

Combining ICT Technologies To Serve Societal Challenges

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ARTICLE INFO

Article history:

Received: 27 November, 2020

Accepted: 09 February, 2021

Online: 28 February, 2021

Keywords:

Artificial Intelligence

Data Analytics

Conversational Interfaces

ABSTRACT

European countries continue to receive an increasing number of migrants and refugees from an also increasing number of both European and non-European countries. This results in a huge societal challenge which is societal inclusion of people speaking different languages and of diverse backgrounds. Key for their inclusion is job finding which comes with hurdles like the language, the difficulty in assessing and certifying their skills and many more. In this paper, we present the architecture of a novel platform that aspires to provide migrants with a) assistance in discovering and assessing their hard and soft skills by employing Artificial Intelligence technologies, b) recommendations of appropriate job sectors and positions based on their profile, c) recommendations about training that would allow them to find jobs in the country/region they are located and d) practical information regarding the integration process. Furthermore, the proposed platform aims at assisting host authorities, non-governmental organizations and companies in detecting the needs of the target populations (migrants and refugees) through data analytics and supports them in reaching them. Apart from the technical architecture, we provide the results from the initial testing of the platform in real-life pilots in two countries.

1. Introduction

The current trend of migration for economic reasons combined with large flows of refugees (“people fleeing their countries due to armed conflicts or persecution”) challenges our societies. A key to societal inclusion of migrants and societal coherence is their integration in the labour market. Nevertheless, the elaborate human resource recruitment processes established in our economies make it difficult and complicated not only for the migrants but also for host organisations, according to the claims gathered through interviews with field experts. The main barriers (also discussed in [1]) are multiple: a) lack of professional qualifications and certified skills and competences; b) language skills are impeding fluent communication and this is even more intense for refugees; c) the scale of the phenomenon which is large and increasing: over a million refugees in Europe since 2015, 70% of them with ages between 18 and 64, i.e. in working age and low-skilled people percentages greater than the average of the hosting countries’ [2]. Refugees and migrants are a heterogeneous group

as far as education and other issues are concerned and thus, special vulnerabilities have also an impact on individuals’ labour market integration chances.

In the host societies, there are organisations (public, private or Non-Governmental Organisations) that try to assist migrants and refugees in finding their way to the labour market. However, two factors limit the positive impact of these efforts to a certain extent: a) the multiplicity of entities operate usually with no coordination among them and b) the fact that the potential employers have to follow stricter regulations when hiring migrants and also have to afford the cost for screening their skills and profiles at the absence of any certificate and/or proof. At the same time, tailored training is considered of paramount importance to increase the probability of employment of refugees and migrants according to the Committee for Labour Migration [3]. Soft skills are also important and should not be overlooked. The new recommendation on Key Competences for Lifelong Learning [4] has enhanced the importance of key competences and soft skills, which are considered as equally important to hard skills when looking for a job. The evaluation of the soft skills is also difficult to be

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performed imposing further barriers in the integration of migrants in the labour market.

The exploitation of Information and Communication Technologies (ICT) is considered an appropriate mean to communicate with the migrants and refugees as they usually have access to the internet usually through mobile devices. ICT technologies could also contribute to personalization of the information presented to the users. However, up to now, ICT has been used mainly for information provisioning which is valuable but yet not enough. As a result, the integration of migrants and refugees is still a challenge for all involved actors i.e. migrants, refugees, host authorities, NGOs, private and public organisations and society alike.

In this article, we present a novel digital platform that aspires to support not only migrants and refugees but also the host authorities and organisations towards the integration of the first group in the labour market. The proposed platform employs state-of-the-art technologies like artificial intelligence and data analytics to lower the cost of skills evaluation, facilitate the operation of organisations and significantly shorten the path of migrants to the labour market. In its design, we have combined Artificial Intelligence, data analytics, native mobile applications and web technologies with social science expertise and skill assessment techniques to offer a novel holistic platform to the migrants. The proposed platform is not a “bundling” of functionalities like the ones offered by multiple other platforms; instead, it offers novel functionalities like the skill assessment functionality based on machine learning algorithms trained on data from migrants’ populations. The proposed platform has been prototyped and used by migrants/refugees in real life.

