KRAKEN

BROKERAGE AND MARKET PLATFORM
FOR PERSONAL DATA

D5.8 KRAKEN marketplace testing and validation final report

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Grant agreement	871473
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Reviewer(s)	Juan Carlos Pérez Baún (ATOS), Sebastian Ramacher (AIT), Manuela Kos (AIT), Petra Kölndorfer (AIT)
Version	Final
Due Date	31/10/2022
Submission Date	31/10/2022
Dissemination Level	Public

Release History

Version	Date	Description	Released by
v0.1	15/07/2022	Index initial version	Silvia Gabrielli (FBK)
v0.1	04/10/2022	First draft version for internal review	Silvia Gabrielli (FBK)
v.02	06/10/2022	Revised version (based on ATOS review)	Silvia Gabrielli (FBK)
v.03	19/10/2022	Revised version (based on AIT review)	Silvia Gabrielli (FBK)
v.04	28/10/2022	Final version including section 4	Silvia Gabrielli (FBK), Juan Carlos Pérez Baún (ATOS)
v1.0	31/10/2022	Quality check. Submitted version	ATOS

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List of Acronyms

Acronym	Description
A-MARS	Adapted Mobile App Rating Scale
B2B	Business to Business
B2C	Business to Consumer
DC	Data Consumer
DP	Data Provider
Dx.x	Deliverable x.x
GDPR	General Data Protection Regulation
HR	Human Resource
SD	Standard Deviation
SMPC	Secure Multi-Party Computation
SSI	Self-Sovereign Identity
SUS	System Usability Scale
TUG	University of Technology Graz
Tx.x	Task x.x
UC	Use Case
UCD	User-Centred Design
UX	User eXperience
VC	Verifiable Credential
WP	Work Package

Executive Summary

This document is the second deliverable of T5.5 of WP5, aimed to provide results from the second evaluation of the KRAKEN platform and, specifically, of the marketplace features prototyped and released in August 2022 for deployment in the health and education pilots.

Based on the evaluation results of the first KRAKEN prototype, tested in October 2021 with 15 users (D5.7 KRAKEN Marketplace testing and validation first report), the Consortium worked at improving the usability and quality of user experience of the KRAKEN components, as well as at finalizing the set of features and use cases covered by the platform, by implementing the second and final prototype release, deployed in July 2022 (D5.6 KRAKEN Marketplace Final release).

In September 2022 a multi-dimensional evaluation of this second KRAKEN prototype was carried out by involving 35 users selected from the relevant user groups and user stories identified in D5.1 Initial pilot marketplaces user stories and D5.2 Final pilot marketplaces user stories.

As in the previous evaluation study, the users were invited to assess the usability of the prototype after individual usage and to provide feedback on their subjective experience with the KRAKEN solution as providers or consumers of data products in the health and education pilots, by means of questionnaires and interviews.

This report presents the main results of the evaluation conducted in 2022 to inform the future user-centred design (UCD) of data sharing platforms like KRAKEN, as well as to inform the future KRAKEN exploitation activities targeting a wide adoption of the KRAKEN solution by users in the next months.

Additionally, information of the flow of the different use cases (UCs) for both health (4 UCs) and education (3 UCs) pilots, is provided.

Introduction

1.1 Purpose of the document

This document describes the user-centred methodological approach deployed to evaluate the final KRAKEN prototype in year 2022, by combining quantitative and qualitative feedback collected from participants involved in the health and education pilots in September 2022.

It presents the main findings and recommendations collected from testers regarding the usability and user experience with the KRAKEN solution, providing a multi-dimensional view of its qualities and its impact on the target user groups. These findings can be of interest to the design and research community working at the development of data sharing platforms like KRAKEN, and it can inform future decisions on KRAKEN exploitation in the two pilot domains addressed during the project or in additional application sectors.

This deliverable provides the description of the implemented flows for the 7 UCs planned at the beginning of the project. A high-level overview of the UCs is shown through the use of infographics, and screenshots of the processes are also included.

1.2 Structure of the document

After the introduction to the deliverable's contents, in section 2 the most relevant changes and improvements to the KRAKEN prototype implemented after the first evaluation study are reported. Section 3 describes the methodology deployed to assess the usability of the KRAKEN marketplace prototype released in August 2022 and to collect quantitative and qualitative user feedback on their perceived quality of the solution that might affect its future adoption. It also presents the main recommendations derived from this final evaluation study relevant to inform the future exploitation of KRAKEN in the health and education pilot sectors. Section 4 include details on the 7 UCs implemented demonstrating the use of the KRAKEN platform in both pilots. Finally, section 5 concludes the report by summarizing the main insights from this evaluation that can feed future research and design of data sharing platforms like KRAKEN over the next months.

2 Relevant changes of the final marketplace release

The first evaluation study conducted on the KRAKEN platform and marketplace, conducted in October 2021, reported in D5.7 "KRAKEN Marketplace testing and validation first report" [1] and [2], helped to identify key improvements of the KRAKEN features design, both from a frontend and backend perspective, as well as it supported the prioritization of key features' development according to users' needs and their main preferences or expectations for data sharing platforms.

2.1 Health pilot release
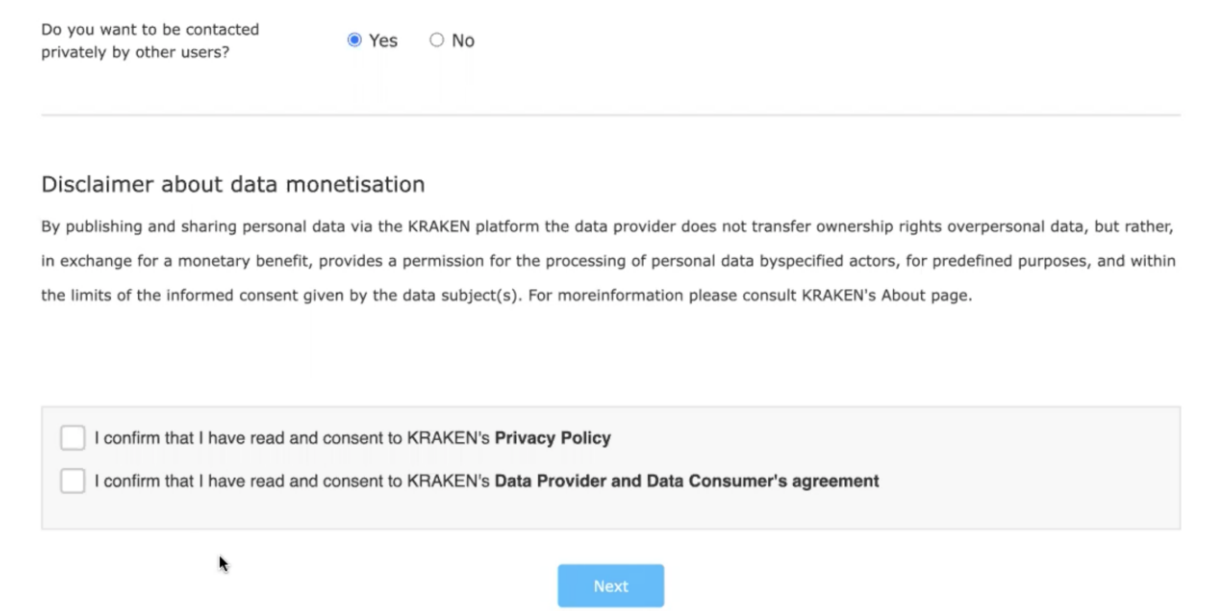
The final release of the health pilot provided a smoother access and navigation of the marketplace features, with a context relevant description of privacy policies or disclaimers to be read and approved by users of the platform (Fig. 1).

Data providers and data consumers were enabled to sign up and register to the marketplace by using the SSI mobile app to then share and control their data on the marketplace web app.

In the final release data providers were also provided with the possibility of creating and publishing a batch data product, of creating and publishing an analytics data product and to monitor active data accesses by means of the marketplace mobile app.

Data consumers were able to select a batch data product among the ones available in the marketplace, to fill in the "batch data product" form, to complete the transaction and payment with the Metamask wallet and download the data. They were also enabled to select an analytics data product in the marketplace, add it to a computation basket (Fig. 2), buy analytics packages, paying in Metamask and reviewing the statics results.

Overall, the additional features implemented for the final release of the marketplace allowed to provide a more complete user experience (UX) with the KRAKEN data sharing platform, including the use cases of data providers/consumers interested to access the platform to provide/consume analytics data products, a possibility which had been judged as particularly interesting and wanted by most users involved in the first evaluation round of KRAKEN.
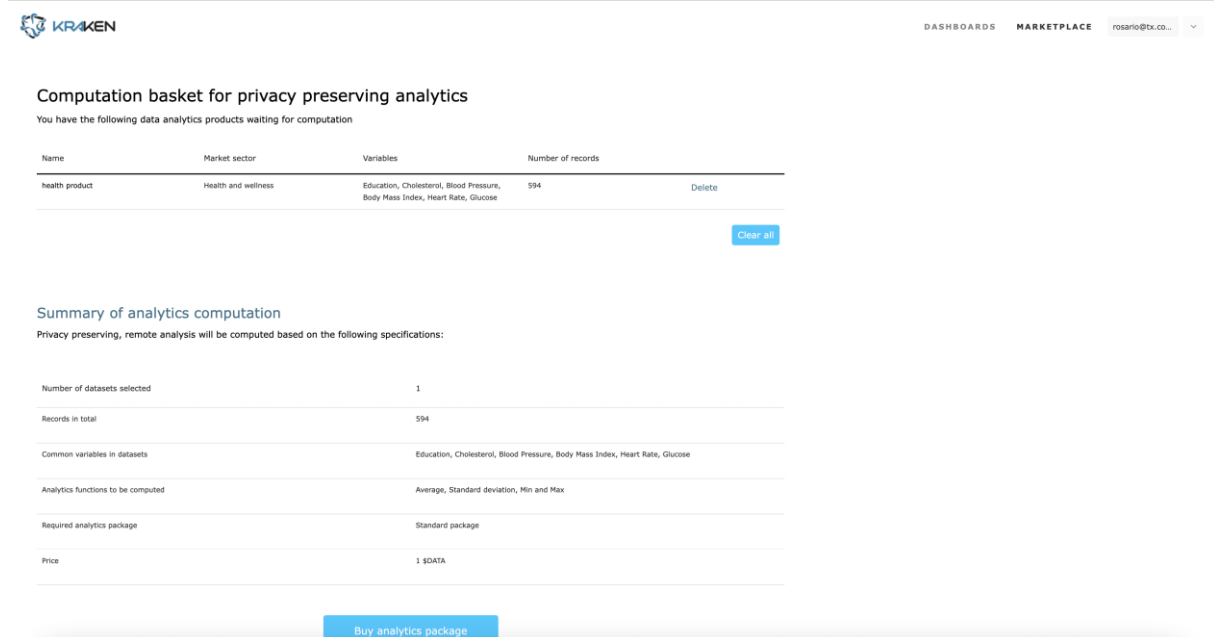
Figure 1: Example of disclaimer supporting user understanding of privacy policies during the registration process

Figure 2: Computation basket displayed once the user has added a data analytics product

2.2 Education pilot release

The final release of the education pilot provided an improved UX for data providers, like university students, to sign up and register to the marketplace by using the SSI mobile app to then share and control their data on the marketplace web app. They were provided with the possibility of exporting and sharing education data.

Specifically, on the KRAKEN Edu connector they were enabled to login to the Edu connector, connect their wallet app to the Edu connector, export a credential (Grade or Diploma) into the mobile wallet, display the credential in the wallet and allow computation on a grade or diploma to the university.

On the KRAKEN marketplace they were able to create an education data product (grades, such as course certificates or diploma) with their credentials.

Also, in the case of the education pilot, its final release provided a complete and more meaningful UX for the data provider, including the possibility of allowing computation on education data products that may increase data consumers' motivation to register to the KRAKEN platform for accessing data products, thus making more attractive the KRAKEN marketplace for future consumers of data in the education domain.

3 Multi-dimensional evaluation of the KRAKEN final release

3.1 Methodology and procedural protocol

Participants Inclusion criteria

To conduct the multi-dimensional evaluation of the KRAKEN marketplace final release, in September 2022, 35 participants belonging to the user groups of *data providers* and *data consumers* identified in D5.1 "Initial Pilot Marketplaces User stories" [3] were invited to take part to the evaluation for both the health and education pilots.

Recruitment strategy

In early 2022 a recruitment campaign was launched through the KRAKEN website, as well as by communications at relevant dissemination events of KRAKEN (e.g., webinar on "*Women in technology behind data-sharing, privacy preservation and Self-Sovereign identity*") to identify volunteer testers with different levels of expertise in the domain of data sharing platforms. Special attention was paid during the recruiting phase to ensure gender balance in the participant sample.

Eligible candidates identified by FBK and the KRAKEN consortium, in collaboration with the pilots' leaders from Lynkeus and TUG (University of Technology Graz), were contacted and invited (by email) to participate to the evaluation activities. They were asked to read the information sheet and sign the consent form (Annex A), provided by FBK, before their enrolment in the evaluation.

A calendar of timeframes for the evaluation activities was agreed at consortium level and proposed to participants at the time of their recruitment.

Rewarding mechanism

Participants were rewarded for their time dedicated to the evaluation by means of an Amazon gift card of 50 Euros.

Individual assessment of the KRAKEN release

In September 2022 participants were invited to access the KRAKEN second release prototype individually and to conduct a *walkthrough* of the solution to assess its usability and quality of user experience (UX). They were asked to use Android smartphones to access KRAKEN, since the SSI mobile app was available for Android operating system only. They were provided two weeks for:

1. Reading a list of tasks and guidelines (Annex B) supporting their exploration of the platform and of the key functionalities provided by the final release of the prototype for each pilot. Participants were invited to use fake data during their registration to the platform and their exploration of its functionalities, to preserve privacy. For the data analytics product tasks in the health pilot, they were provided with the open access dataset Framingham_v3[1] suitable to the purpose of the testing phase.

2. Watching a set of introductory videos showing i) how to access the KRAKEN marketplace by using the SSI mobile app to register to the platform, ii) how to publish or to purchase a data product in the health or education pilot, iii) how to publish a data analytics product in the health or education pilot.

3. Filling in a digital version of the SUS (System Usability Scale) questionnaire [4] to assess the usability of the platform (Annex C) and a digital version of the A-MARS (*Adapted Mobile App Rating Scale*) section E [5], measuring the subjective quality of the platform (Annex D). The post session questionnaire also included 5 open questions on relevant factors affecting the

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[1] https://en.wikipedia.org/wiki/Framingham_Heart_Study

user adoption of data sharing platforms (Table 1) and 1 optional free text question collecting any user recommendations for a future improvement of the KRAKEN platform.

During the two weeks of the testing phase participants received technical support by email from partners FBK, TEX, Lynkeus and TUG in case of problems with the installation of the KRAKEN components or doubts in their understanding of the testing tasks and guidelines.

Multi-dimensional evaluation interviews

In the second half of September 2022 a subgroup of 10 participants belonging to the health pilot were invited to join a semi-structured interview of 30 minutes, to investigate more in depth their replies to the 5 open questions regarding the main factors influencing their adoption of data sharing platforms like KRAKEN. The interviews were administered by FBK staff and recorded to enable a more detailed analysis of participants' responses. The moderator initially provided a brief introduction to the interview objectives. Then, participants were asked to elaborate their answers to the series of questions reported in Table 1 by adding any relevant comment shading light on their user experience with the KRAKEN platform.

Factor investigated	Questions
Set 1: Health Data / Education Data Management	1. Would you be interested to use KRAKEN for providing/consuming data products? Why or why not?
Set 2: Privacy preserving data sharing systems	2. Are you interested to use the privacy preserving analytics of KRAKEN?
Set 3: Sharing health/education data	3. What factors do you consider important when deciding to share your information with another entity?
Set 4: Compensation for Sharing Data and Data valorisation	4. What type of compensation would you be looking for in exchange for your data products?
Set 5: Acceptance, ethics	5. Is the provided information relating to your data protection and privacy rights and freedoms sufficiently clear and understandable?

Table 1: Factors and questions posed to participants involved in the pilots

Participants' characteristics

In total, 30 individuals (12 males, 40% and 18 females, 60%) participated in the health pilot evaluation, 14 (46.6%) were aged 35 to 54, 13 (43.3%) were aged 18 to 34, 3 (10%) were aged 55 to 64. Participants were researchers, experts in Big Data projects for healthcare or blockchain technologies for health, legal experts working in projects related to personal data sharing, managers of companies offering digital health solutions, project managers of public health solutions. Most participants (19/30, 63.3%) had some experience with data sharing platforms, some participants (10/30, 33.3%) had no experience and a participant (1/30, 3.3%) had good experience.

Five males' participants were involved in the education pilot evaluation, from the initial number of 8 students who had expressed interest to take part in the study. They were students at the Technology University of Graz with computer science background, most of them (4/5, 80%) aged 18 to 34 and a participant (1/5, 20%) aged 35-54. Most participants (3/5, 60%) had some experience with data sharing platforms, a participant (20%) had no experience and a participant (20%) had good experience.

Data analysis

The data collected during the interviews were analysed by applying the microinterlocutor analysis method [6][7] to the recorded sessions, whose main results are reported in section 3.3. The microinterlocutor analysis is a method used to analyse interview data in health-related research [7] [8]. It not only reveals each participant's attitude, stance, and arguments, but also provides researchers with a quantitative overview of participant grouping [6]. Following Onwuegbuzie et al [6], we first analysed all the transcriptions of the interview discussions, to get an overall understanding of the transcriptions. Next, we coded participants' responses to each discussion question of the interview. We paid attention to their words throughout the interview and coded their responses by interpreting all the words they contributed. We integrated these data with the analysis of the responses to the 5 open questions of the questionnaire and coded the thematic categories of explanations that participants provided for their responses, which helped us understand more deeply why the participants responded in certain ways. We used the thematic categories to structure our reporting on the open-ended questions, available in the results section. By taking this step, we produced descriptive statistics for all the questions, as summarized in section 3.3.1 and 3.3.2. In this way, it is possible to see how participants to the interviews responded to each question, but also to get an overview of the responses of the whole group per each pilot, based on which we generated the insights explained in the results section.

3.2   Results of the usability and subjective quality assessments

Results from the participants individual assessment of the usability of the KRAKEN final release, based on the SUS questionnaire, showed an average score of 52.95 (SD 15.92) for the health pilot and an average score of 50 (SD 24.32) for the education pilot. By considering only the score of testers in the health pilot having "some knowledge" or "good expertise" with data sharing platforms (20 participants, 66.6% of the sample), the average score raises to 60.33 (SD 15.23), for the education pilot the average score is 60.83 (SD 16.64). These scores correspond to the grade D, percentile range 15-34, they can be defined with the adjective OK/Fair, they reach a marginal level of acceptance and belong to the detractor level, meaning that users are more likely not to recommend this system to other users with this level of usability [9] [10]. To notice that SUS scores below 68 (Good level) indicate problems with the system design that should be identified and resolved before a final deployment of the solution.

