipment, internet coverage. Need for support/training manuals and guides for the use of digital tools by guidance practitioners. Need to define new procedures for semantic knowledge bases to be tracked, weighted, and evaluated by a self-learning artificial intelligence system. The results of such feedback will be subject to supervised tuning by advisors.	Approach based on semantic and logic knowledge base (*semantic AI*)
Stage 2: Competence and Interests mapping			
Stage 3: Professional and personal development plan			
Stage 4: Monitoring and Evaluation	Follow up difficulties-difficulties to keep track of the beneficiaries' career development		

Unit 3: Final Flow-Chart

After going through the first two phases of the mapping process, the partnership concluded to the final Flow-chart of the Guidance Process that is improved by the incorporation of digital tools and methods.

Stage 1: Reception and user data collection

Content:

- Stage 1 aims at creating a warm climate, rapport and relationship building between the counselor and the client. The client is informed about the process and the objectives of the counseling process. This stage includes the development of an initial interview, the compilation of a complete professional and educational background of the client, and the signing of documents -"contract" between counsellor and client.

Methodologies

- Interviewing techniques
- Active listening – presentation skills
- Filling of predefined forms
- Use of communication media, computer etc.
- Drafting and processing of documents and completed forms.
- Signing and archiving of official documents

Tools and materials

- Means of communication (phones, e.mail, web platform, etc. in case of online session)
- Forms and activity reports: History, Personal Dossier, etc.

Output:

- Registration – completed forms.
- Client's professional and educational record

Artificial Intelligence Tools (and relative potentialities)

- **Blockchain permissioned** (approach for improving data storage preserving data CIA properties) – *output*
- Web3 IPFS (a revolutionary approach for the ethernal web to preserving data integrity and availably)
- Web Scraping OSINT (approach for the information checking using text mining applied to data provided by search engine)

- **Knowledge base** (it is the core for the logics for the smart module, it represents the mapping of the know-how of counselor in the form of rules and relations) – *output*
- **Humanoid chatbot based on ontologies (**to obtain additional information useful for the counselor to evaluate profile, potentiality and skills) – *output*
- Analysis of nonverbal components on multimedia streams (computer vision behavior analysis)

Stage 2: Competence and Interests mapping

Contents

Stage 2 refers to the personal competence mapping, aiming to define the profile of the "client", that will enable him/her to make appropriate career or educational choices. Through specific methodologies, the professional profile is depicted in terms of soft and hard skills, interests, values, and training or professional experiences. According to the results, a matching with professional pathways is provided and possible skill gaps and/or need for upskilling is defined.

Methodologies

- Competence Mapping
- Skills gap analysis
- Matching of profile to jobs or educational pathways

Tools and materials

- Competence Mapping Form
- Competence Profile (digital) Form

Outputs

- Guidance Report including users' competence profile and suggested educational or career pathways.

Artificial Intelligence Tools (and relative improvements)

- **Blockchain permissioned (approach for the certification of the mapping stage) – *output***
- **Knowledge base** (it is the core for the logics for the data analysis, it represents the mapping of the know-how of counselor in the form of rules and relations) – *output*
- Data mining module (It is a good solution in a big data scenario to associate the profile to one or more classes of a mathematical module defined)
- **Humanoid chatbot** based on ontologies (It is an important solution to obtain additional information useful for the counselor to evaluate profile, potentiality and skills) – *output*
- **Game interaction scenario** based on ontologies (It is an important solution to obtain additional information using an interactive approach in a virtual scenario useful for the counselor to evaluate profile, potentiality and skills) – *output*

Stage 3: Professional and personal development plan

Contents

The objective of stage 3 is mainly the personal and career development of the client through the creation of an individualized action plan. The process helps to identify any barriers or factors that may influence his/her decision, while further career or education information is gathered before taking the final decision. Within this stage the client is called to make educational and professional decisions. The ultimate goal is the development of a personal action plan, including all the steps the person needs to take to reach his/her goals. The career counselor may also offer practical help to the individual, such as creating a resume, learning job search techniques, or assistance in making a letter for the university etc.

Methodologies

- Interview techniques
- Personal coaching, Counselling
- Provision of career and/or education information
- Role playing
- Technical support on job search

Tools and materials

- Job descriptions
- Databases with studies- training catalogues
- Databases of labour supply and demand

Output:

- Individualized career action plan

Artificial Intelligence Tools (and relative improvements)

- **Blockchain permissioned (**approach for the certification of the action plan) – *output*
- Web Scraping OSINT (approach to obtain information about trends as benchmark using text mining applied to data provided by search engine)
- Stochastic Modelling (approach for the definition of probabilistic action plan)
- Semantic Graph Theory (a visual way to describe a weighted graph as personal action plan)

Stage 4: Monitoring and Evaluation

Content

Stage 4 aims to assess the results achieved by the client after an implementation period of about 6 months of their professional action plan. Also, an important

part of this stage is to verify the user's degree of satisfaction with the assistance services received.