The rest of this article is organized as follows: in section 2, we present existing digital platforms tackling the migrants’ integration challenge and discuss their strengths and weaknesses. In section 3 we describe the proposed platform, and its technical architecture is presented in section 4. Section 5 presents the results from the

evaluation in real life and section 6 concludes the article. A preliminary version of the presented approach was initially published in [1] without technical details and any evaluation results.

2. Existing Platforms

Up to now, few tens of platforms primarily targeting the needs of the migrants/refugees have been deployed exploiting the fact that the majority of them has access to the internet through their mobile phones. The following table is based on the table that appears in [1] and reflects the current situation. The fact that such platforms proliferate, show that they cover actual needs and thus the involved actors try to satisfy them. The table includes the information considered necessary for their comparison.

Examining the table, it is evident that there is no platform adopting a holistic approach. Most of these platforms present to the user information but the supported functionalities of search and the limited languages reduce their actual value. Just one of these platforms supports skill assessment and this targets a limited set of job sectors. This is mainly due to the language barrier which is difficult to overcome with any textual-based assessment. As explained in [5], there are methodologies to assess skills and competencies, but they are mainly twined with the education processes which is not a representative case for the migrants arriving in a new country. The use of neural networks has been proposed in [6] in the context of assessing skill of surgical doctors. With respect to digital tools, they usually evaluate performance in a normative way after the user has completed an exercise. In many cases, this is not possible without the subjective scoring of an external evaluator.

To sum up, guidance through the path from arrival to labour market integration is provided in a rather segmented way by existing platforms. Having a unique platform offering all these services through a single point and having a digital companion guiding the user through it would be of high value.

Table 1: Online platforms for migrants

Platform	Organisation	Target	Type of platform	Services	Language
https://mygrants.it/	Mygrants - social enterprise - Bologna	Migrants	online training; information platform	Information on asylum and rights, social challenges, entrepreneurship; formal training opportunities; non-formal training	English French Italian
https://www.arbeitsagentur.de/fuer-menschen-aus-dem-ausland	German Ministry of Work	Migrants	information platform; online training (language); recognition of qualifications; job vacancies; e-services for inclusion	Information and support on financial, social insurance, German education, starting a business, finding a job in Germany.	German English Arabic
https://jobskills.arbetsformedlingen.se/	Swedish Public Employment Service	Migrants	job matching service	Creation of a profile, career guidance services; job matching services	English Swedish Arabic Farsi Somali Amharic

Platform	Organisation	Target	Type of platform	Services	Language
http://myskills.de/	Berufliche Kompetenzen Erkennen	Migrants	assessment platform	Online recognition of skills for people with no vocational qualification (8 professional profiles assessed)	German English Turkish Arabic Russian Persian
https://ec.europa.eu/migrantskills/#/ ; https://ec.europa.eu/social/main.jsp?catId=1412&langId=en	European Commission	Third country nationals	self-assessment platform	Online self-assessment tool to create a profile of skills	EU languages Arabic Farsi Pashto Sorani Somali Tigrinya Turkish
https://www.make-it-in-germany.com/en/living-in-germany/integration/advisory-service/	German Government	International qualified professionals; prospective international students; employers; Institutions	information platform	Informational content on jobs, study and training, Visa and living in Germany for those who want to move to Germany	English German Spanish French
https://www.universitaperrifugiat.it/en/default.aspx	Uninettuno telematic University - Rome	Migrants and refugees	training platform; recognition of qualifications	Recognition of study titles previously earned in their countries of origin to access the University; recognition of vocational skills	English French Italian Arabic
http://www.mocs4inclusion.org/index.php	Project funded by European Commission	Institutions with focus on migrants and refugees	training platform	Catalogue of free digital learning initiatives for migrants	English
https://www.refugee.info/	Signpost project Mercy Corps and International Rescue Committee	Migrants	information platform	Informational content for migrants, geo-mapping of services, FAQ, contact with NGOs	Italian Persian Urdu Arabic English French
https://www.infomigrants.net/en/	ANSA, Deutsche Welle, French media companies	Migrants	information platform	Information content and news for migrants	French Arabic Persian Pashto English
https://migrationdataportal.org/?i=stock_abs_&t=2017	IOM	Citizens; organisations	information and data	Data about migration	English
https://openmigration.org/en/	Italian Coalition for Civil Liberties (CILD)	Citizens; organisation	information and data	Data about migration	Italian English
http://migration.iom.int/europe?type=arrivals	IOM Migration	Citizens; organisation	information and data	Data about migration	English
https://iamamigrant.org/	IOM	Migrants and citizens	information platform	Information content and news for migrants	Arabic French Farsi Pashto