The assessment of the subjective quality of the KRAKEN platform, measured with the A-MARS scale, section E, resulted in a score of 11.86 (SD 2.45) for the health pilot and a score of 8.6 (SD 2.70) for the education pilot. Since the A-MARS section E scale consists of 4 questions (score range 4-20) with answer options going from 1 "Inadequate" to 5 "Excellent" we can derive that the score for the health pilot is close to the medium point (3) while the score for the education pilot is lower (2).

Participants to the health pilot requested a better support from the platform with the installation of the different KRAKEN components required to access and use the system. One participant recommended to add a step-by-step tutorial in the marketplace to facilitate the first interaction of users with the platform. Some participants asked to be provided with clearer feedback when performing the different actions and tasks with the system. A participant also suggested to better integrate the cloud storage with KRAKEN, if this may be technically feasible. A few users recommended to extend access to KRAKEN also from operating systems different from Android.

Participants to the education pilot also reported similar problems in performing the initial steps to access and use the KRAKEN prototype. One participant found somehow difficult to use the privacy calculator function available with the product creation form. He recommended to simplify this form by explaining terms such as 'adversary' that might be unfamiliar to most users to understand.

However, some users in both pilots provided also positive comments and appreciation for the KRAKEN concept and innovative solution released, encouraging the consortium to keep working on this solution

to empower citizens in better managing their sharing of personal data by means of secure, privacy preserving technologies.

Overall, these results show that there is still room for improvement of the usability of the KRAKEN final release for its deployment in a B2C (Business to Consumer) scenario, and that the status of the release makes it more suitable to a B2B (Business to Business) audience, having already some technical expertise or knowledge in the domain of data sharing platforms.

3.3 Results on the other factors affecting user adoption

Table 2 displays how each participant in the interviews responded to each question, including the indication of agreement, indication of dissent, ambivalent response, no response, and response given with an elaboration. In sections 3.3.1 and 3.3.2, we explain our results for each open question included in the health and education pilot evaluations, providing a descriptive statistical overview of the types of responses (including nonresponses) and qualitative categorizations of participants' elaborations.

Question	Participant No.									
	1	2	3	4	5	6	7	8	9	10
1.	SE[b]	SE	A	SE	A	SE	A	A	SE	A
2.	D[d]	A	SE	A	A	SE	SE	SE	A	NR
3.	SE	SE	A	SE	AR	A	A	A	A	A
4.	A[a]	D	AR	SE	A	AR	NR[c]	SE	D	A
5.	A	AR[f]	A	A	D	A	A	A	A	A

Table 2: Participants' responses in the interviews

[a]A: indicated agreement.
[b]SE: Provided significant example suggesting agreement.
[c]NR: Did not indicate agreement or dissent (i.e., nonresponse or did not know).
[d]D: Indicated dissent.
[e]SD: Provided significant example suggesting dissent.
[f]AR: Ambivalent response.

3.3.1 Health pilot findings

Health data management

Question 1: Interest in providing or consuming data through KRAKEN

We asked participants "Would you be interested to use KRAKEN for providing/consuming data products? Why or why not?".

As shown in Fig. 3, most participants (27/30, 90%) said they were very interested in providing or consuming data through KRAKEN, some of them (7/30, 23.33%) mentioned their particular interest for sharing data for research purposes. Some participants (5/30, 16.66%) found the platform interesting and trustworthy because it provides data protection, and it considers legal aspects. A few participants (3/30, 10%) expressed no interest in using KRAKEN, 2 of them due mainly to usability problems met during the testing phase and 1 for a lack of interest in sharing personal data. A participant observed that the term "marketplace" would be appropriate in the case of sharing anonymised data, but not for personal data, which, according to the Data Strategy of the European Commission, cannot be considered as goods. Two among the interviewed participants expressed interest not only for using KRAKEN as individual citizens, but also as institutional representatives, supporting the B2B deployment of the platform.
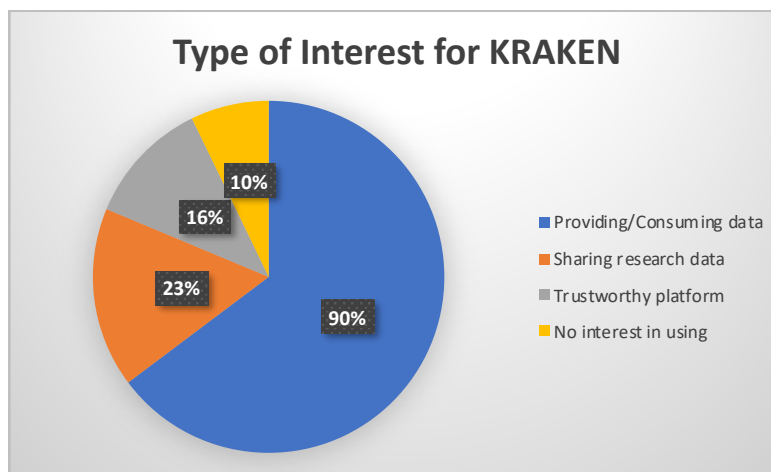
Figure 3: Type of user interest for using KRAKEN

Privacy preserving data sharing systems

Question 2: Interest in using the privacy preserving analytics of KRAKEN

This question asked participants "Are you interested to use the privacy preserving analytics of KRAKEN?".

In response, only a few participants (4/30, 13.33%) expressed no interest in the privacy preserving analytics products of KRAKEN, and one participant said he didn't know (Fig. 4). The other participants (25/30, 83.33%) replied they were interested or potentially interested to use this type of service offered by the platform, since it provides an added value to users, especially for those interested to access statistics for research purposes. Among the interviewed participants, one mentioned that this type of service can be useful to solve possible issues with the data format, and a participant stressed the importance of analytics data products in ensuring security and privacy protection of the shared data.

Figure 4: User interest for analytics data products in KRAKEN

Sharing health data

Question 3: Entities to share health data with

Participants were also asked "What factors do you consider important when deciding to share your data with another entity?".
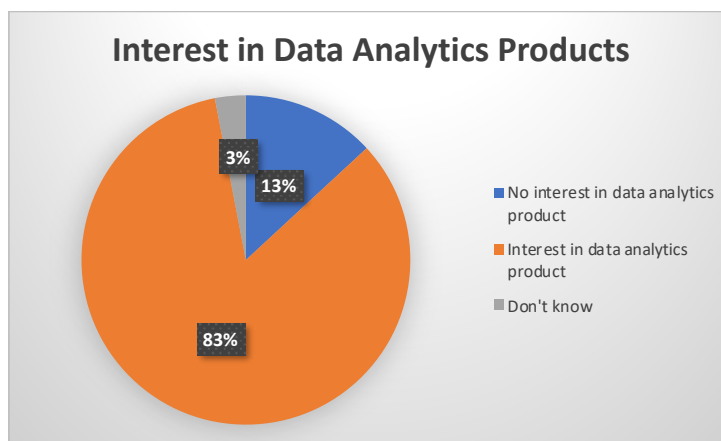
In response, most participants (24/30, 80%) mentioned that the credibility of the other entity, the security and privacy preserving features of the platform would be the most important factors. A few participants (3/30, 10%) also mentioned the purpose for which their data will be used by the other entity (Fig. 5). Two participants thought it was important the transparency of the data sharing and usage process, one mentioned the quality of the experience or feedback of other users having previously shared data with that entity. A participant deemed important the treatment of her data according to the European legislation and the permanence of her data on the European territory. Other factors mentioned by participants were the possibility of combining data products with information about the market sector (e.g., tags), data protection and permission (including possibility of limiting or revoking data access). Among the interviewed participants, two expressed a preference for sharing data with private entities, since they thought they are better in protecting data compared with public entities who might be subjected to other legal constraints (e.g., sharing available data in case of crimes investigations or similar). Two other interviewees said they would prefer to share data with public entities, instead, since they were more interested in supporting public health scopes rather than commercial objectives of a private entity, or commercial exploitation of data.
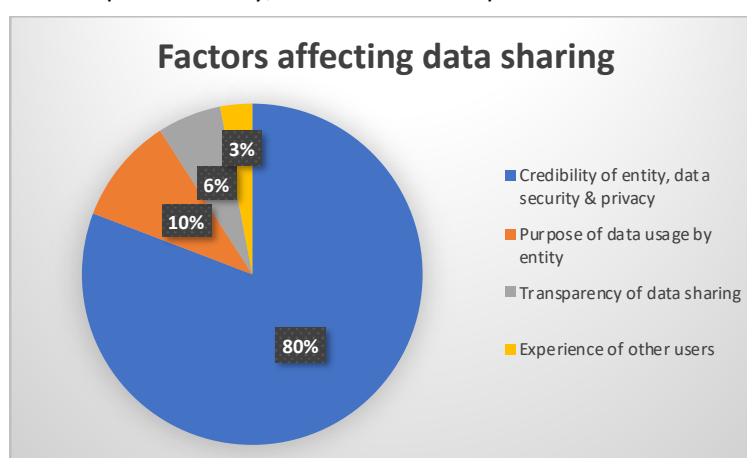

Figure 5: Most important factors affecting user data sharing

Compensation for sharing data and data valorisation

Question 4: Type of compensation for sharing data products

We asked participants "What type of compensation would you be looking for in exchange for your data products?".

Most participants (21/30, 70%) expressed interest for getting monetary compensation for sharing their data products, including the possibility of receiving remuneration in the form of cryptocurrency. A few participants (4/30, 13.33%) said they would prefer to receive as a compensation free access to web services (e.g., storage services), points to be spent to access data products available in the platform or to donate their points/compensation to no-profit organizations. Some participants (5/30, 16.66%) said they would prefer to have no compensation for their data sharing, or they had not clear opinions on this matter (Fig. 6).

Three of the interviewed participants further elaborated their responses by saying that payments in cryptocurrencies might be not particularly appealing for individual users, so traditional monetary compensation would be preferable in a B2C scenario. In the case of institutional representatives using the platform (B2B deployment), all forms of payments were considered appropriate. Two participants also added that access to datasets for research purposes should be provided by KRAKEN free of charge.
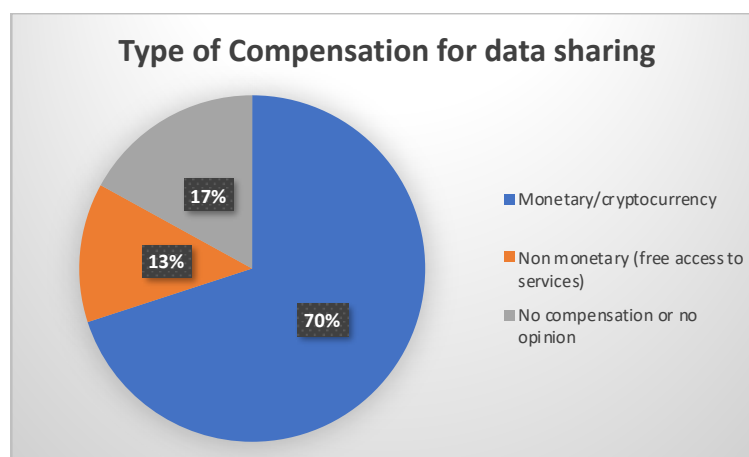

Figure 6: Type of compensation preferred for data sharing

Acceptance, ethics

Question 5: Understanding information on data protection and privacy

Finally, participants were asked "Is the provided information relating to your data protection and privacy rights and freedoms sufficiently clear and understandable?".

Most participants (26/30, 86.66%) replied that the information on data protection and privacy provided by KRAKEN was sufficiently clear and complete. A few participants (3/30, 10%) said that there was still room for improving the information provided, in terms of simplifying content for a non-legally informed audience (Fig. 7). A participant would have appreciated to see more examples and icons supporting an easier understanding of how KRAKEN ensures data protection, privacy and GDPR compliance. A participant found this information was clearer in the SSI app rather than in the marketplace web app.

Four among the interviewed participants said that the information on data protection and privacy was in KRAKEN above the average quality if compared with similar platforms. Two interviewees suggested that for the future it would be helpful to arrange possible forms of certification on this matter for platforms and digital services of this kind, to guarantee data protection and compliance to relevant regulation without requiring much reading and approvals on the user side.
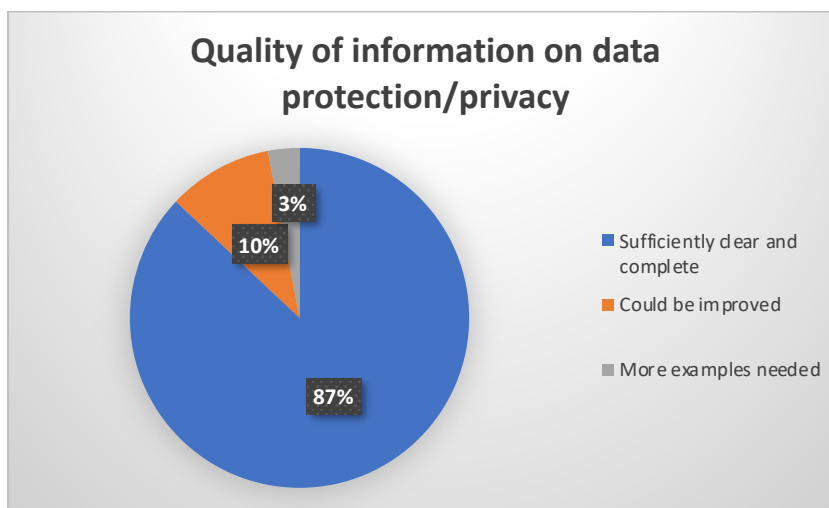
Figure 7: User assessment of information provided on data privacy and data protection

3.3.2 Education pilot findings

Education Data Management

Question 1: Interest in providing or consuming data through KRAKEN

We asked participants "Would you be interested to use KRAKEN for providing/consuming data products? Why or why not?".

As shown in Fig. 8, most participants (4/5, 80%) said they would be interested to share educational data through the platform. A participant mentioned that the main pillars on which KRAKEN is based (including smart contracts) facilitate trust in the platform and willingness to share data through it. Only one participant (1/5, 20%) expressed some concerns in using the platform, mentioning environmental sustainability problems related to energy consumption of the blockchain, as well as lack of motivation on installing the different apps/components required to access the marketplace. A participant showed a stronger interest to use the platform from a data consumer's point of view rather than from a data provider perspective.
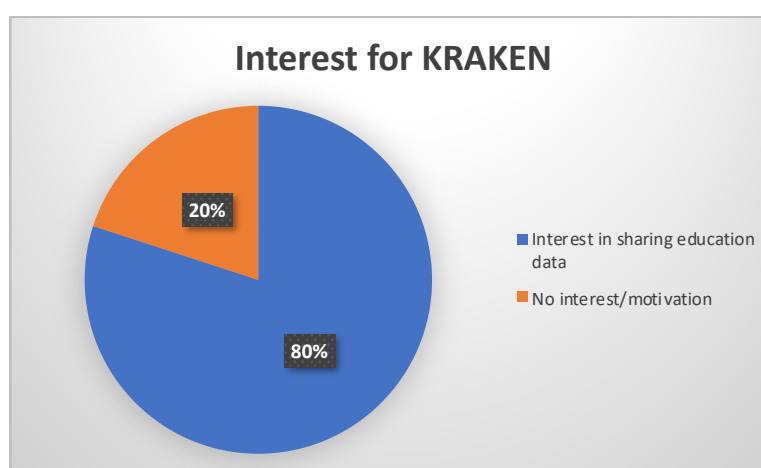

Figure 8: Interest for using KRAKEN

Privacy preserving data sharing systems

Question 2: Interest in using the privacy preserving analytics of KRAKEN

This question asked participants "Are you interested to use the privacy preserving analytics of KRAKEN?".

In response, most participants (4/5, 80%) were aligned in saying that data analytics products are a much better solution for sharing personal data, overcoming possible barriers related to privacy preservation and trust. By contrast, a participant (1/5, 20%) said he was not particularly interested in using this type of functionality provided by KRAKEN (Fig. 9).
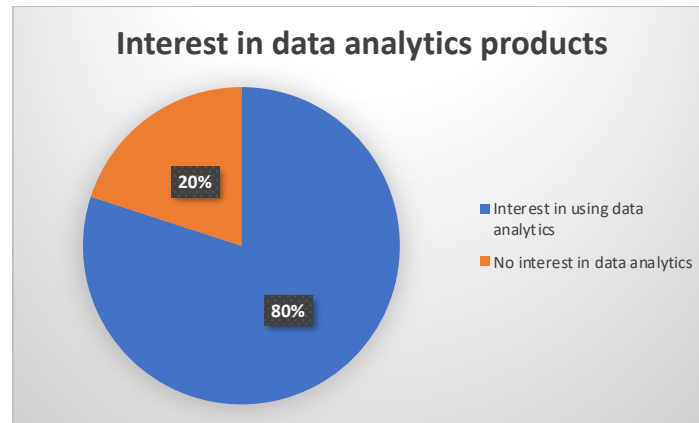

Figure 9: User interest for analytics data products in KRAKEN

Sharing education data

Question 3: Entities to share education data with

Participants were also asked "What factors do you consider important when deciding to share your data with another entity?".

In response, all participants said that trust in the entity with which they share data would be the most important factor, as well as the kind of data security, privacy and confidentiality guaranteed (Fig. 10). A participant also mentioned he would consider important the scope for which an entity would use their data and the possibility of having a fine-grained control over who to share data with, for how long, with the chance of revoking access to their data.
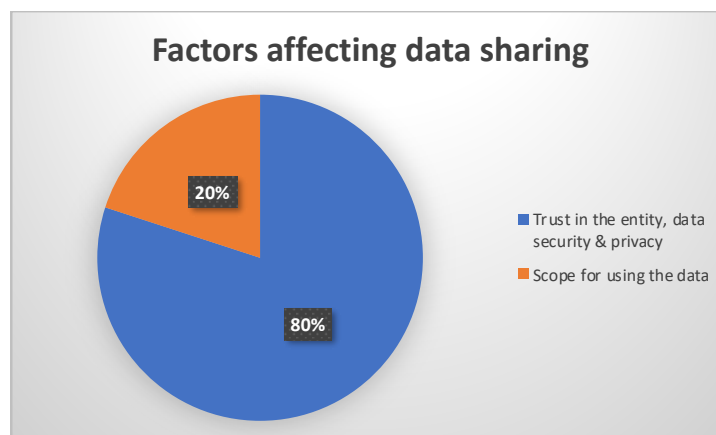

Figure 10: Most important factors affecting user data sharing

Compensation for sharing data and data valorisation

Question 4: Type of compensation for sharing data products

We asked participants "What type of compensation would you be looking for in exchange for your data products?"