Development methodologies

- Feedback collection
- Collection of evidence and informative data
- Analysis of data

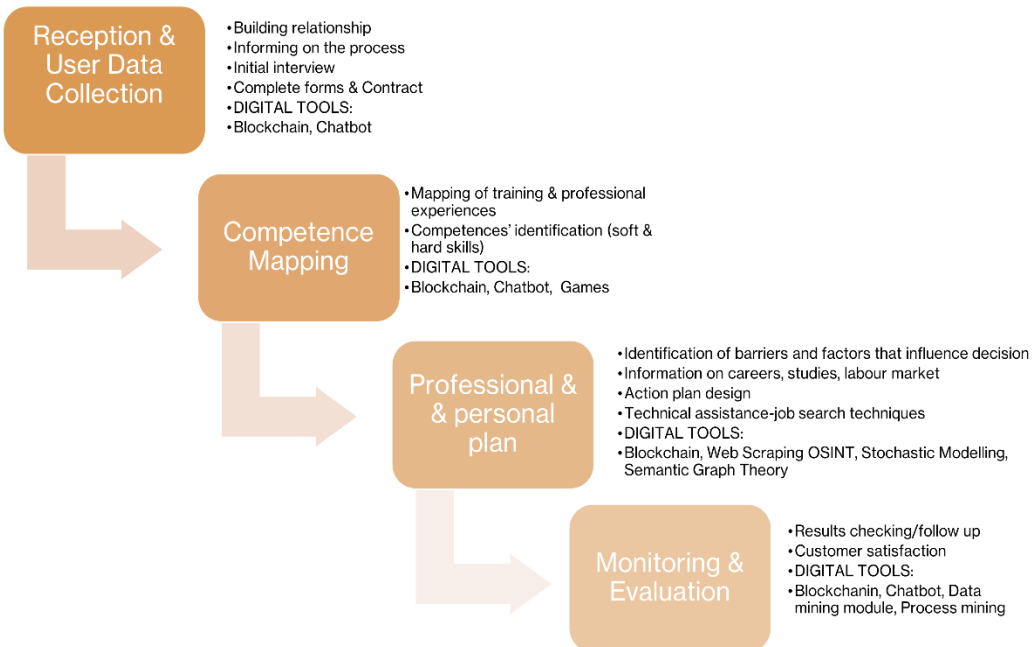
Tools and materials

- Evaluation forms
- Monitoring forms

Artificial Intelligence Tools (and relative improvements)

- **Blockchain permissioned (approach for the certification of the results) – *output***
- Knowledge base
- Humanoid **chatbot** based on sentiment analysis (a solution to detect, using opinion mining, the degree of satisfaction of the client)
- Data mining module (It is a good solution in a big data scenario to associate the results of the action plan to one or more classes of a mathematical module defined)
- Process Mining (for the extraction of evidence from the data collection on feedback/evaluation of the process)

Graphic representation of the guidance pathway/Flow-chart

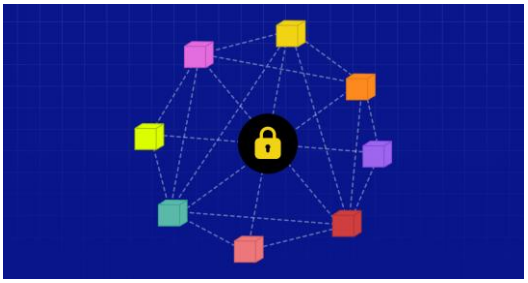


Conclusions on the New Digital Tools to be implemented in the Career Guidance Process- Deliverables of artificial intelligence

Taking into consideration the suggested modules of artificial intelligence for each stage, considering the results of SWOT ANALYSIS, next steps of project will be characterized by the development of the following modules:

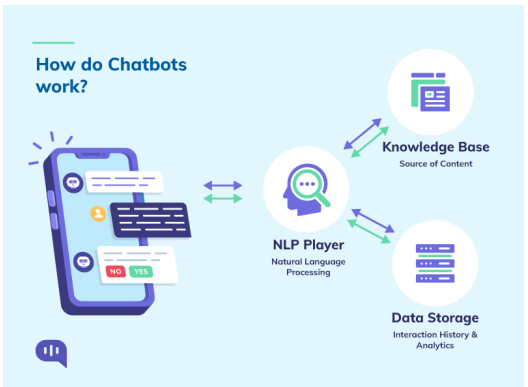
- **Blockchain permissioned**:

  It will be applied for improving data storage preserving data CIA properties of each stage



- **Knowledge base**: It will be implemented mapping the know-how of counselor in the form of rules and relations

- **Humanoid chatbot based on ontologies**: it will be implemented as supporting module to obtain additional information useful for the counselor to evaluate profile, potentiality, and skills



- **Game interaction scenario based on ontologies**: this solution will be implemented to obtain additional information useful to evaluate profile, potentiality and skills