Platform	Organisation	Target	Type of platform	Services	Language
					English
https://euraxess.ec.europa.eu/jobs/science4refugees	European Commission	Refugees researchers and research groups with vacancies	matching platform for science vacancies	Information and support services on working and living in Europe; research refugee friendly internships, part-time and full-time jobs, access to an European Research Community	English
https://www.migrantsorganise.org/	a consortium of partners	Migrants and activists	online community		English

3. The Proposed Solution

We have designed a novel platform which has multiple target groups: a) refugees which are seeking for asylum, b) migrants who are seeking a better life, c) vulnerable migrants (e.g. suffering diseases), d) host authorities which are trying to improve their offerings and facilitate the integration of migrants and refugees, e) non-governmental organisations and f) organisations that consider migrants as receivers or target groups of their services.

For the users falling under the first three aforementioned categories, we aspire to assist them in preparing effective job applications and in finding appropriate positions to apply. For local people, finding a job consists primarily of three steps: as shown in Figure 1 below: 1) inspect available job positions which is usually done through a web-based job position portal or a professional social network or (more rarely) through a Human Recruitment agent; 2) filter the jobs and select those of interest to apply. Language is not a barrier for locals and the creation of a CV or an application is usually not an issue. 3) go through (one or more) interviews or follow the recruitment process of the specific organization where again, in principle, communication and specific aid is not required, although ways to maximise the potential of getting the job exist and are gaining momentum, as shown in Figure 1. For migrants and refugees, each of these steps represents a challenge: accessing the job announcement, understanding them (due to language barrier) and selecting some of them are of great difficulty. Often the CV format is not familiar to them, and usually their qualifications are not certified since they are gained via informal and nonformal experiences.

Figure 1 shows the process of labour integration without the proposed platform on the left (marked as a) and with the functionalities offered by the proposed platform on the right. As shown in the right (figure 1b), the 1st step is completely changed and automated by the proposed platform:

1. to prompt the selection of job position and relieve the migrants from searching in relevant portals which they may not be aware of, the platform prompts them to fill in their skills and profile.
2. Additionally, the platform prompts them to answer dedicated questionnaires which enable the evaluation of soft and hard skills. Artificial intelligence technology is used to evaluate the skills through these questionnaires as it will be elaborated in the next section.

3. As many refugees and migrants do not possess certification of their qualifications, the platform supports them in entering other types of proofs (e.g. images or videos). The proposed platform offers to them guidance through a wizard (step-by-step approach) and also provide videos to help them create their portfolio.

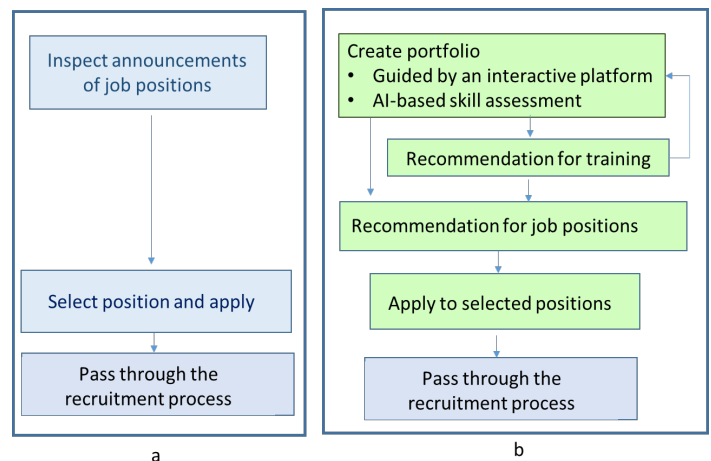


Figure 1: The path to the labour market now (shown in (a)) and with the proposed intervention (shown in (b), on the right)