Some participants (2/5, 40%) replied that they were not interested in getting a compensation for their data products, another participant would be rather interested in getting access to other data products or physical assets. A participant mentioned the opportunity of getting vouchers or future employers contacts, while another participant said he would compare his data products with similar ones available in the marketplace and set the price according to the market value (Fig. 11).
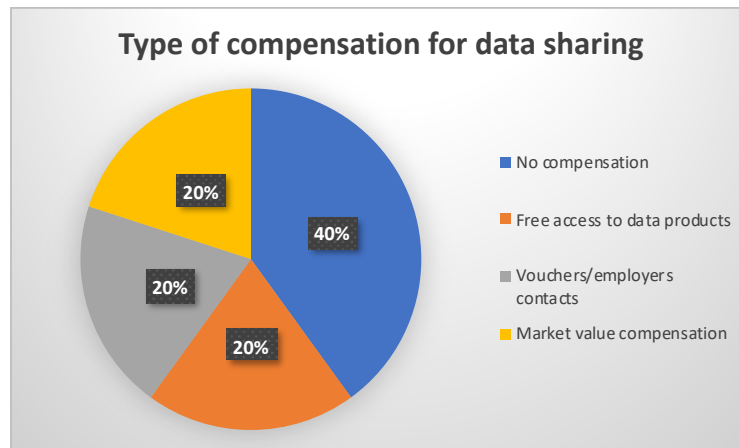

Figure 11: Type of compensation preferred for data sharing

Acceptance, ethics

Question 5: Understanding information on data protection and privacy

Finally, participants were asked "Is the provided information relating to your data protection and privacy rights and freedoms sufficiently clear and understandable?".

Most participants (3/5, 60%) replied that the information provided by KRAKEN on data protection and privacy policies was sufficiently clear and understandable (Fig. 12). A participant, however, had not clearly understood how the platform would store his data and distribute it to interested consumers. Another user also had still some concerns on how KRAKEN would ensure respect of his data privacy rights.
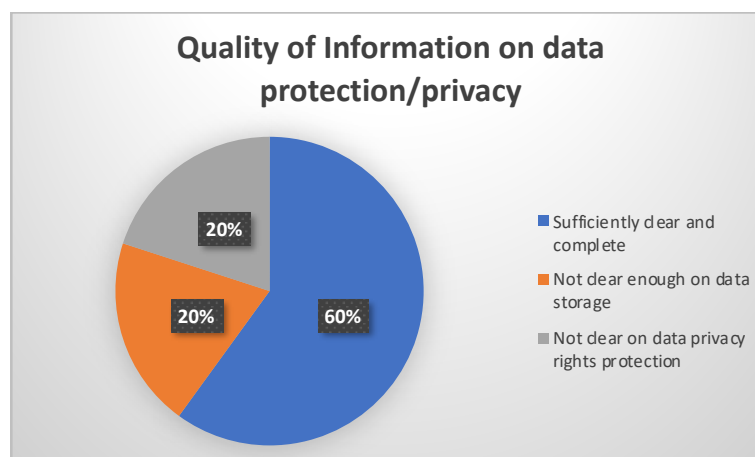

Figure 12: User assessment of information provided on data privacy and data protection

3.3.3 Summary of main findings

The study presented a multidimensional evaluation of the KRAKEN personal data sharing platform, tested by 35 individuals representing key target user groups of the platform in the health and education pilot domains. Our main findings show that the usability of the prototyped platform was perceived by users as marginally acceptable but requiring further improvements for its deployment in a B2C scenario. The importance of the usability dimension was stressed by participants during the interviews, where most of them expressed interest and trust in using the data sharing solution, both as providers and consumers of data products, if the user experience ensured is good, and the security and privacy preserving components of the platform, including its privacy preserving analytics, are clearly presented to the user.

Regarding the sharing of health or education data through the platform, most of our participants expressed a preference for sharing data for research or non-profit purposes, while they were less inclined to share data for commercial reasons.

The possibility of sharing data analytics products was also perceived as interesting, providing added value as a KRAKEN service, contributing to further ensure security and privacy of the shared data.

The most important factors influencing participants willingness to share data with another entity were the credibility of this entity, as well as the security and privacy preserving features of the platform. The purpose for which the shared data will be used by the other entity was also deemed important for some of our participants in both the pilots.

Concerning the possible incentives to users for sharing data products, our findings suggest that most participants in the health pilot were interested in receiving monetary forms of compensation, while in the education pilot nonmonetary compensation was preferred. Insights from the interviews indicated that more traditional forms of monetary compensation would be appropriate in a B2C deployment of KRAKEN, while cryptocurrencies would also be appreciated by institutional users in a B2B deployment.

Our investigation into the possible user concerns regarding the ethics dimension of using the platform revealed that most participants found the information on data protection and privacy provided by KRAKEN as sufficiently clear and complete. Some participants provided suggestions to further facilitate understanding and decision-making by users on this matter, although they recognized that this aspect may represent a main challenge for interacting with data sharing platforms by non-legally informed users.

All these considerations and findings may be relevant to further inform the user-centered design of future data sharing platform like KRAKEN, contributing to better fit the needs and expectations of users, as well as to ensure a functional coevolution of these cutting-edge technologies with user preferences and behaviours.

4   Use cases demonstration

This section provides details of the different processes of the UCs with the purpose of demonstrating the fulfilment of the four UCs described for the health pilot, and for the three UCs defined for the education pilot. First, a high-level overview of the UCs by using infographics is presented, and then some screenshots of the processes are included.

4.1   Use case 1: The data owner (individual/organization) sells his/her data

Figure 13 gives a high-level overview infographic of the UC1 The data owner (individual/organization) provides his/her data. The infographic can be downloaded from the following KRAKEN web page link:

https://krakenh2020.eu/sites/kraken/files/public/content-files/2022/UC1_DataOwner_0.pdf

This use case enables citizens, institutions and organizations to offer protected personal and sensitive data (biomedical data and well-being records).
The Data Providers are able to provide their data setting the user consent, the price of dataset and defining the conditions of access and use of their data.
Data Providers (DPs) can register and access to the marketplace by using SSI solution, an SSI mobile app which stores Verifiable Credentials (VCs) and key material for accessing the marketplace.
The marketplace shows a catalogue with the available datasets and the health metadata. Beside the dataset price, the marketplace through the use of smart contracts stores the user consent for sharing data and the access criteria.
The data can be used by food product manufacturers, health insurance companies or biomedical product companies interested in certain lifestyles and demographics for marketing or product development purposes.
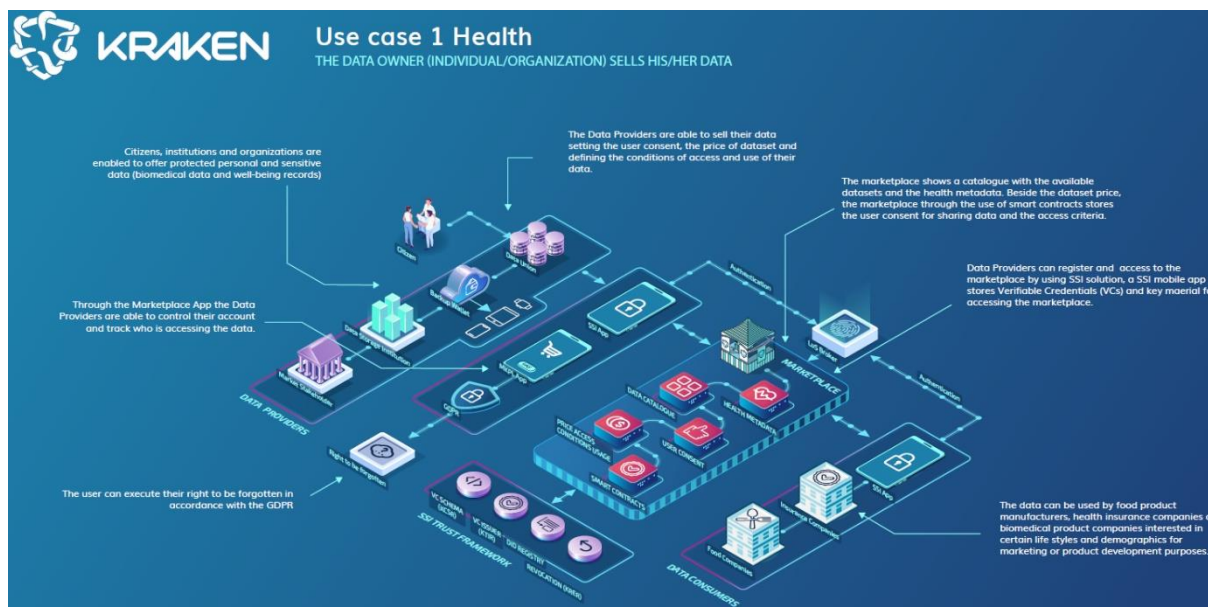The user can execute their right to be forgotten in accordance with the GDPR.

Figure 13: The data owner (individual/organization) provides his/her data[2]

The following figures (14a to 14e and 15a to 15b) show some screenshots of the process involving the use of SSI mobile app for the registration process and login process (15a to 15b) and an overview of the data provider creating a new data product on the marketplace (14a to 14e).

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[2] https://www.krakenh2020.eu/sites/kraken/files/public/content-files/2022/UC1_DataOwner_0.pdf

Figure 14a shows the marketplace main dashboard, the Figure 14b presents the description of the product during the process of creation of a new product, the Figure 14c depicts the selection of the dataset to publish, the Figure 14d shows how is pricing the product and the Figure 14e depicts the published final product.
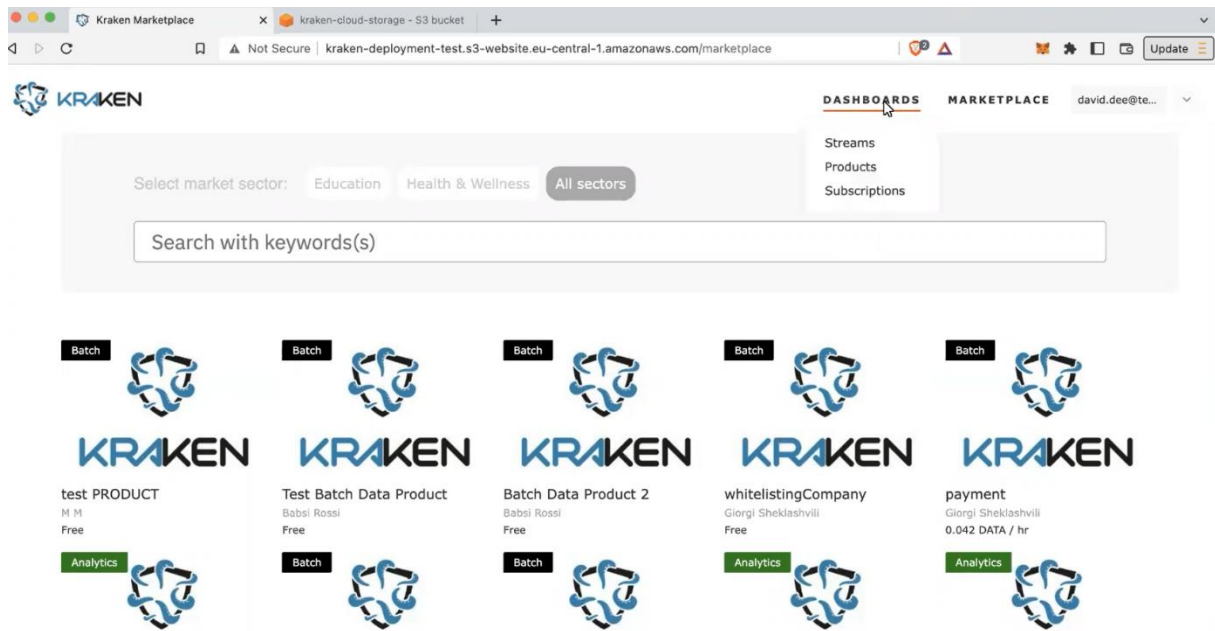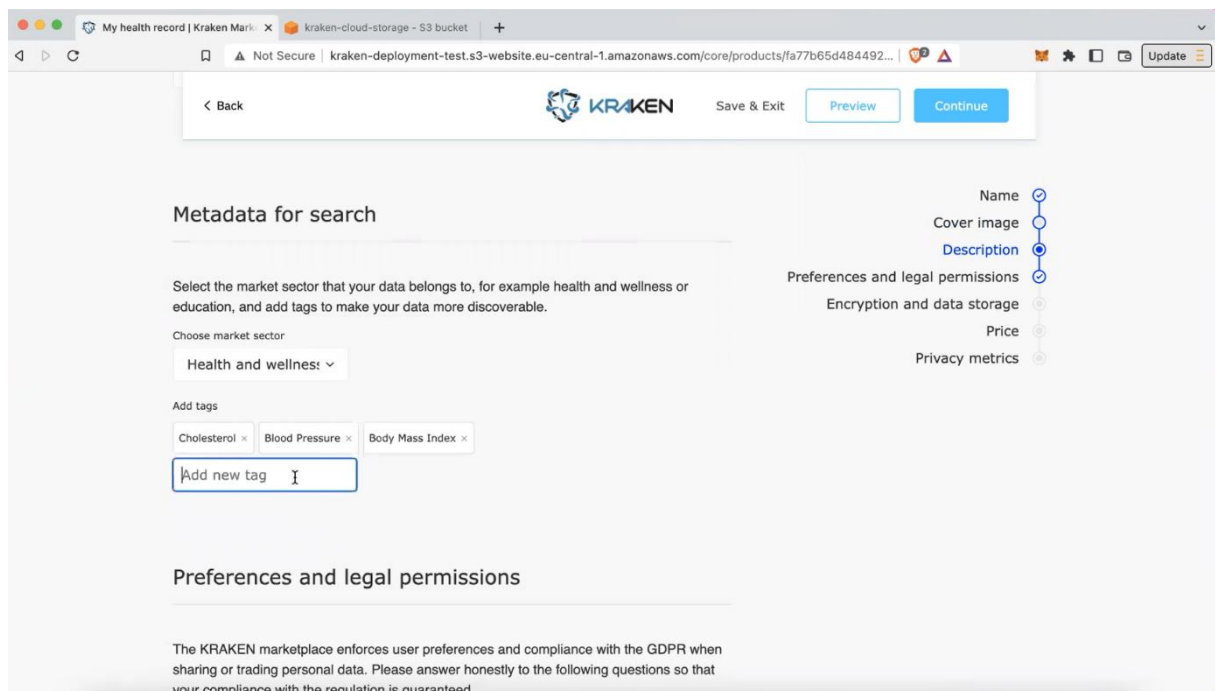

Figure 14a: Marketplace dashboard
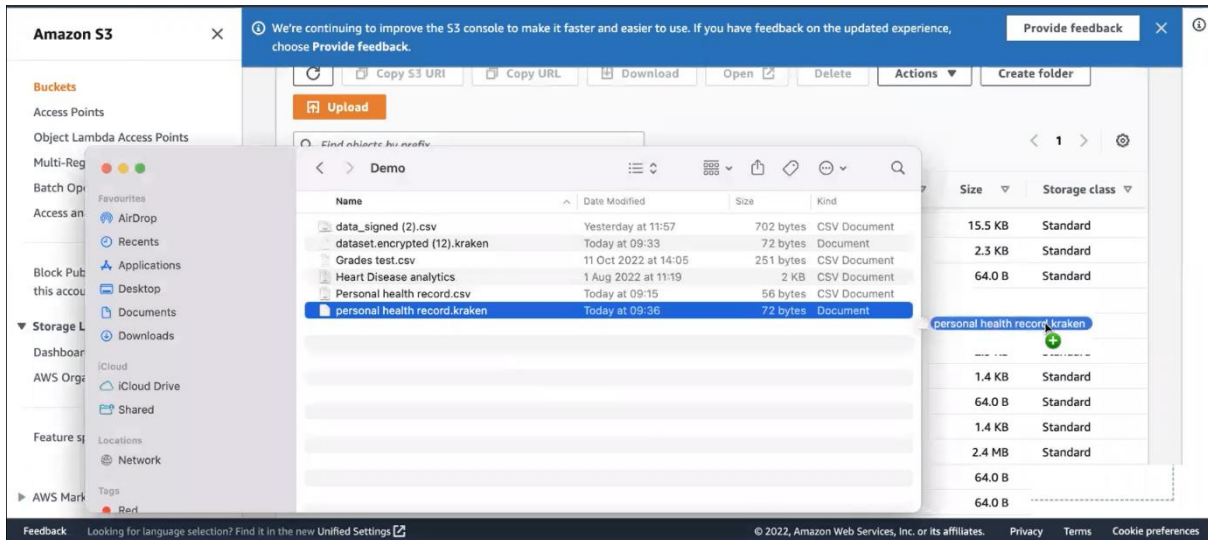

Figure 14b: Data provider creates a new product

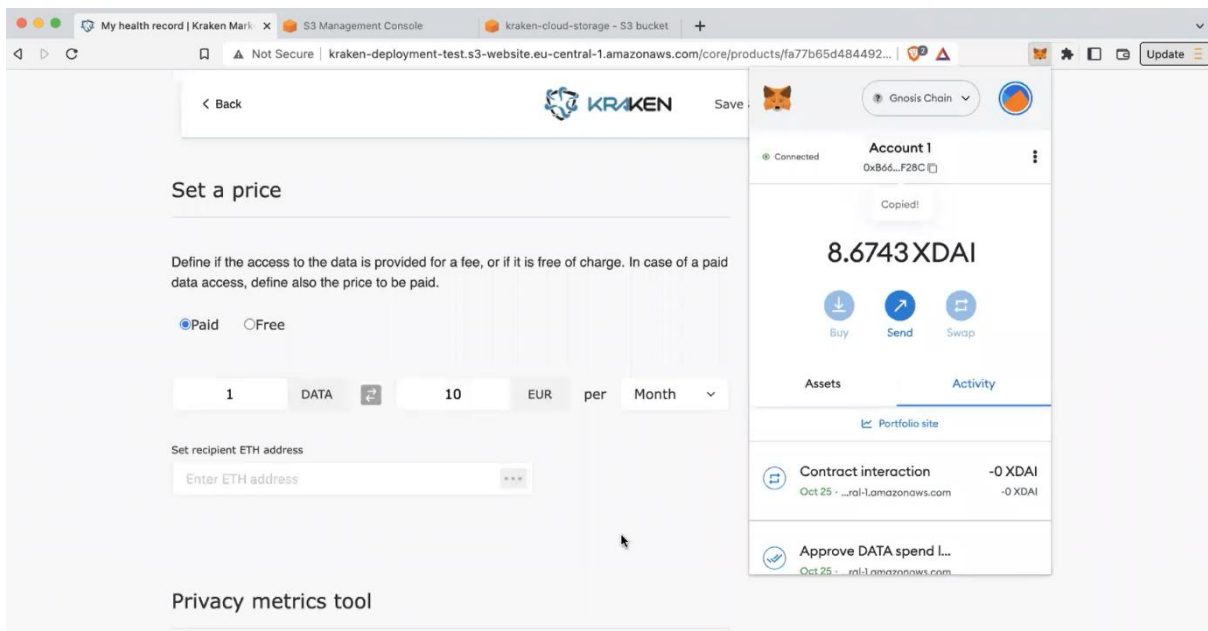**Figure 14c: Data provider selects the dataset to share**

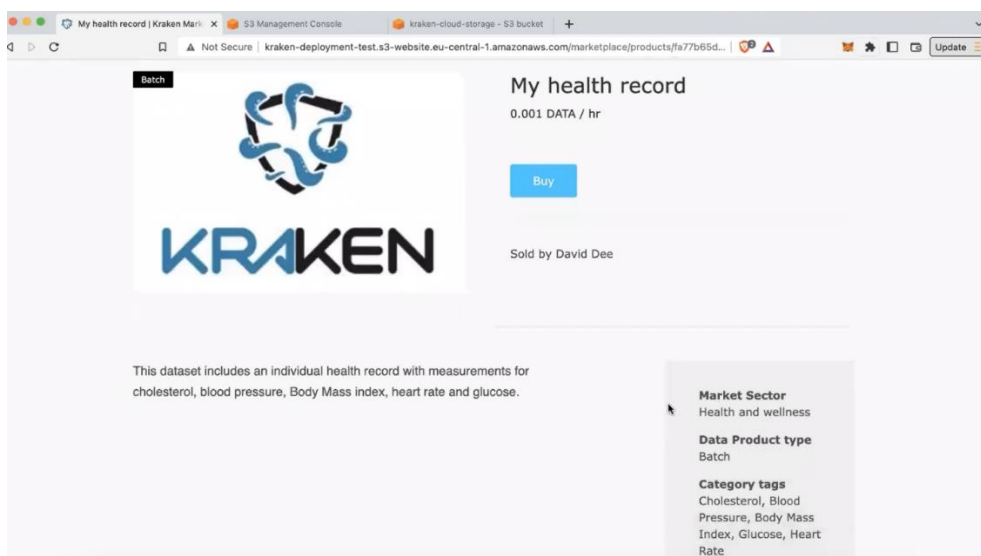**Figure 14d: Data provider pricing the new product**

Figure 14e: New product published on the marketplace

A recorded video of the process can be watched through the following KRAKEN web page link:

https://krakenh2020.eu/pilots/health

The use of the SSI mobile app is a common process to all the use cases when the user wants to access the service provider such as the marketplace or the university site leveraging SSI solution.

The user read the QR code the marketplace shows (Figure 15a) and a connection is established between de marketplace and the SSI mobile app, through this connection the user accepts the credential offered by the marketplace for accessing the service (Figure 15b).
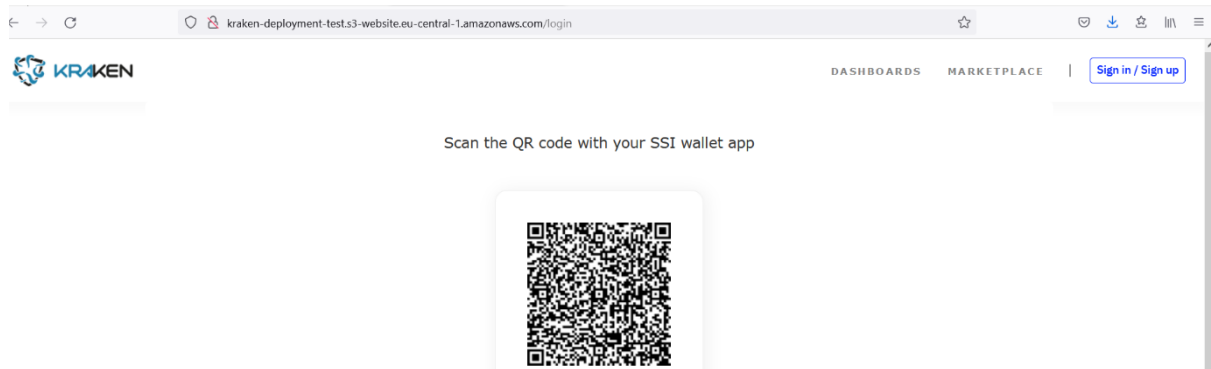

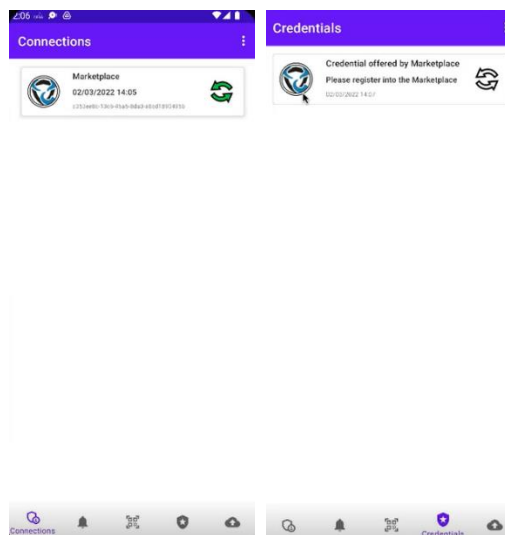**Figure 15a: Data provider accessing the marketplace by using the SSI app**

Figure 15b: Connection established, and credential accepted in the SSI mobile app

A recorded video of the process can be watched through the following KRAKEN web page link:

https://krakenh2020.eu/pilots/health

In case a person is acting on behalf an organization (e.g., a private company or a research centre), beside the VC issued by the marketplace for the login process, that person must provide a VC issued by the organization for presenting to the marketplace. In this complex process is also involved the Depute tool (user web app for requesting the VC and the administrator system side for accepting the request and issue the credential). Additionally, behind the scenes and transparent to the user, the KRAKEN Company Identification Tool (KCIT) is used for verifying the company DID and again the Depute for checking if a credential has been revoked. This process has been tested by the developer team from different partners and the marketplace support team.

Figures 16a to 16c shows some screenshots on how the person acting in behalf of an organisation asks to the organisation for a VC for this purpose (on the up to the right side the user web site, on the up

to the left side the admin web site, on the down left side the KCIT tool and on the down right side the user mobile).

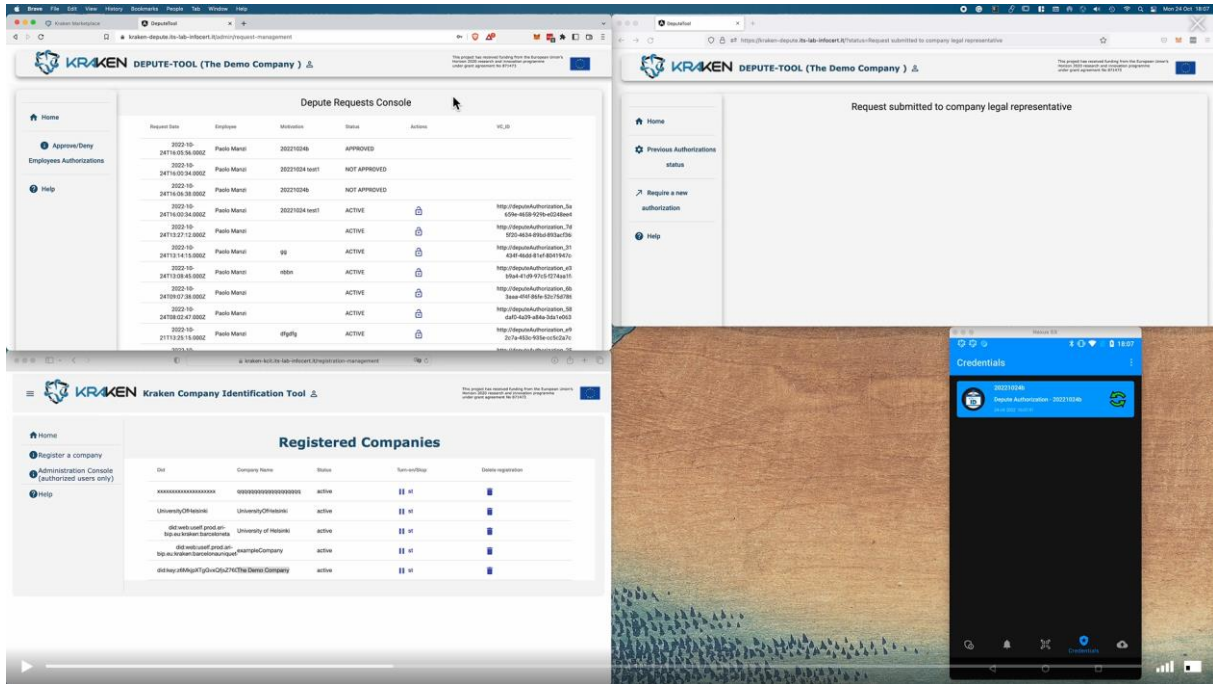Figure 16a depicts the dashboard of the components involved in the process.

Figure 16a: User Credential from the Depute tool user web app, Depute admin web app and KCIT

Figure 16b shows the credential presented by the user on the bottom right side and the marketplace registration web page for accessing the KRAKEN data exchange platform.
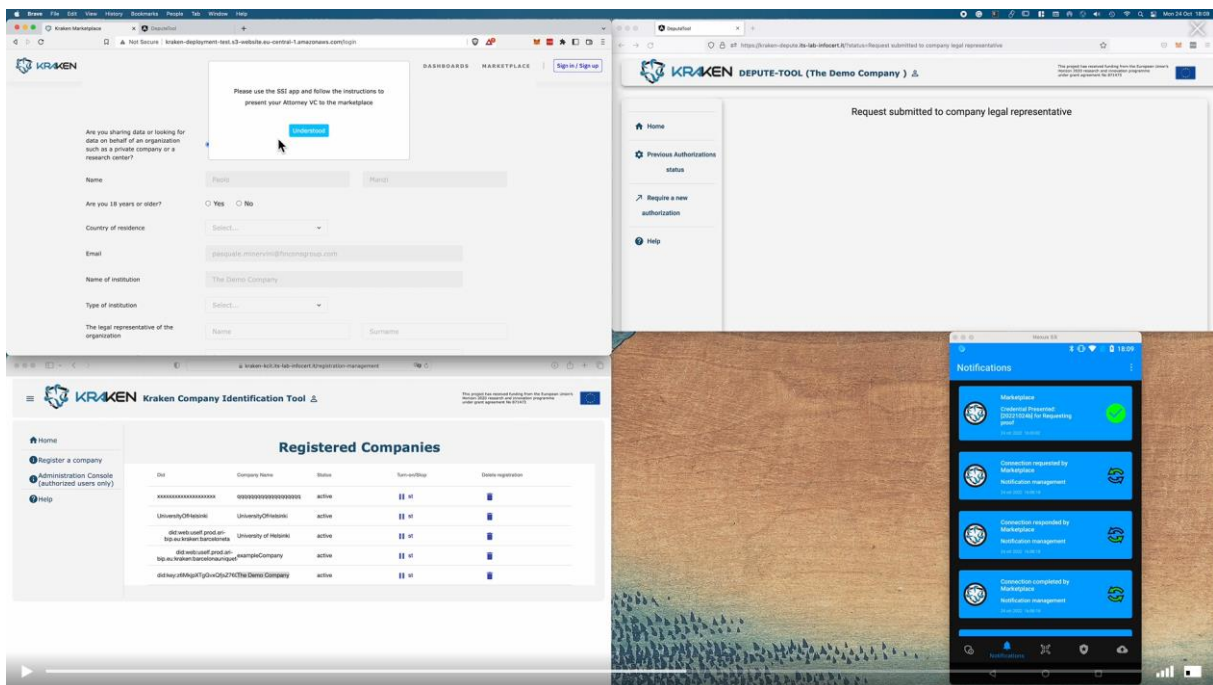

Figure 16b: Credential presented to the marketplace site, the Depute admin web app and KCIT

Figure 16c presents the credentials on the mobile wallet issued by the Depute and the marketplace (down right) and the company validation (down left) made by the marketplace for giving access to the marketplace (up to the left).
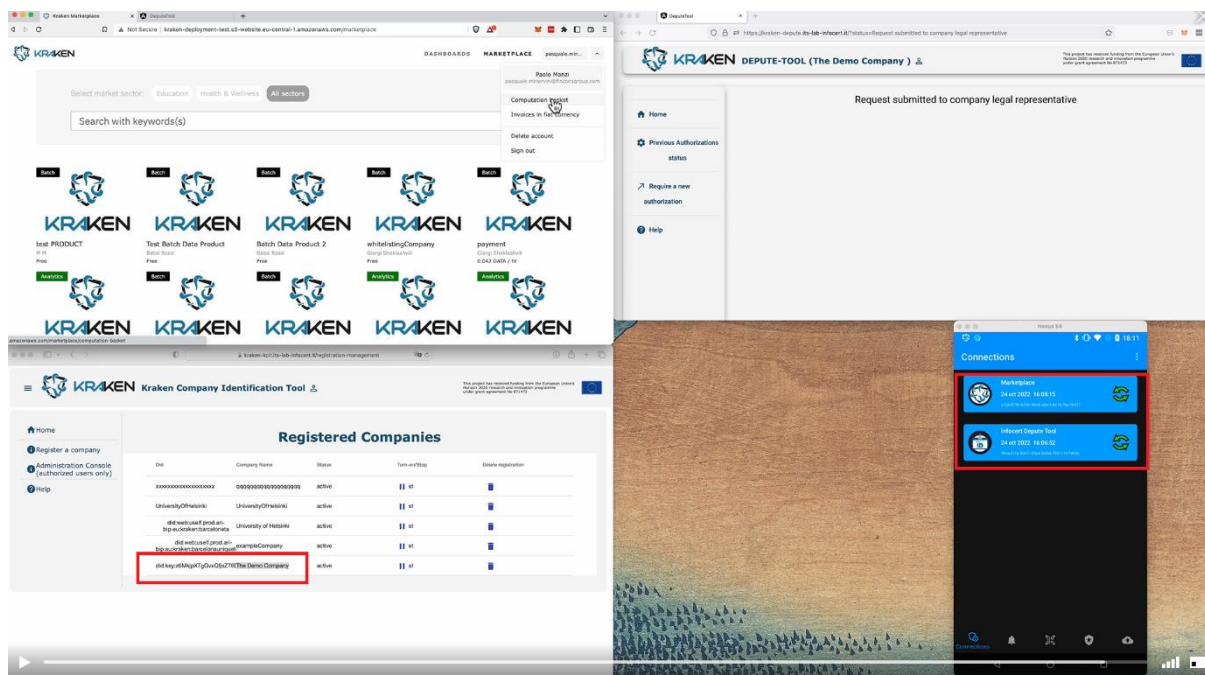
Figure 16c: Shows the credentials provided by the user for accessing the marketplace

Recorded videos of the whole process can be watched through the following KRAKEN web page links:

https://krakenh2020.eu/pilots/health

The process for creating a new product on the marketplace can be watched through the following KRAKEN web page link:

https://krakenh2020.eu/pilots/health

4.2   Use case 2: The data consumers purchase access to data

Figure 17 provides a high-level overview infographic of the UC 2 The data consumers purchase data. The infographic can be downloaded from the following KRAKEN web page link:

https://krakenh2020.eu/sites/kraken/files/public/content-files/2022/UC2_DataConsumersBuy.pdf

In this UC the DPs can offer two types of datasets on the SSI-enabled marketplace:

1. **Data streams** that include health, diet, physical activity and other wellness data collected by mobile apps, wearable devices and other sources. These are available within the same environment, creating additional value for organisations engaged in big data type analytics.
2. **Personal health records** collected and stored, such as laboratory results, medical records and radiology images.

The marketplace shows a catalogue with the available datasets and the metadata. It allows researchers to browse and select datasets of interest from a wide range of medical records provided by hospitals.

Data consumers can register and access to the marketplace through the SSI solution by using an SSI mobile app which stores Verifiable Credentials (VCs) and key material for accessing the marketplace.
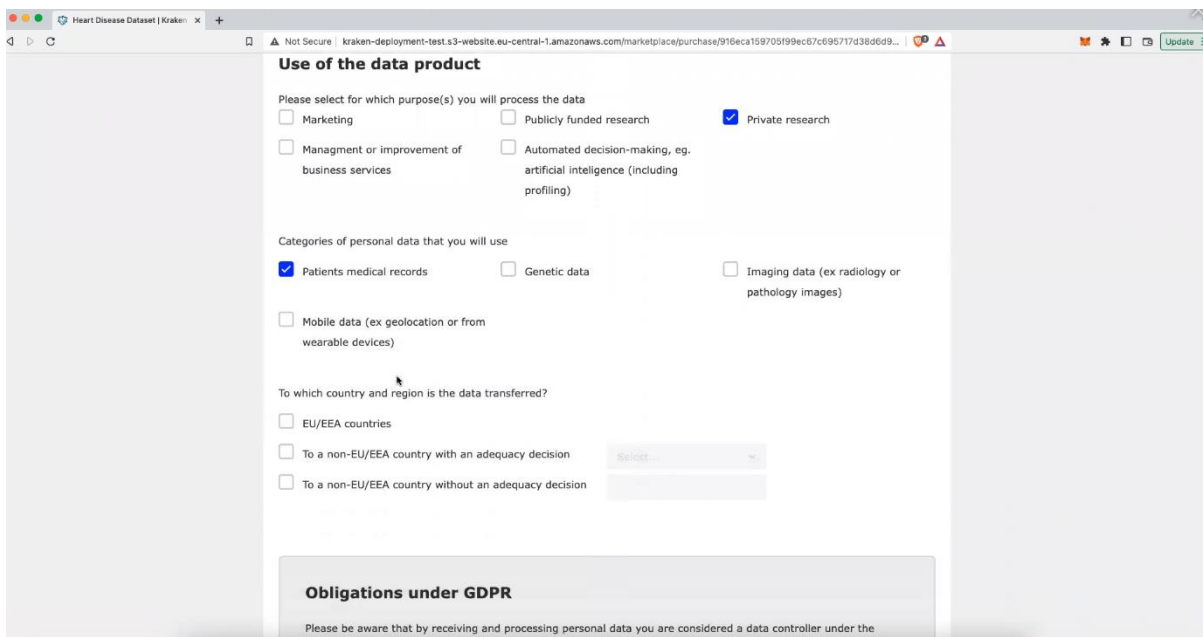
Figure 17: The data consumers purchase access to data[3]

The following figures (18a to 18c) show some screenshots of the health batch data product purchase process.