Once the profile and skills are registered, the user is provided with

- Personalized recommendations about the job categories he/she is appropriate for, based on the definition of skills relevant to each occupation or more specifically to the ESCO code, i.e. to the code of the occupation category in the multilingual classification of European Skills, Competences, Qualifications and Occupations [7].
- Recommendation of additional training modules which would significantly improve their potential for getting a job. For example, assuming a user has a set of certain skills and according to these skills he matches job category A. If a skill is also needed for this job category, then a training that leads to the improvement of this skill is suggested to the migrant. This way, the migrant/refugee becomes aware of opportunities to maximise their potential for being hired.
- Once this is done, the migrant/refugee is ready to get from the proposed platform a list of job positions related with the job categories he is appropriate and then (if he wishes) to apply (e.g. send his CV created in the previous step).

To facilitate the migrants/refugees life easier, a conversational interface (a chatbot) is integrated in the platform. The proposed chatbot and the whole platform support multiple languages as it is crucial for the migrants and refugees to easily find the information they are looking for in their native language and understand the results of their activities.

Turning out attention to the rest target user groups mentioned at the beginning of this section and to offer them valuable assistance, we have designed the platform so as to represent a single-point-of-entry for them with regards to information about refugees/migrants flows, demographics of the migrants' population per country, statistics about their needs and skills as well as the means they find more useful for finding a job. For these groups, once they have set a concrete goal, (e.g. assist vulnerable migrants in finding jobs), they need as accurate information as possible and as fast as possible because the resources that can be devoted are scarce. The proposed platform essentially aggregates information and presents it to the users (indicating of course the source of the information) in an easy to understand way by employing data analytics.

Table 2: The offerings of the platform for the two target groups

Offerings targeting migrants
<ol style="list-style-type: none"> 1. multilingual environment (English, Greek, French, Arabic, Spanish and Farsi) 2. Information about employment 3. Information about social integration 4. Skill assessment using a) Questionnaires and b) Serious games 5. Online training including a) Text, b)Videos and c) Self assessment questionnaires 6. Relocation recommendations based on the migrant's social needs 7. Recommendation of appropriate job categories (using ESCO classification) 8. Recommendation of appropriate job vacancies 9. Recommendation of trainings 10. Chatbot that is trained on the employment/social information and provides answers to migrants questions in many languages
Mobile app for foreign language learning and assessment
Tools for Host authorities, Companies and NGOs
<ol style="list-style-type: none"> 1. Graphs and statistics about the skills of the migrants 2. Recommendations for the host authorities
Statistics regarding migration and employment in Europe

Additionally, to facilitate the task of organizations working with the migrants, the platform supports the organization of users (migrants) in groups. This way, if an organization wants to summarize the skills of a group they are managing/handling, the organization can ask the migrants to use the group identifier and fill in the skill assessment questionnaires. Then the organization can observe the statistics of the skills of this specific group and look for appropriate job positions and relevant trainings. This was considered a very valuable tool during the interviews we organized with such organisations.

To sum up, the major difference between the proposed method and the other in the literature is that no other platform adopts a

holistic approach. The offerings of the proposed platform are summarised in the Table 2.