Figure 18a presents the selection of the dataset by the consumer.

Figure 18a: The consumer selects the dataset to access on the marketplace

The consumer indicates the use of the data product (Figure 18b).

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[3] https://www.krakenh2020.eu/sites/kraken/files/public/content-files/2022/UC2_DataConsumersBuy.pdf

Figure 18b: The consumer determines how the dataset will be used

The consumer purchases the dataset, confirms the transaction and finally is able to download the file (Figure 18c).
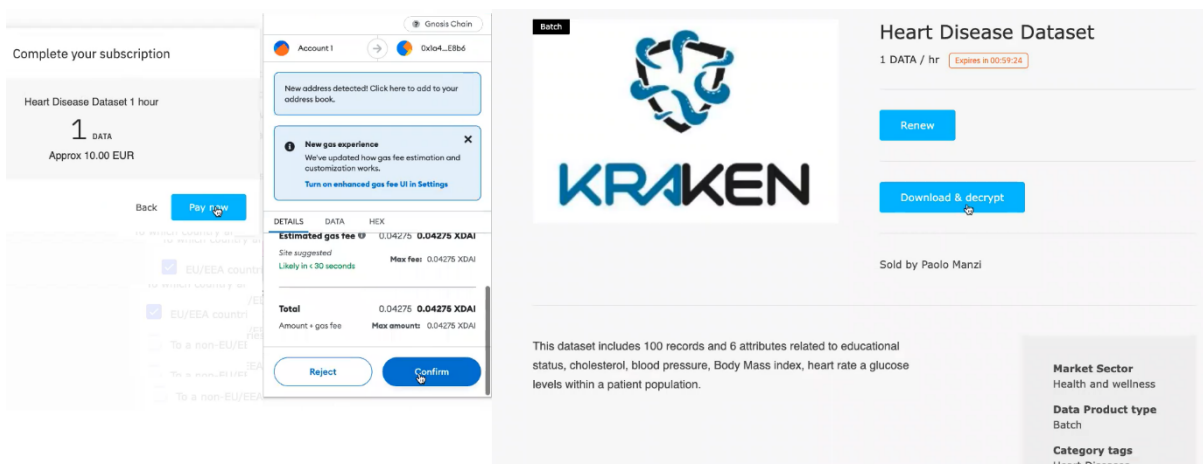

Figure 18c: The consumer confirms the payment and download the dataset

A recorded video of the whole process can be watched through the following KRAKEN web page link:

https://krakenh2020.eu/pilots/health

4.3   Use case 3: The data monetization process

Figure 19 shows a high-level overview of the UC3 The data monetization process. The infographic can be downloaded from the following KRAKEN web page link:

https://krakenh2020.eu/sites/kraken/files/public/content-files/2022/UC3_TheDataMonetisationProcess.pdf

The KRAKEN biomedical marketplace will allow the exchange of economic value primarily using Streamr's token DATACoin to pay for access to Data Products or computations on Data Products. Users will also be allowed to exchange economic value using fiat currencies for Batch Data Products.

An autonomous community of commercial data actors called Data Union is created through an open-source platform, this model provides direct empowerment of the data owner.

The KRAKEN marketplace uses the public xDai blockchain designed for fast and inexpensive payment transactions.

The monetisation of personal data within the KRAKEN marketplace involves the sale of access to data. In the case of direct access to batch datasets and data streams, the marketplace has taken a payment for time-based-access approach, enabling direct monetisation on a per-use basis. In the case of privacy-preserving analytics using SMPC (Secure Multi-Party Computation), the KRAKEN marketplace will take a pay-per computation / query approach. The data consumer doesn't obtain direct access to the input datasets and only obtains access to the results of the query or computation.

When access to a real-time data stream product has been purchased, it will be granted access to a consumer. If, on the other hand, one or more personal health records have been transacted, a physical copy of the data will be exchanged only after appropriate anonymisation.

Once the transaction is executed, involved parties will be able to exchange data in a secure way.

Figure 19: The data monetization process[4]

The following Figure 20 shows some screenshots of the health dataset analytics product payment process, where the consumer chooses the access period to data, the payment token, confirming the transfer of funds and confirming the subscription until the transaction is completed.
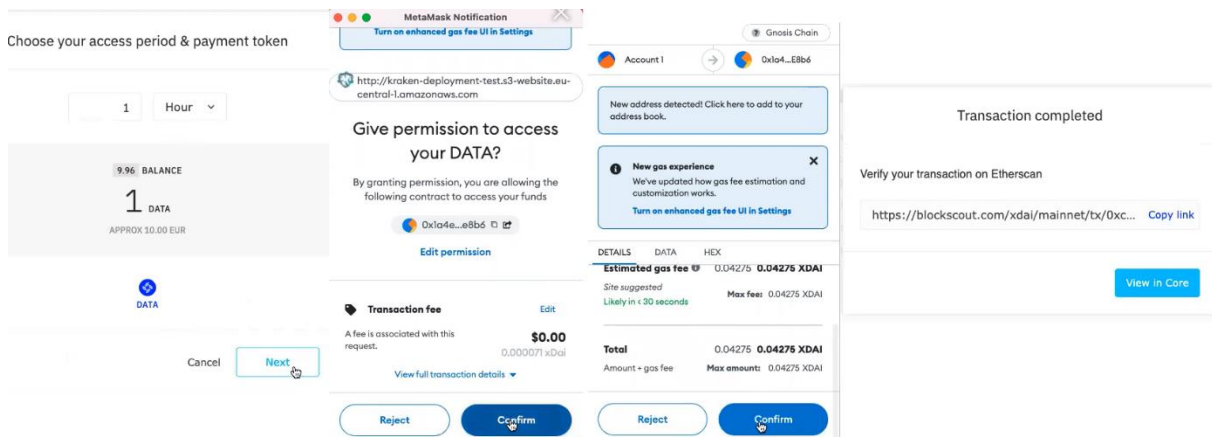

Figure 20: The consumer chooses the access period and payment token

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[4] https://www.krakenh2020.eu/sites/kraken/files/public/content-files/2022/UC3_TheDataMonetisationProcess.pdf

The payment process is included in the UC2 recorded video and can be watched through the following KRAKEN web page link:

https://krakenh2020.eu/pilots/health

4.4   Use case 4: Data Analytics as a service (DAaaS)

Figure 21 depicts a high-level overview of the UC4 Data Analytics as a service (DAaaS). The infographic can be downloaded from the following KRAKEN web page link:

https://krakenh2020.eu/sites/kraken/files/public/content-files/2022/UC4_DataAnalyticsAsAService%28DAaaS%29.pdf

The KRAKEN platform enables distributed analytics as an additional service, based on SMPC.
Data consumers will be able to pay for standard set of fixed analytics queries (e.g., Average, Standard deviation, Min and Max) on the data advertised in the marketplace. The results are returned to the consumer when payment is confirmed, without granting direct access to the data.
Multiple companies currently experimenting with these techniques will be able to offer their services through the KRAKEN platform, leveraging the availability of datasets (Data Products) in the KRAKEN marketplace, while data owners will be remunerated for each analytics request.

Figure 21: Data Analytics as a service (DAaaS)[5]

The following figures show screenshots of the health analytics product publication process (Figure 22a to 22c) and the health analytics product purchase and result processes (Figure 23a to 23c).

Figure 22a shows the type of method for publishing the data, in this case Privacy-preserving remote analysis.

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[5] https://www.krakenh2020.eu/sites/kraken/files/public/content-files/2022/UC4_DataAnalyticsAsAService%28DAaaS%29.pdf

Publish data on the Kraken marketplace

The KRAKEN marketplace allows you to publish different types of data which can be accessed by data consumers in different ways. Select the most appropriate method for publishing your data from the options below.
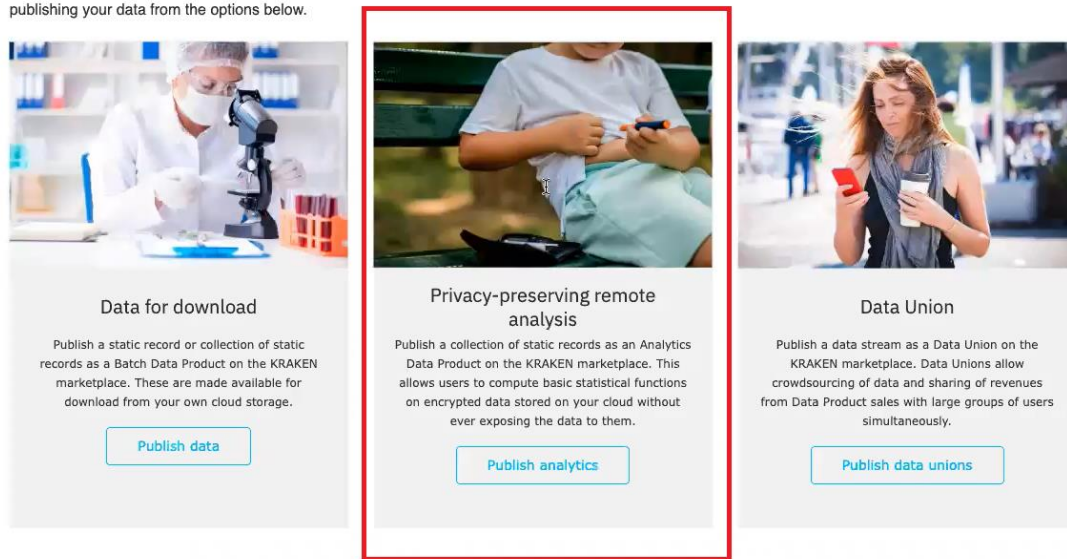

Figure 22a: The data provider selects the method of publication

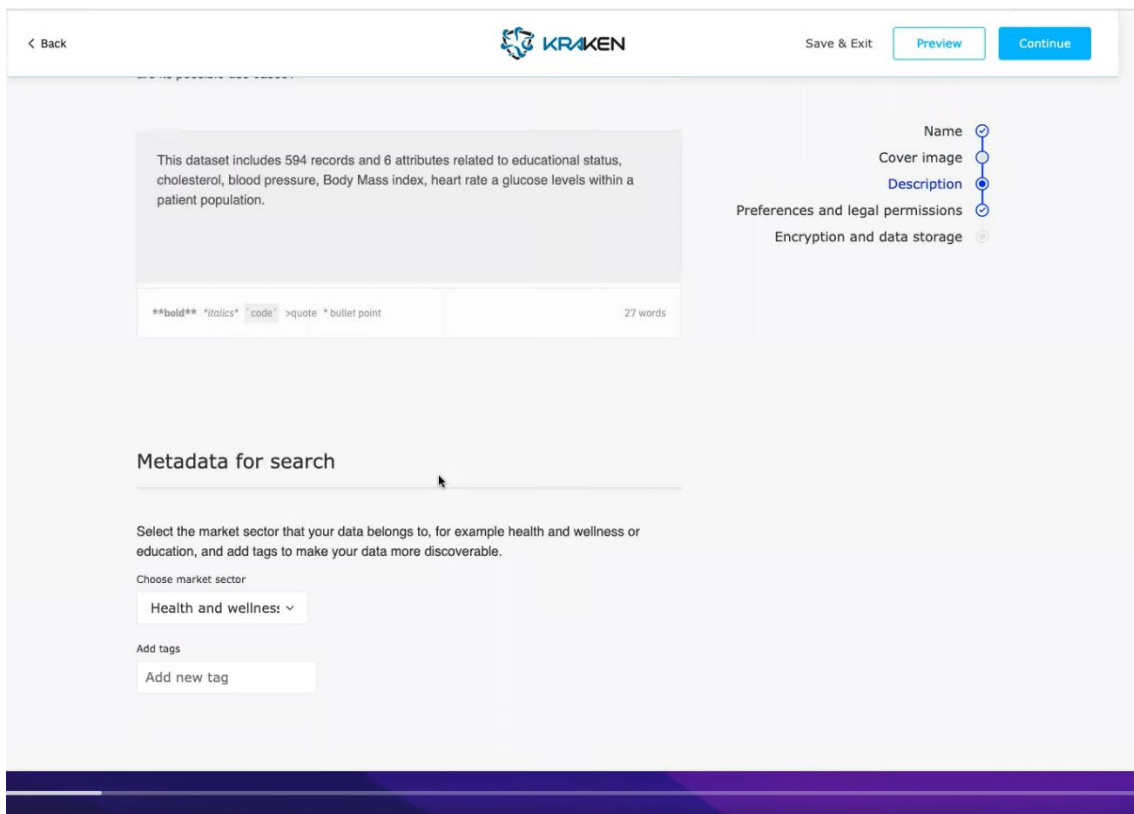The data provider defines the analytics product (Figure 22b)

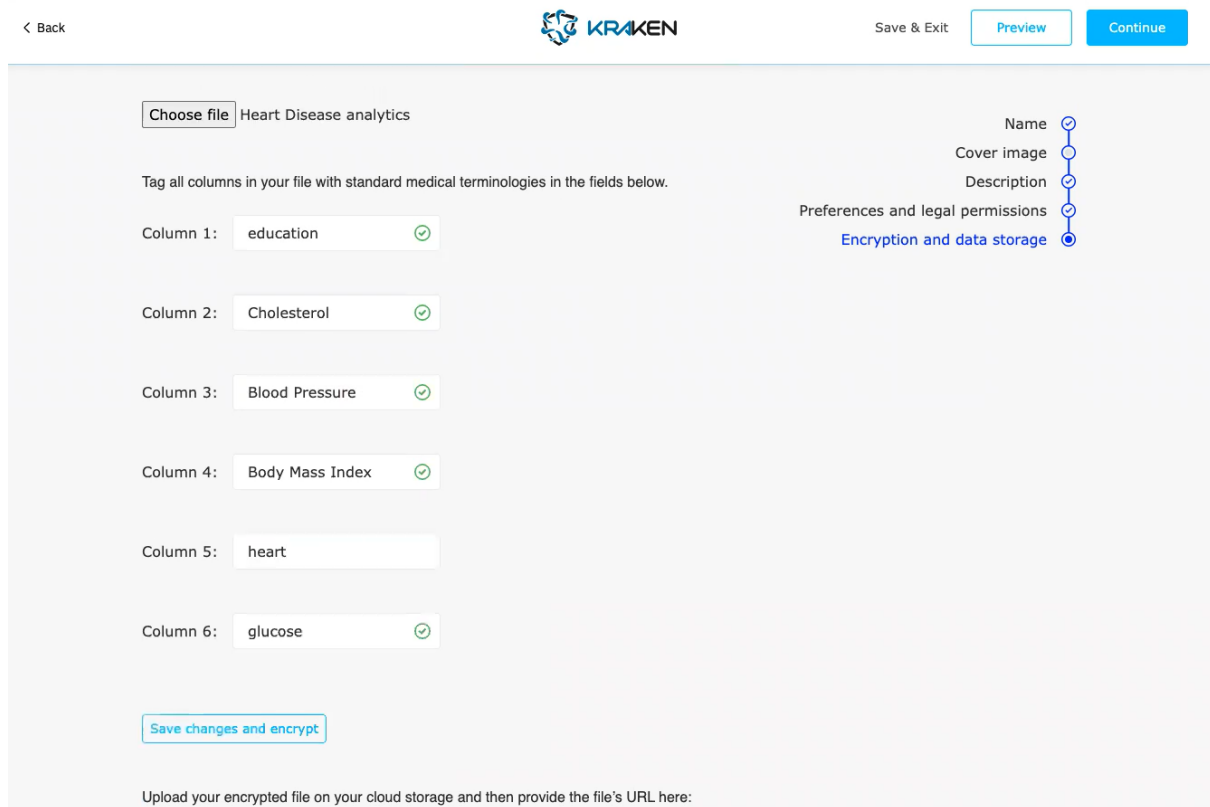**Figure 22b: The data provider defines the analytics product**

Figure 22c: The data provider tags the columns to be encrypted

Similar process to Figure 18c in UC1 follows afterwards.

Once the analytics product is available through the marketplace (Figure 23a), the data consumers are able to purchase the results.
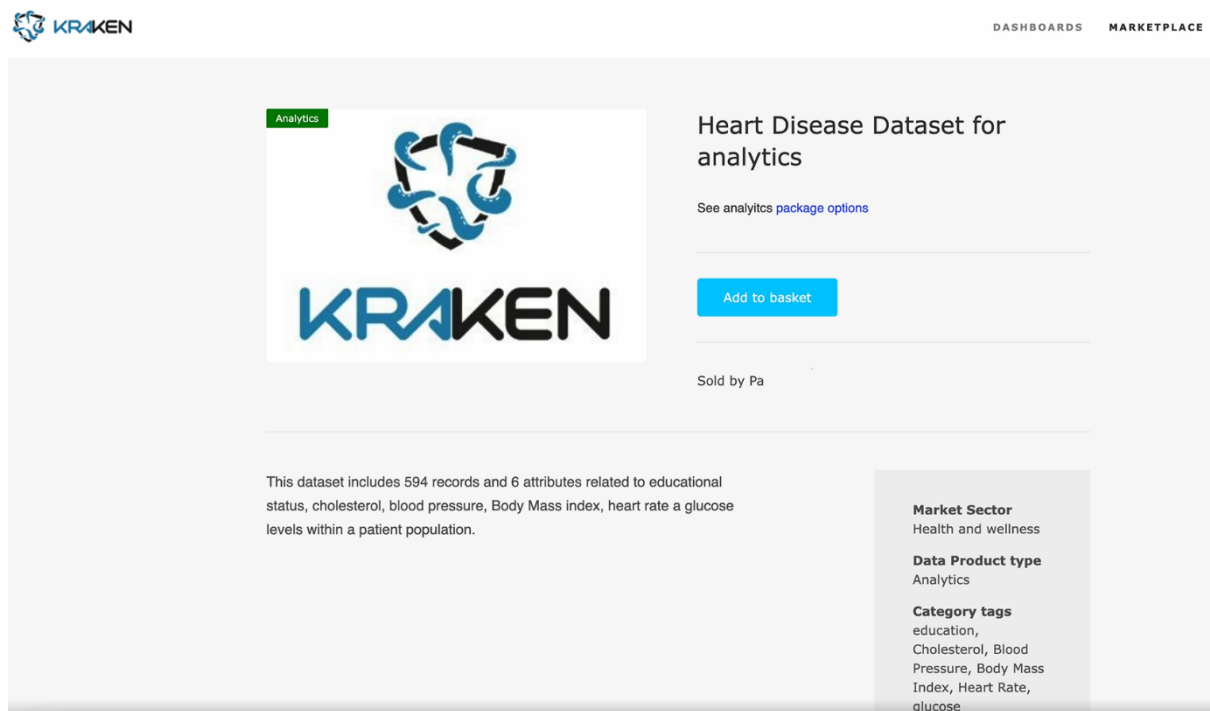

Figure 23a: Analytics product available on the marketplace

According to the computation options the consumer buys access to the analytics package (Figure 23b).

Figure 23b: Computation features for analytics package

After the confirmation of the transaction and the computation between the different SMPC nodes the results are provided to the consumer (Figure 23c).

	education	Cholesterol	Blood Pressure	Body Mass Index	Heart Rate	glucose
average	1.888890266418457	233.2628469467163	134.91932010650635	26.04709529876709	75.95966815948486	79.50512599945068
standard deviation	1.062577247619629	45.076019287109375	23.201083183288574	5.4572954177856445	10.849327087402344	33.11737060546875
min	0	0	96	0	57	0
max	4	332	206	45.80000019073486	100	225

Figure 23c: Analytics results

A recorded video of the health analytics product publication process can be watched through the following KRAKEN web page link:

https://krakenh2020.eu/pilots/health

The recording of the health analytics purchase process, and the retrieved results can be watched through the following KRAKEN web page link:

https://krakenh2020.eu/pilots/health

4.5   Use case 5: University Produces Academic Data

Figure 24 presents a high-level overview of the UC5 University Produces Academic Data. The infographic can be downloaded from the following KRAKEN web page link:

https://krakenh2020.eu/sites/kraken/files/public/content-files/2022/UC5_University%20ProducesAcademicData_0.pdf

The University generates a large amount of education data that serves as evidence of students' progress.
The university offers a service to students for requesting VCs (Verifiable Credentials), requiring strong authentication by using eID means through the connection with the eIDAS network.
The University can generate VCs including student graduation certificates (bachelor or master's degree), certificates of attended courses or enrolment status. These VCs are digitally available and easily verifiable authenticity by cryptographic means.

The university generates a VC with the selected student's academic data. The VC will be stored in the student's SSI wallet and backed-up on their SSI cloud wallet and can be shared with other organizations.

The student can use their VCs from different devices and recover the VCs if the mobile is lost or stolen.
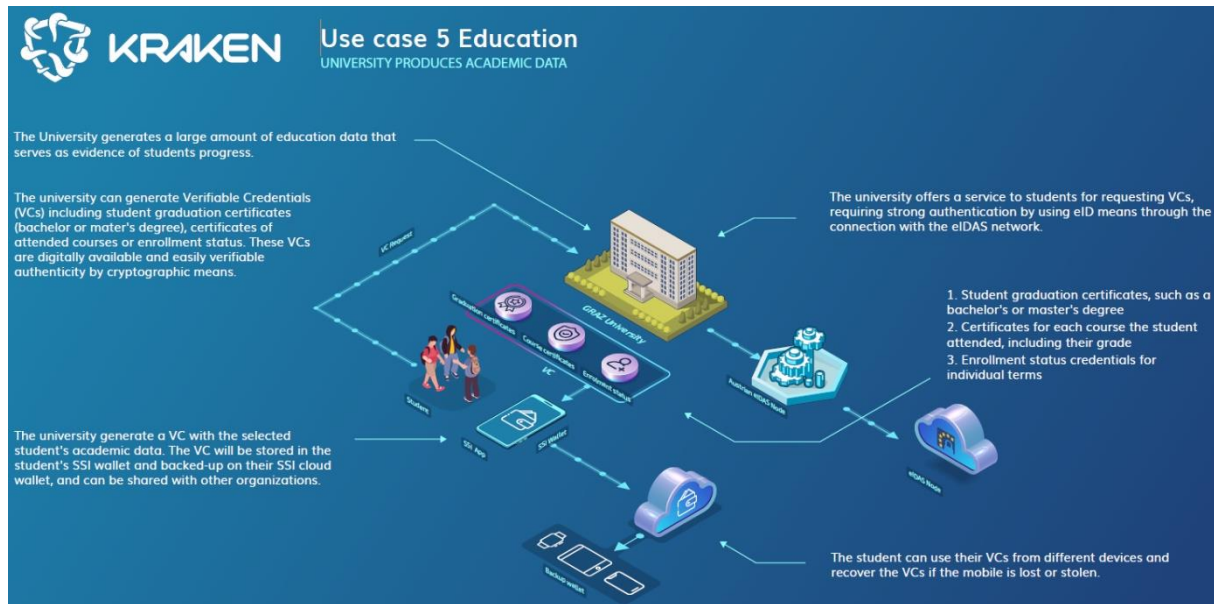

Figure 24: University Produces Academic Data[6]

The student browses to the Education Credential Exporter Graz University online site and login in (Figure 25a).
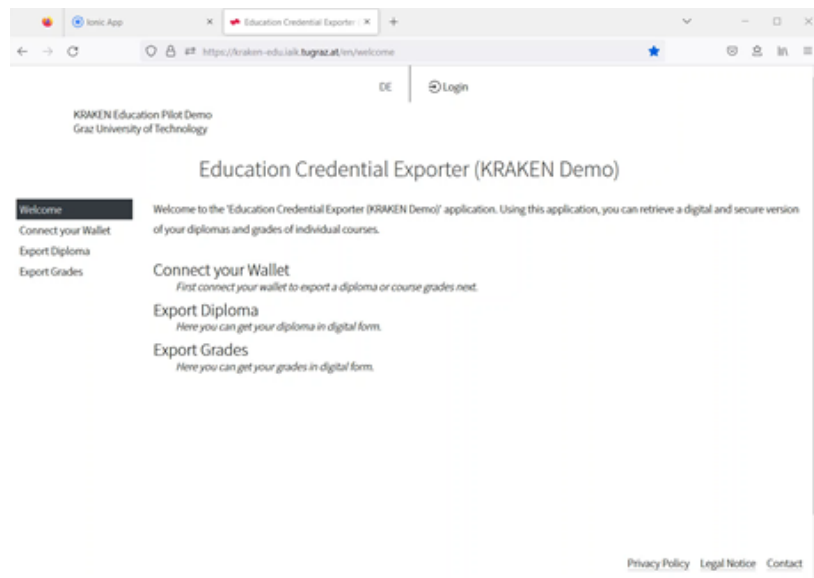

Figure 25a: Graz University login page

The student connects her/his wallet with the Graz system (Figure 25b).
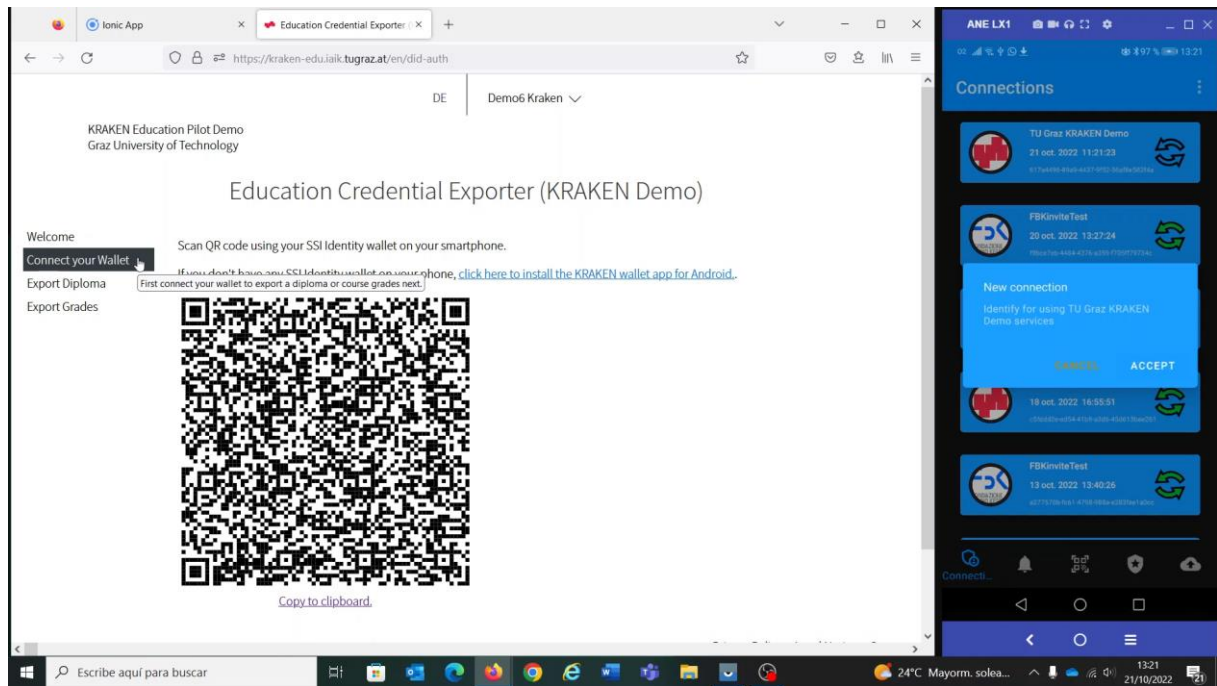

Figure 25b: The student connects her wallet with the Graz system

Once the connection is stablished the student can export her/his diploma or grades (Figure 25c).
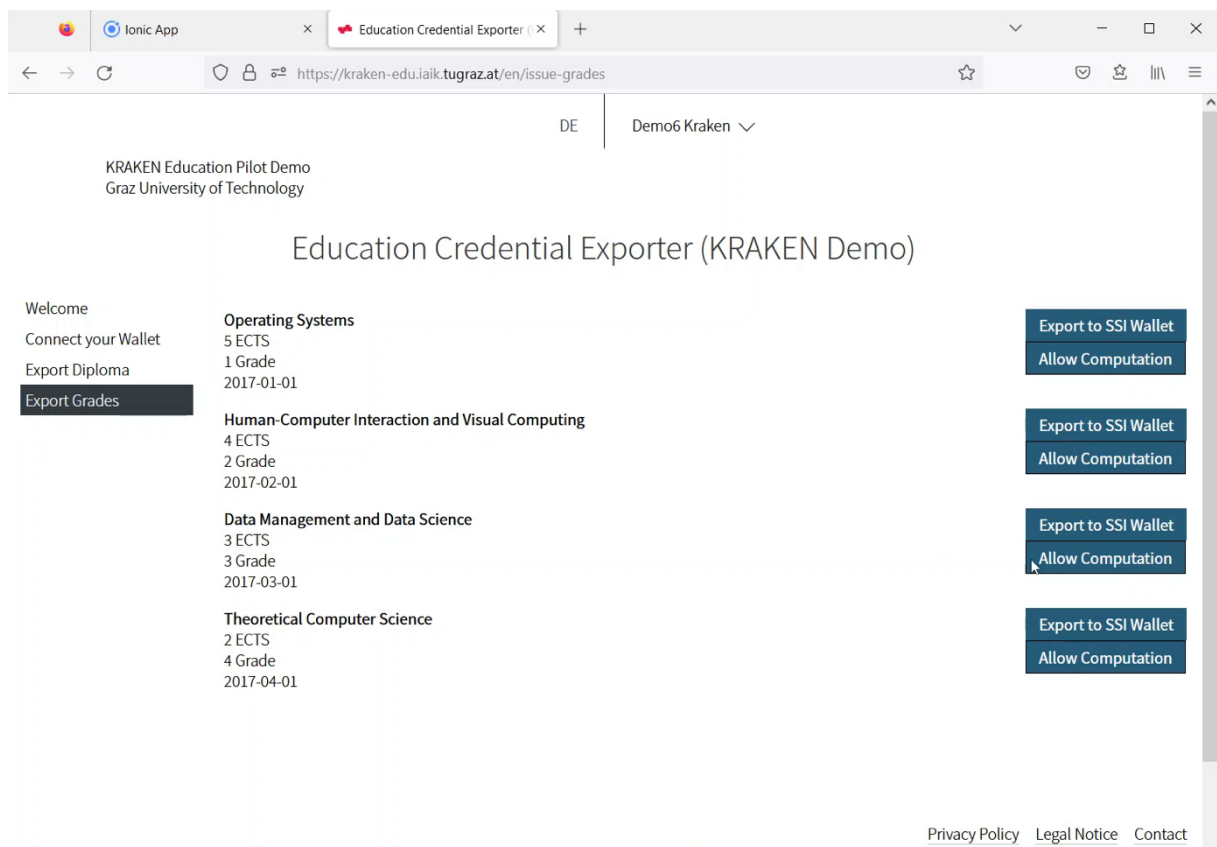

Figure 25c: The student exports diploma or grades to her wallet

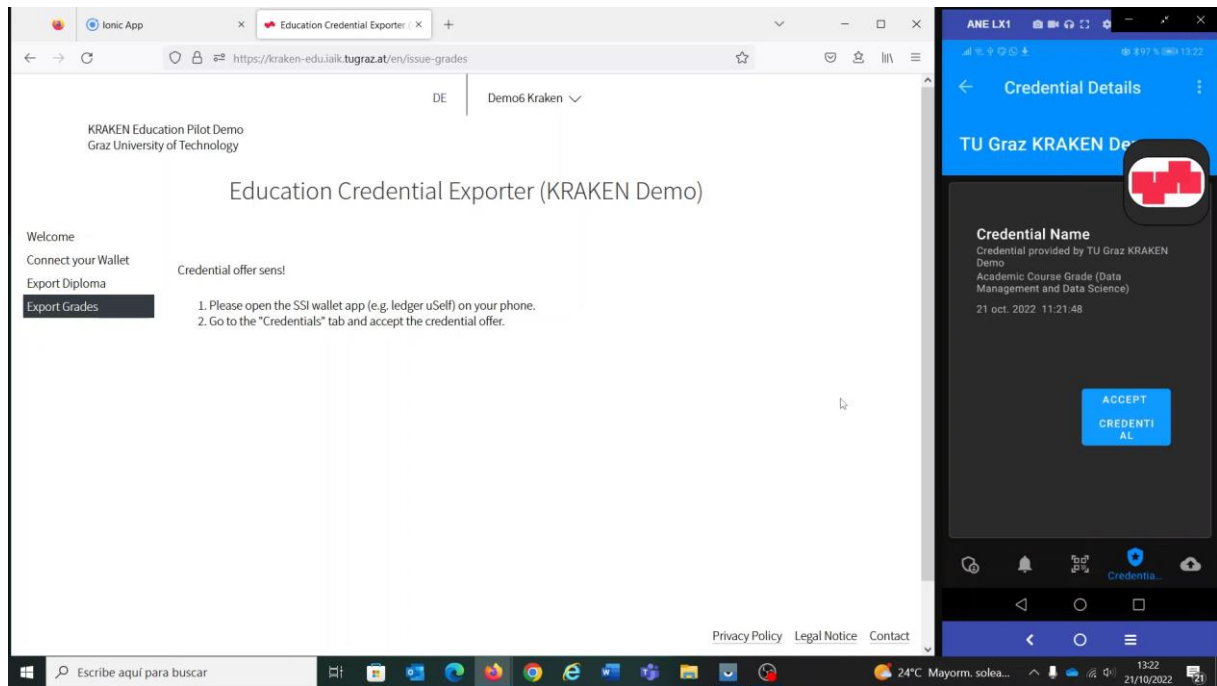The student accepts the credential sent by the Graz system (Figure 25d).

Figure 25d: The student accepts the credential sent by the university

The student receives the credential into her wallet for using in the future (Figure 25e).
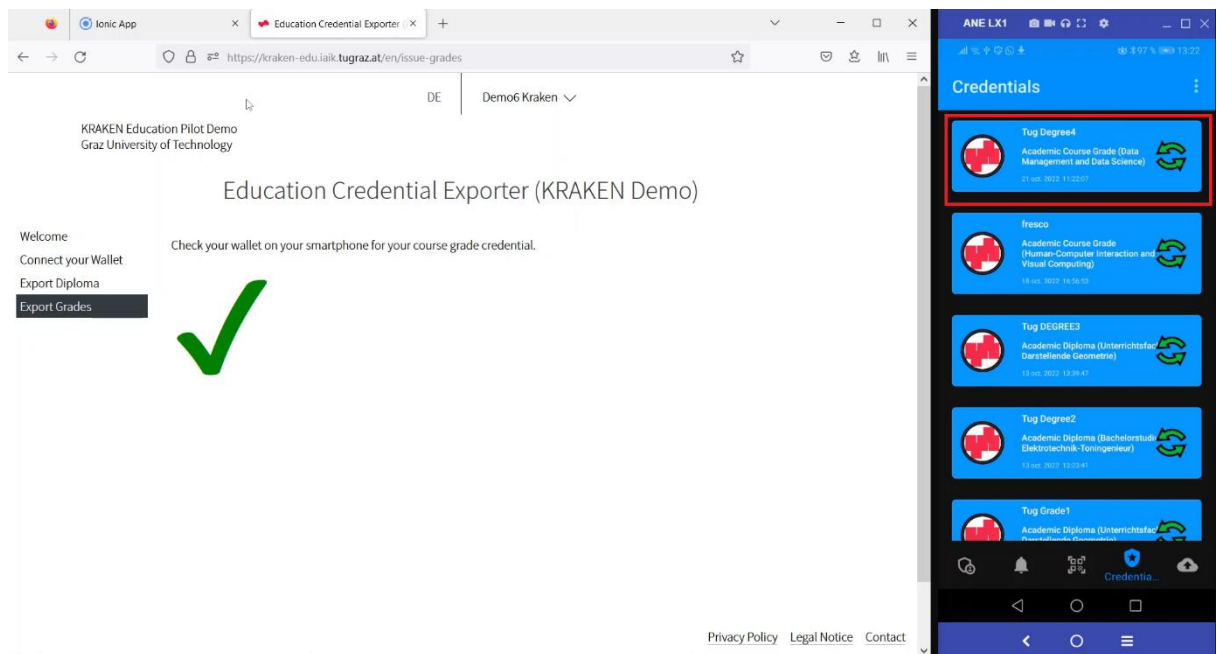
Figure 25e: The credential is stored in the student's smart phone wallet

A complete video recording of this process can be seen in the KRAKEN web page on the following link:

https://krakenh2020.eu/pilots/education

4.6 Use case 6: Recruitment Service Academic Data

Figure 26 shows a high-level overview of the UC6 Recruitment Service Purchases Academic Data. The infographic can be downloaded from the following KRAKEN web page link:

https://krakenh2020.eu/sites/kraken/files/public/content-files/2022/UC6_RecruitmentServiceBuysAcademicData.pdf

The University generates a VC with the selected student's academic data. The VC will be stored in the student's SSI wallet and can be shared with other organizations. The content of the SSI Wallet can be backed-up on their SSI cloud wallet.