4. Technical Architecture

The technical architecture of the proposed platform is shown in Figure 2, where the distinction between the front-end components, the backend components and the repositories is clearly shown. The platform runs in a cloud environment. The front end is organized in two sets of components: a) those serving the migrants/refugees (shown on the left in green) and b) those serving Host authorities, Companies and NGOs (HCN) (shown on the right in orange). Both sets include a) a home page which is the landing page of the platform and is different per user groups once the user is logged in, b) an account page- here the user creates his/her profile inserting different information depending on the user type they belong and c) the "about" page where information for the platform, the services it provides and the way it handles the collected data is provided. In the account page, the host authorities, companies and NGOs insert their name, the services they offer and the geographical area where they operate (for example, health services in Athens). In the same page, if the user has entered as a migrant, the information collected includes personal information.

The interface for the migrants/refugees further includes: a) the "e-portfolio" component which guides step-by-step the migrant to fill in his/her skills and competences in a very user friendly way; b) the "chatbot" which responds to questions relevant to legal, social and health – it supports relevant questions in six different languages; c) the skill-assessment (SA) questionnaires which include multiple choice questions and questions requiring the association of elements (visual or textual); d) the recommender User Interface (UI) that offers recommendations for trainings and job vacancies and e) the social/career interface which offers general information about relevant issues.

The interface for the HCN group includes (apart from the three components already presented) a) the data analytics component through which the HCN finds information about the migrants' flows and needs as already described above, b) the group analytics, which presents to the HCN statistics about the group they manage and they have the rights to access (e.g. on the results from the skill assessment or their needs) and c) the social/career interface where they can upload pieces of information they consider of value to the migrants/refugees.

The back-end part is where intelligence resides. First of all, the component "neural network algorithms for skills assessment" implements artificial intelligence to evaluate a mix of thirty five hard and soft skills (like numeracy and communication) based on the serious games the migrants played. This component uses a model which has been trained with data that come from the local society. To improve the accuracy of the evaluation, we are using the platform to collect data from migrants and train the model with them to provide more accurate evaluation results.

The chatbot backend component is responsible for the processing of the information available to it (the migrants' question) by providing the appropriate answer. The proposed chatbot [8] is a Question-Answer oriented agent, capable of replying to migrant administrative service-related queries and it incorporates two different systems, a daily conversation agent

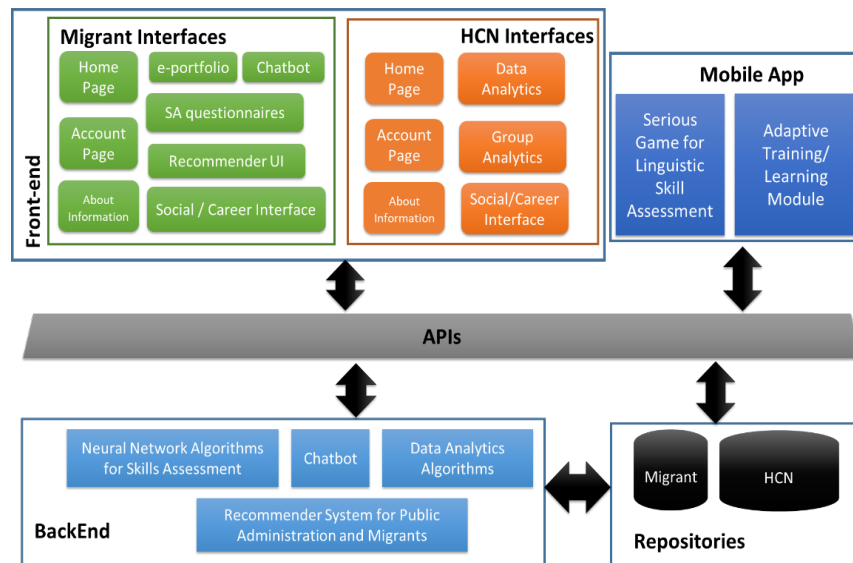


Figure 2: The technical architecture of the presented platform

based on the model released by Huggingface and an answer retrieval module. The latter initially searches for valid in regard to the user query documents, splits them into semantic paragraphs and then applies a BERT [9] fine-tuned model to finally reply to the user.

The methodology of initially splitting the document into paragraphs depending on the structure of the text, rather than directly forwarding the whole document to the model has shown improved results. Towards extending the chatbot's capabilities, aim is to further take advantage of paragraph embeddings during answer prediction, incorporating them online into the models. A challenge faced by this specific chatbot application is the support of multiple languages and more specifically the support of non-European languages like Arabic and Farsi which are spoken by significant percentages of the migrants and refugees arriving in European countries. As presented in [10] the most common countries of origin to Europe (Mediterranean) for 2019 is Afghanistan, Syria, Morocco and Algeria hence Farsi, Arabic as well as European languages (France Spanish and English) cover the vast majority of the migrant spoken languages.

The Data Analytics algorithms is the component that retrieves data from the repositories so as to present to the HCN information about migrants' flows and needs, as well as information about the performance and characteristics of each group they manage. Thus, it is connected to the data analytics and group analytics component of the front-end. More specifically, this module can display not only the skills of individuals but also the average skills of the entire group. As a result, each HCN is able to identify in an easy and user-friendly way the strengths and weaknesses of each group of migrants in order to offer to them tailored trainings based on their skills and competences.

Finally, the recommender system is responsible for the following functions:

a) it retrieves information about the migrants' social needs (which are declared by himself) and suggests relocation options. In order to identify the most suitable city for relocation, the www.astesj.com

recommender uses Quality of Life tables of European cities and correlates them with the user needs.

b) it retrieves information regarding the skills of the migrant/refugee and recommends appropriate ESCO job categories and job vacancies. More specifically, the recommender system includes 40 occupation categories, that are matched to all the second level of ESCO-classification, ensuring representativeness of all job categories that exist in the labour market. For every job category we set up thresholds that specific skills must pass in order to assign this job category to the specific user. For every job category the algorithm checks if the skill vector of the user (35 skills) passes the thresholds and if the result is positive then it returns the respective job category.

Additionally, the proposed platform suggests specific job vacancies to the users based on their recommended ESCO categories and location (city). The job vacancies are retrieved from job vacancies web sites and then each job title is assigned to one or more ESCO codes using the ESCO Web Services. The vacancy is considered suitable for the user if it is assigned to ESCO categories that have been recommended to the user. The recommender system allows the user to search for vacancies from a long list of European cities. However, the platform offers a personalized list of cities based the social needs matching (the top cities are the most suitable) in order to assist further to his relocation.

c) it recommends to the migrant trainings that would significantly improve his/her potential of being hired. The platform is equipped with training sessions designed for each of the 35 skills. Each session includes training material (text, video presentations) as well as testing and self-assessment activities.

d) it presents to host authorities evaluations of eight indicators (social, health and other defined by European initiatives) for different European cities. This way a mayor of city A could easily compare city A with other cities with respect of the eight considered aspects, check in which aspect(s) city A is lagging behind the rest of the cities and decide to proceed to implementing

measures to improve city A. For example, if city A has low evaluations in health services, the mayor may trigger appropriate actions and measures to improve health services in city A. With respect to the relocation options, it is worth providing an example: the platform prompts the migrant to declare their priorities with respect to their needs and takes them into consideration when the platform suggests to the migrant to relocate. This implies, that if a migrant has declared that health services are of premium importance, the platform will not suggest him to relocate to a city with low evaluations in health services.

To support this rich functionality, we have deployed a relational database which stores the data relevant to migrants and refugees (in one part) and relevant to HCN in the other as shown in Figure 2. To enable the communication between the repository and the frontend and backend components, a set of Application Programming Interfaces (API) has been developed.

Apart from the platform which runs through any browser and can also run as a web-based mobile app, we have considered the case where a native mobile application can be integrated with the platform. We assume a mobile application that allows the user to assess its reading and speaking competence in English or other EU languages. Having a native mobile application in place allows the evaluation of pronunciation apart from understanding. Although this application could include all the front-end interfaces of the platform, we have opted not to do so and we have kept it as different app to showcase that any relevant mobile app developed by a 3rd party, could be integrated with our platform and use the open API we have developed to include the results in the portfolio (upon specific minor modifications). Once the user interacts with the application and completes the assessment, the score (the level A1/A2, or other according to European qualification levels) is