Recruitment of candidates will be carried out through an Online Company Recruiting Service (Figures 27a to 27e).

After submitting this VC, the HR (Human Resources) system can reliably verify the validity of the VC via the KRAKEN trusted environment.

The HR department collects applications to support an HR expert in assessing the qualification of applicants according to the desired profiles and find the best match accordingly (Figure 27f).
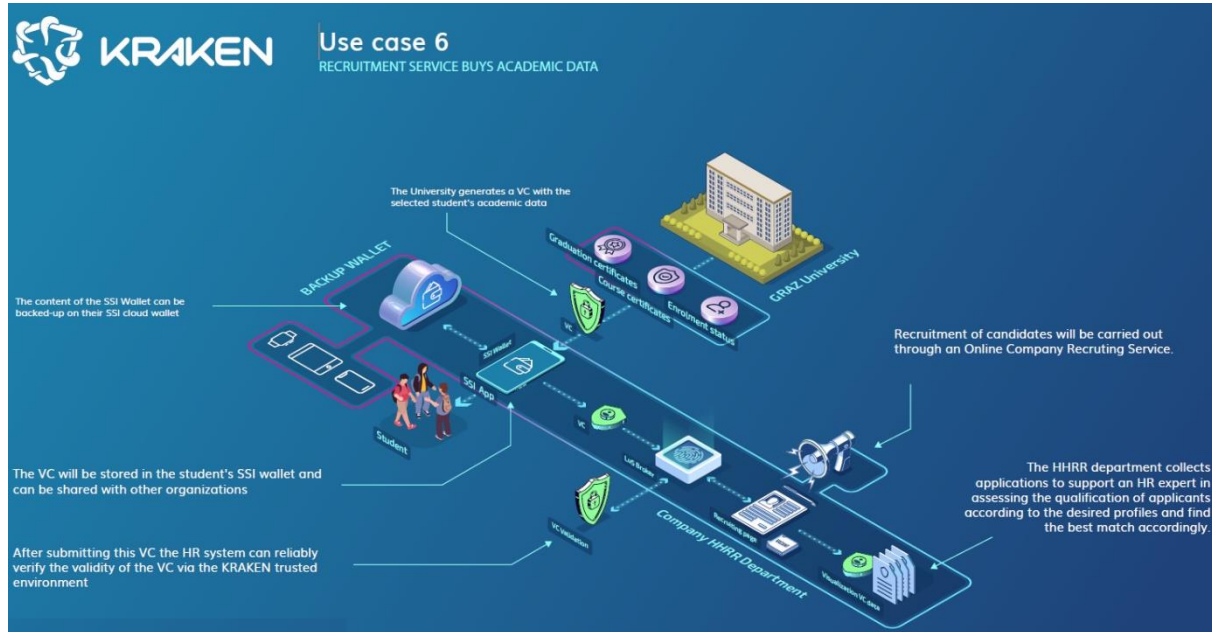

Figure 26: Recruitment Service Purchases access to Academic Data[7]

The student browses to the HR job-application online site and selects an offer (Figure 27a).
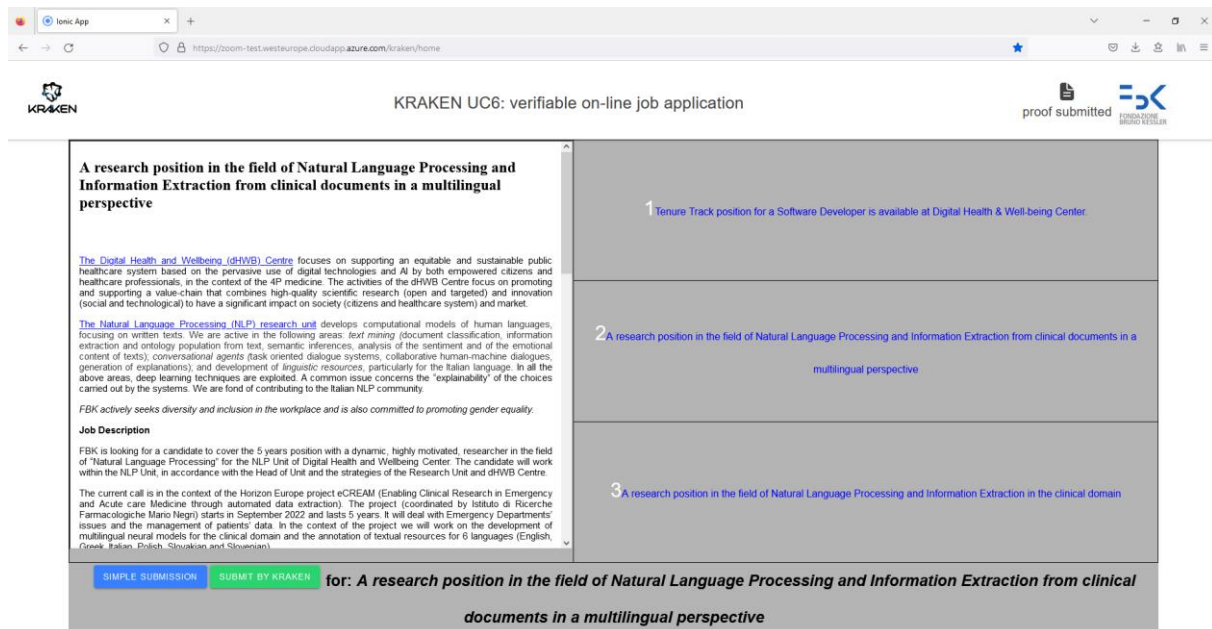
Figure 27a: Description of job application on the HR site

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[7] https://www.krakenh2020.eu/sites/kraken/files/public/content-files/2022/UC6_RecruitmentServiceBuysAcademicData.pdf

The student establishes a connection with the HR job-application online site by using the SSI mobile app (Figure 27b) and register on the site (Figure 27c).
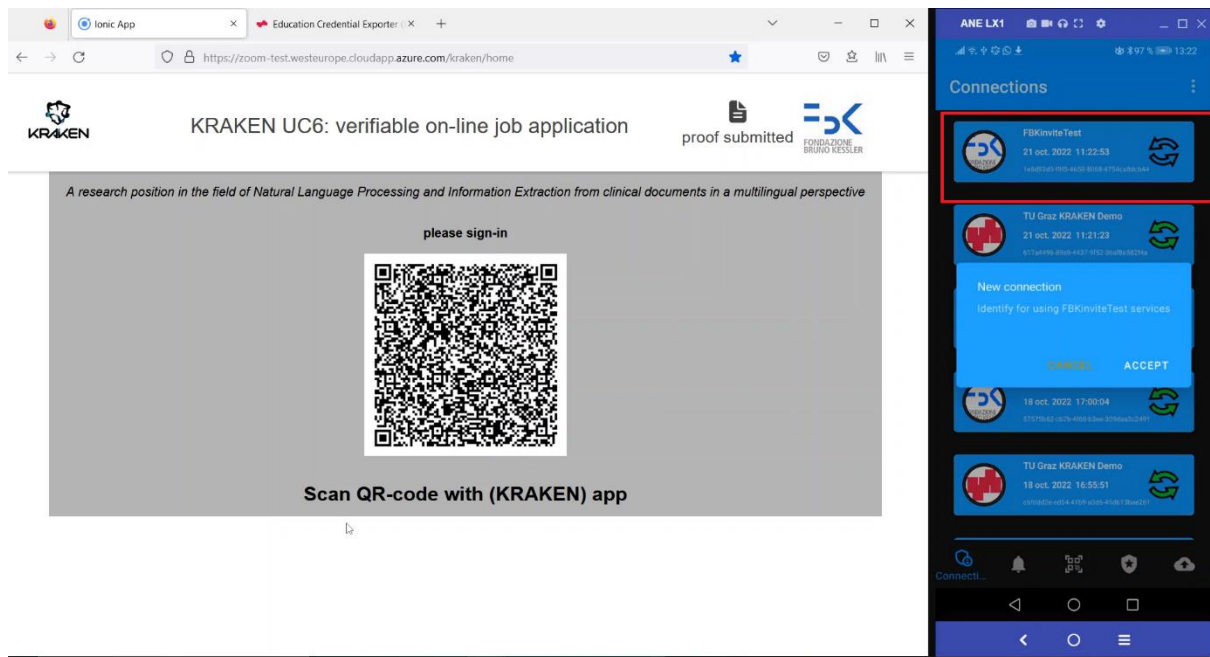
Figure 27b: Student connecting to the HR site
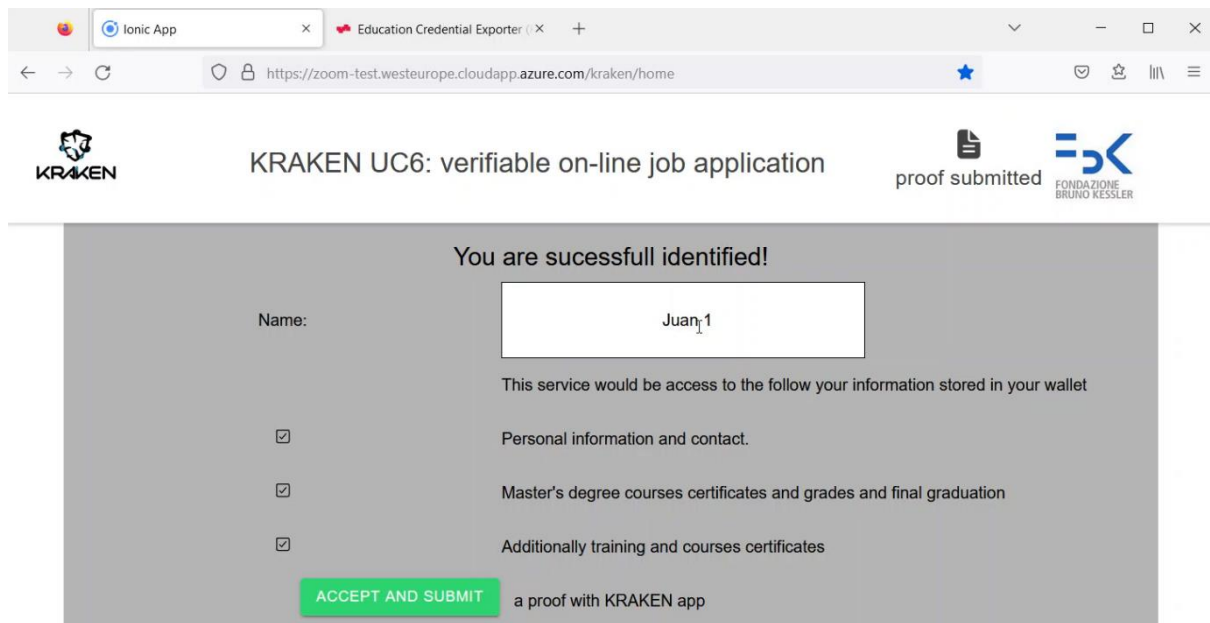
Figure 27c: Student registration and giving consent for using data

Once the connection is stablished the student presents the proof of diploma/degree stored in the mobile app (Figure 27d).
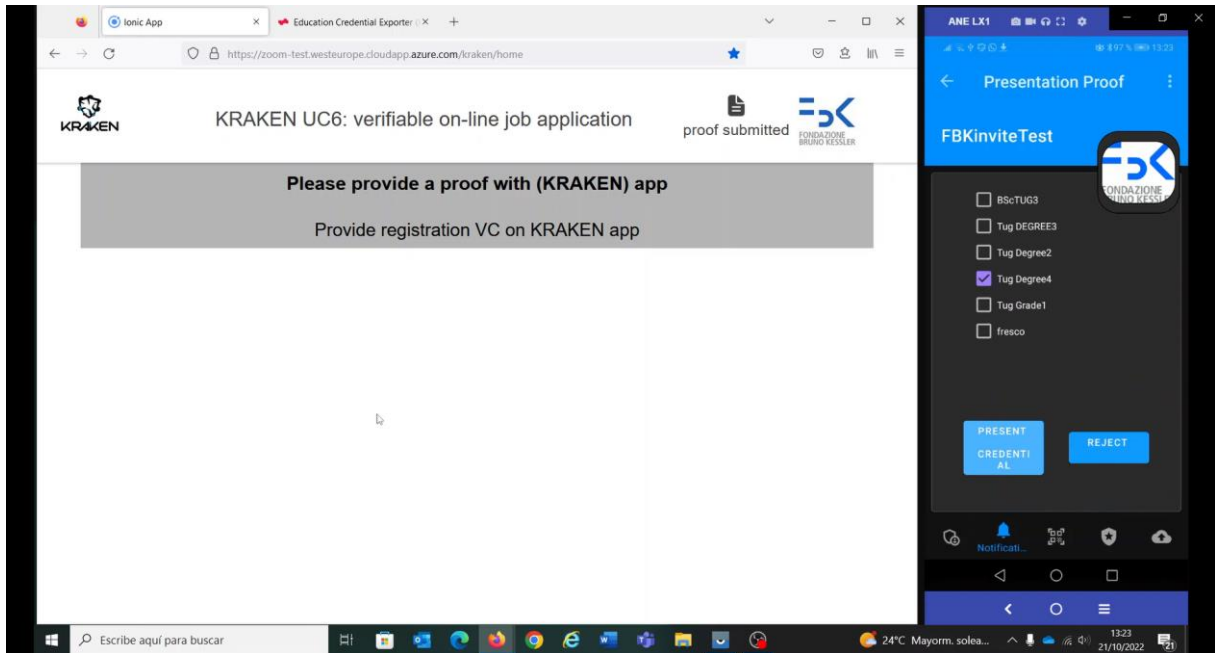
Figure 27d: Student selecting credential to be sent to on-line job application site

The credential reaches the HR job-application online site (Figure 27e) and can be seen by the HR staff (Figure 27f).

Figure 27e: Student applicant successfully registered the application on the HR on-line site

Figure 27f: List of students' applications on the HR on-line site

A complete video recording of this process can be seen in the KRAKEN web page on the following link:

https://krakenh2020.eu/pilots/education

4.7   Use case 7: Processing of Academic Data

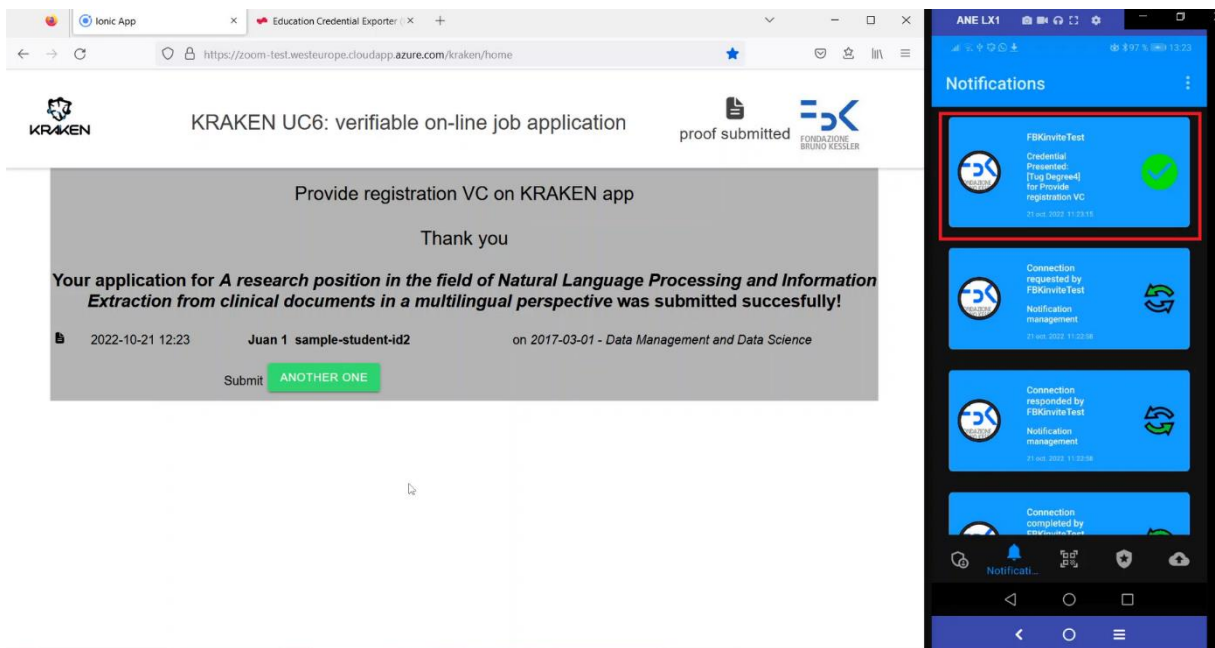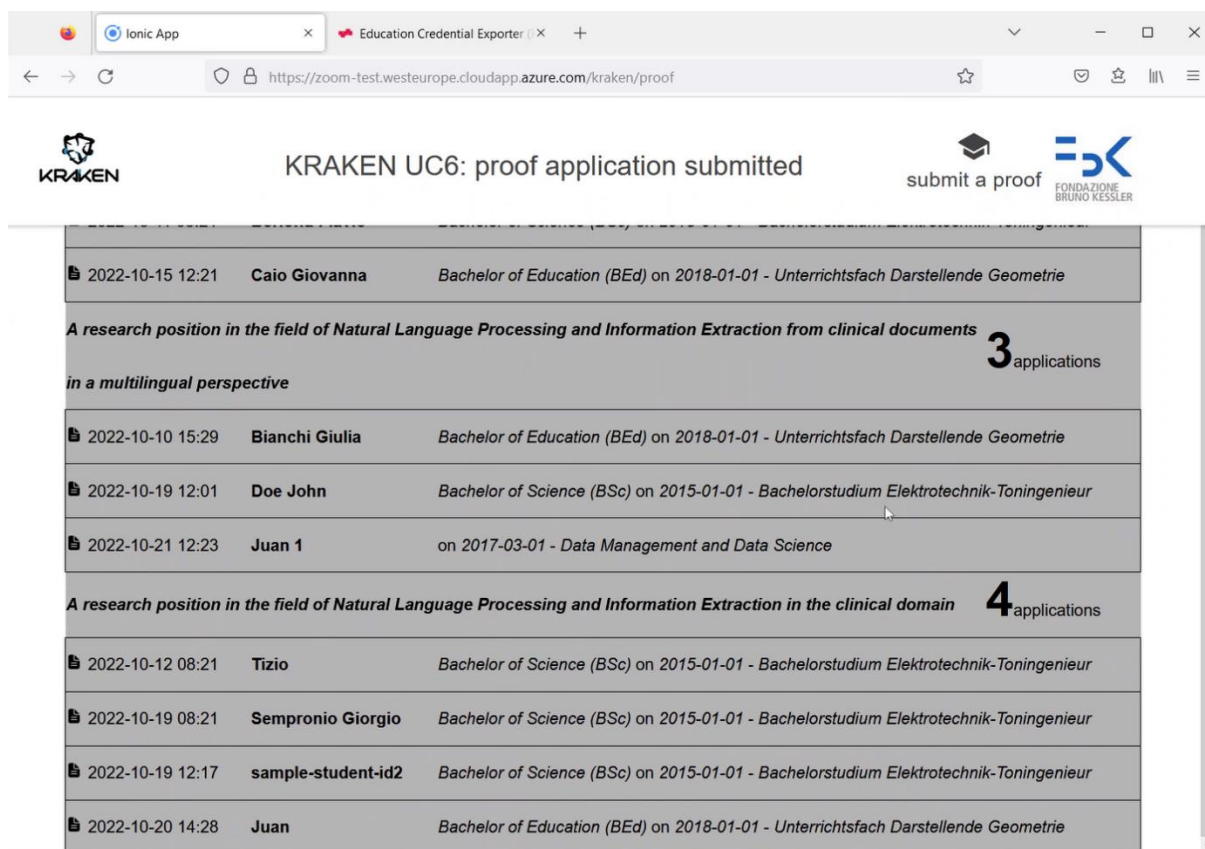Figure 28 gives a high-level overview of the UC7 Processing of Academic Data. The infographic can be downloaded from the following KRAKEN web page link:

https://krakenh2020.eu/sites/kraken/files/public/content-files/2022/UC7_AcademicDataProcessing.pdf

The university shares students' degree and qualifications data through the KRAKEN platform. Dataset can be signed as proof of authenticity.
The marketplace offers to data consumers statistics related to different courses or schools, while preserving the student's privacy. The data will be treated with privacy-preserving techniques such as SMPC, so as not to reveal the identity of the student, but to facilitate the analysis.
SMPC allows statistical analyses to be performed on academic data provided by the university, for example to calculate the average mark of a class.