stored as a hard skill in the repository. It is stressed that the platform supports the evaluation and storage of a set of hard skills, i.e. skills that are easy to quantify like proficiency in a language and a set of soft skills like communication and leadership which are often also called interpersonal skills. This information is directly integrated in the user’s portfolio (and CV) and is considered when they seek for job recommendations. Similarly, if the recommender provides to the user a recommendation to improve his English-speaking competence, a mobile app developed for this purpose will be proposed. This app can be the one described above or any other app providing foreign speaking competence. Any training opportunity can be registered in the platform and suggested to migrants, if it fits their needs. The result from the training can be integrated in the e-portfolio and can be used during job recommendations.

In the following Figure 3, indicative screenshots of the platform are shown. In Figure 3a, the page where the user selects his type (migrant/refugee or HCN) so that the platform provides relevant information. In Figure 3b, the landing page of the migrants is shown while in Figure 3c the web page where the portfolio is created is depicted. Finally, in Figure 3d, the landing page of the HCN user is shown.

5. Evaluation in Real Life

The presented platform has been used in real life by migrants and refugees in two European countries receiving large flows: Spain and Greece. The piloting was organized in the framework of H2020-NADINE project. For the evaluation purposes, three different sub-groups of the first user group was considered: a) asylum seekers, b) recognized refugees and c) vulnerable migrants.



Figure 3: Screenshots from the platform: a) selection of type of user, b) the screen offered to the migrant, c) the page where the migrant creates their portfolio, d) the web page offered to the HCN type of user

They were invited in the premises of NGOs in these countries in small groups. They first watched a demonstration of the platform by a NADINE person which showed the different functionalities and then they were asked to use the platform and evaluate it through online questionnaires to have an objective and harmonized evaluation. The users spent two days in the premises of the NGOs. They also had the option to comment on the platform and the different pages and results they were presented with. The assessment targeted each functionality of the platform separately. The collected results and comments from the two-days tests and the 96 users were used to improve the platform. Further details on the evaluation activities, demographics of the users and details about the evaluation of each functionality can be found in [11].

The results from the real-life evaluation per functionality are shown in Figure 4. The users were asked to rate the functionalities in a 5-level Likert scale. The results showed that for e-portfolio and registration page, the “excellent” and “good” levels were scored by the majority of users. This is considered satisfactory as the proposed platform was used in Farsi and Arabic in the pilot tests. For the rest three functionalities, the results are slightly lower which comes as no surprise because any artificial intelligence-based component requires training. Up to now the AI-based components of the platform have been further trained based on limited datasets. We anticipate that as the platform is more and more used, we will use the data we collect to further train the AI-based components so that these provide more valuable results to the migrants and thus enhance their satisfaction. Namely, for the chat bot, 68% of users evaluated this as “average” and above. It is worth stressing that the migrants “talk” to the chatbot in Farsi and Arabic. Actually, for all functionalities (apart from the registration page), more than 66% of the users evaluate it as average and above. This shows that the platform, although it is currently in a prototype form, succeeds in satisfying the users. We anticipate that this first real time piloting results will help us improve the platform so as to better satisfy their needs. This also contributes to the sustainability of the platform. The “language assessment” functionality was tested through a mobile app which injected the results in the presented platform. This way the potential of integrating 3rd party applications was confirmed.

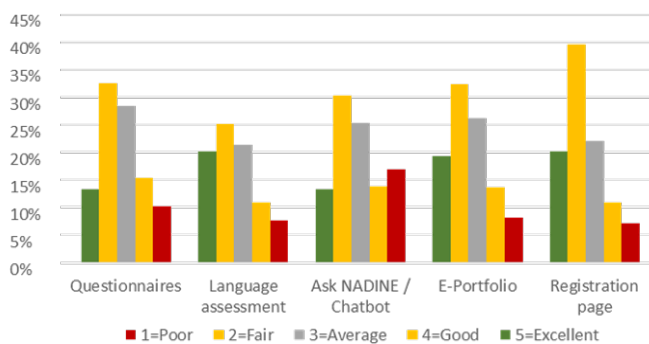


Figure 4: Statistics of the assessment results per component

For each functionality included in the figure, a set of 10 indices were evaluated including: “easy to use”, “enjoyable activity”, “meet my expectations”, “comprehensive/clear”, “time spending”, “cover my personal needs”, “easy to navigate”, “overall aesthetics” along with some additional ones which are linked to the

specifics of each functionality. These results together with the comments received through free text questions are now used to improve the platform. A common observation was that higher levels of satisfaction were indicated by vulnerable migrants compared to the rest two categories of recognized migrants and asylum seekers. In the language assessment, the percentages of results do not sum up to 100% as a percentage of the pilot users did not test and thus did not rate the language mobile app.

Moreover, and in order to evaluate the participants’ overall experience from the platform, more specific aspects were also examined: Likelihood of recommending NADINE platform, User friendliness of NADINE platform, on which level the platform covers the participants’ personal needs / requirements, How comprehensive and clear it is, Easiness to use and understand NADINE platform, Easiness to navigate through NADINE platform, Effectiveness and usefulness. All results regarding the evaluation of the participants’ overall experience from NADINE platform are thoroughly demonstrated in the Figure 5. The result is very satisfactory, as the strong majority reports good experience for the platform which is currently in prototype level. Further details of the evaluation can be found in [11].

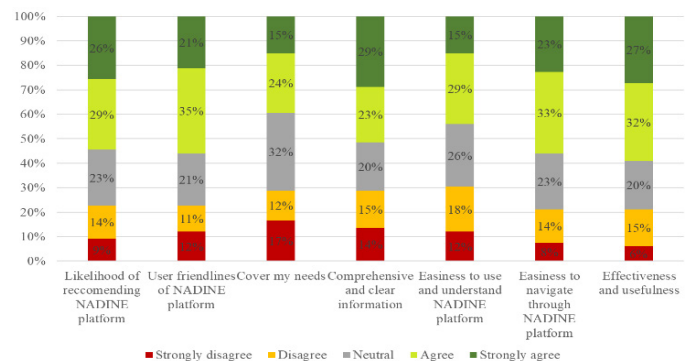


Figure 5: Statistics of the assessment results per component

Turning our attention to the host authorities, NGOs and private organisations, in this phase, ten (10) interviews were conducted. The main outcomes of the interviews were: a) finding information in a single point saves a lot of time for them as they have a clear picture of the situation in significantly shorter time; b) for NGOs working with migrants, the data analytics presented by the platform regarding the information relevant to the groups of migrants they work with was considered an extremely valuable tool; c) for host authorities, the most valuable functionality was the ability to see the sector (social, health, other) that they lack behind and also the ability to communicate with the migrants; for organizations working towards job finding for migrants, having in place a component that evaluates the skills in an accurate way for migrants and refugees is very valuable. They all consider the platform a valuable tool for their everyday job which creates the expectation that the number of migrants and of HCN users engaged with the platform will continuously increase. HCN actors considered that the deployment of a platform like the presented one requires funding from host authorities (regional or national) or EU-wide initiatives.

6. Conclusions

The societal inclusion of migrants and refugees passes through their integration in the labour market. A platform that supports all

their way to the labour market has been proposed in this paper. Its novelty lies not only in the fact that it does support them along the whole path but also on the fact that it exploits mature ICT technologies like artificial intelligence and data analytics to offer unprecedented experience to the users. Utilising artificial intelligence, a set of soft and hard skill are assessed through the platform. Through an appropriately designed user interface, the users are guided to create their e-portfolio. Based on this information, appropriate job sectors and concrete job positions are suggested to the users. The host organizations in turn enjoy mainly data analytics which offer them appropriate information facilitating their decision making. The offerings of the proposed platform prototype have been positively evaluated in real life in two countries receiving large numbers of refugees and migrants.

Acknowledgment

The work presented in this document was funded through H2020-NADINE project. This project has received funding from the European Union's Horizon 2020 Programme under Grant Agreement No. 822601.

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