Figure 28: Processing of Academic Data[8]

In the same way as seen in the UC1 and UC4 for the health pilot, university can publish grades data on the marketplace for analytics purpose in two ways unsigned (Figure 29a) and signed for proof of its authenticity (Figure 29b).
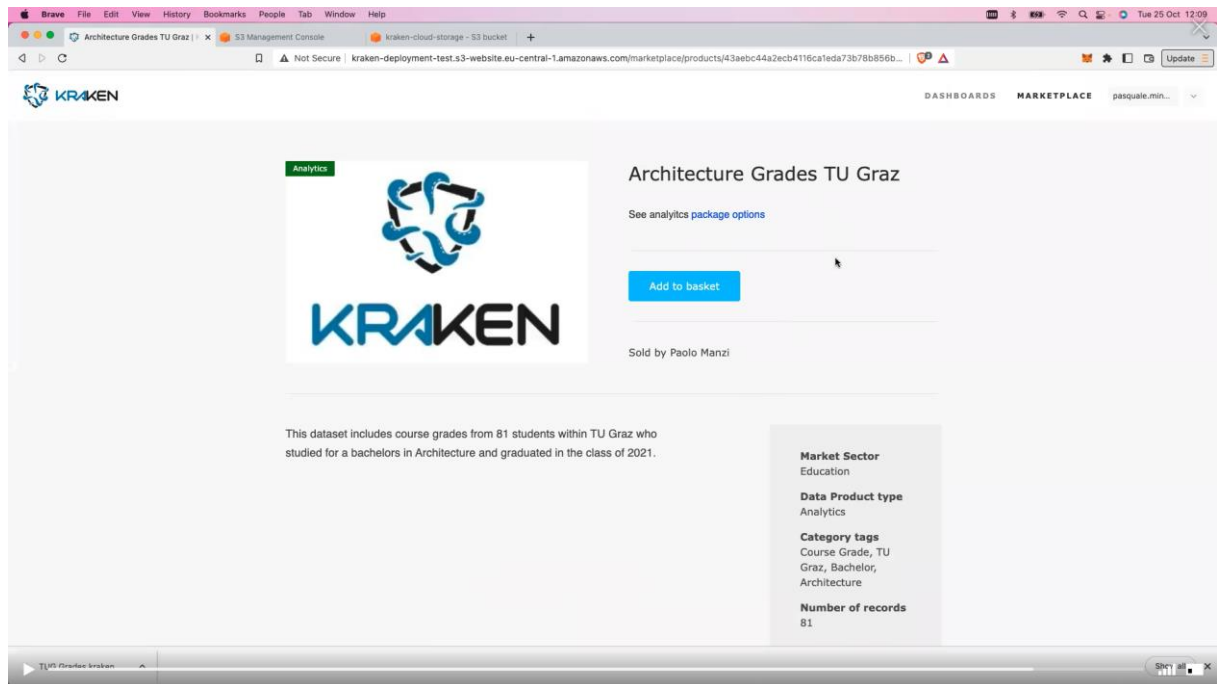
Figure 29a: Published university analytics product

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[8] https://www.krakenh2020.eu/sites/kraken/files/public/content-files/2022/UC7_AcademicDataProcessing.pdf
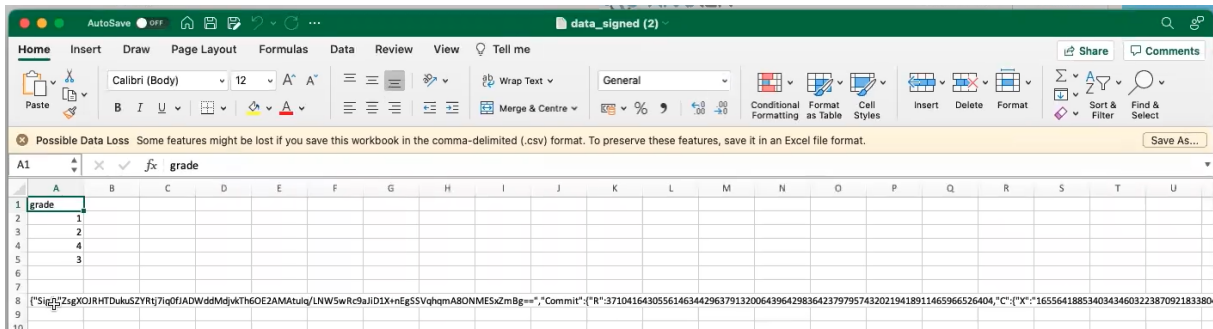
Figure 29b: Published university analytics signed product

Complete recording videos of these processes can be seen in the KRAKEN web page on the following links:

https://krakenh2020.eu/pilots/education

As seen in UC4 for health data product, an analytics package of the education data, published by the university, can be purchased by a data consumer (Figure 30a), obtaining the results (Figure 30b).
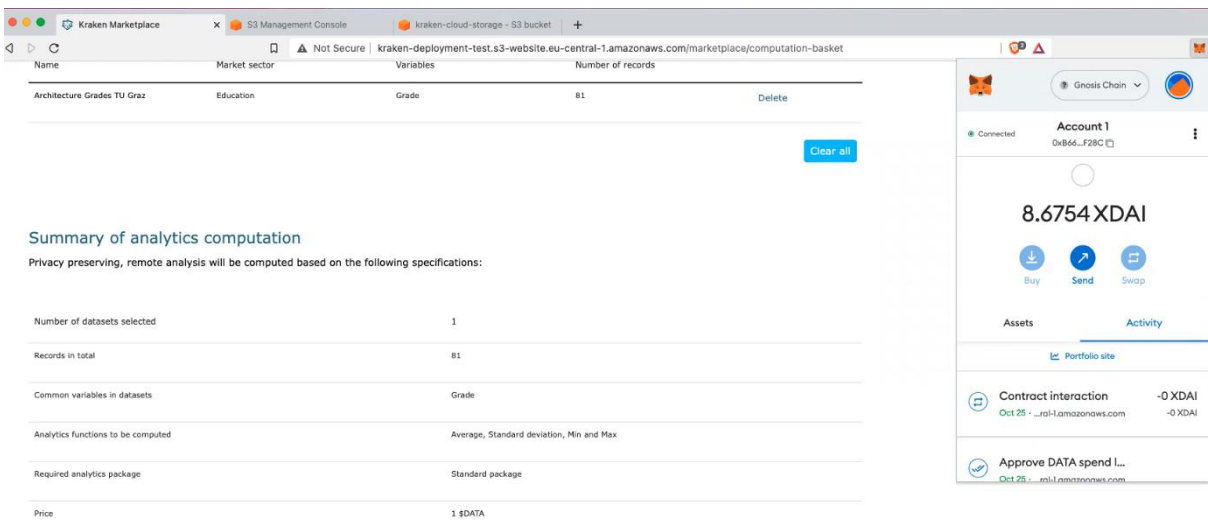
Figure 30a: Data consumer buys an education analytics package

Figure 30b: Education statistic results after analytics

A complete video recording of this process can be seen in the KRAKEN web page on the following link:

https://krakenh2020.eu/pilots/education

4.8 Extra Use cases:

This section provides screenshots and videos of both, common processes to all the use cases and those processes and flows not included in the use cases but developed during the KRAKEN project lifetime. It includes the following processes:

- Use of LIM asset for obtaining a credential form eIDAS network
- Use of LIM for signing a document
- KWCT company tool
- Back up of credentials and key material stored in the mobile wallet, by using the SSI mobile app.
- Use of Marketplace mobile app

4.8.1 Use of LIM for obtaining Credential from eIDAS network and signing document

The end-user browses to the LIM main page and connects her/his wallet (Figure 31a).
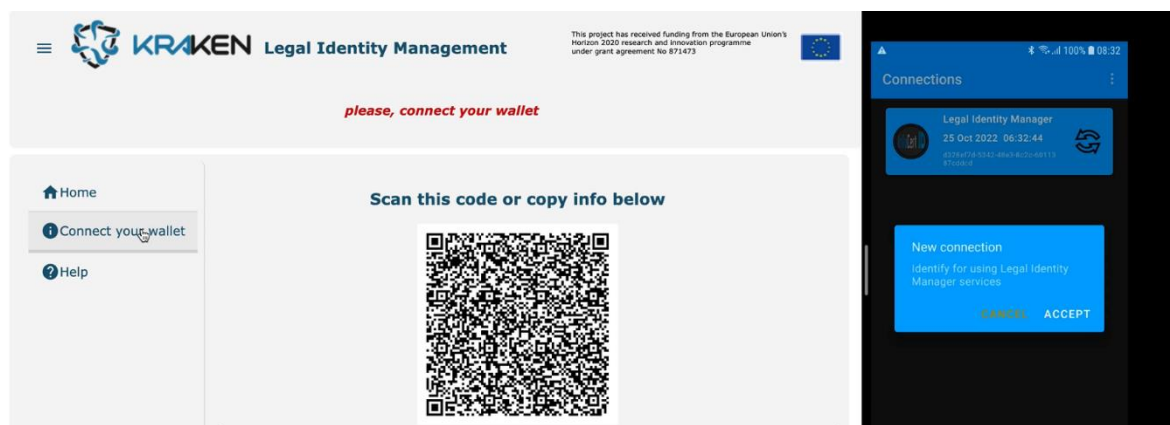
Figure 31a: User connecting her/his wallet with the Legal Identity Manager

Once the connection is established the end-user asks for an identity VC issued by the eIDAS network. To this end and for security checking a mobile phone number is included and an OTP is sent to the mobile (Figure 31b).
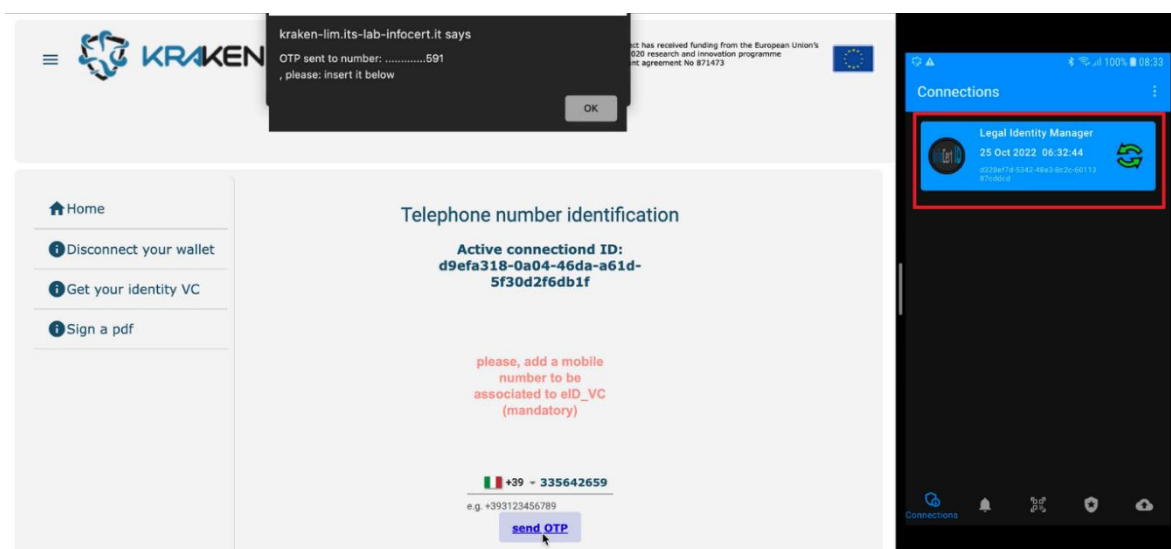
Figure 31b: User asks for an identity VC

After the mobile phone has been identified the user is able to proceed with the identity VC request (Figure 31c).

Figure 31c: User selects Identity Provider

The end-user selects her/his origin country for being redirected to the right country eIDAS node (Figure 31d) and selects the identity provider. By accepting to deliver her/his identity data (Figure 31e) the identity provider delivers the information, which finally reach the LIM creating the identity VC to be sent to the mobile user (Figure 31f). This identity VC is stored in the mobile wallet for future use (e.g., sign a pdf).
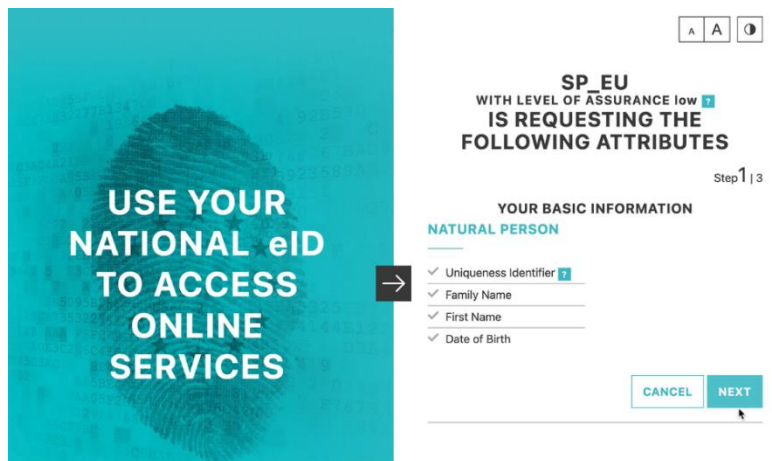
Figure 31d: User accepts delivering identity data
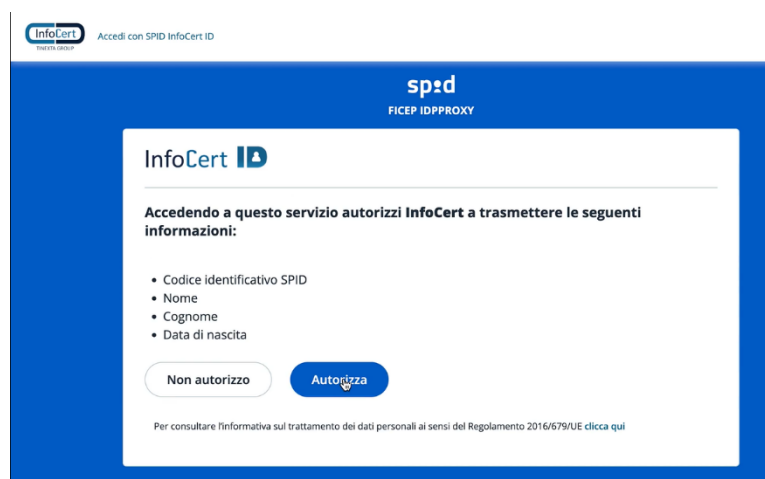
Figure 31e: User consents to deliver specific identity data
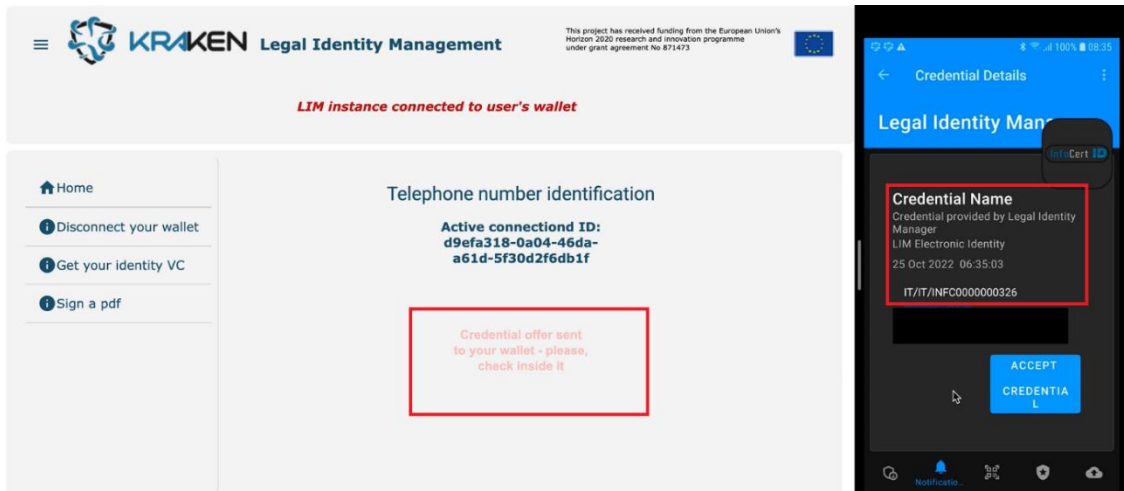
Figure 31f: User receives the identity VC from LIM

A complete video recording of this process can be seen in the KRAKEN web page on the following link:

https://krakenh2020.eu/marketing-material/demo-videos

4.8.2 Use of LIM for signing a document

The end-user uses the LIM for signing a pdf document by using her/his Identity VC (Figure 32a).

Figure 32a: User selects the identity VC for signing the document

The user selects the pdf to be signed (Figure 32b).
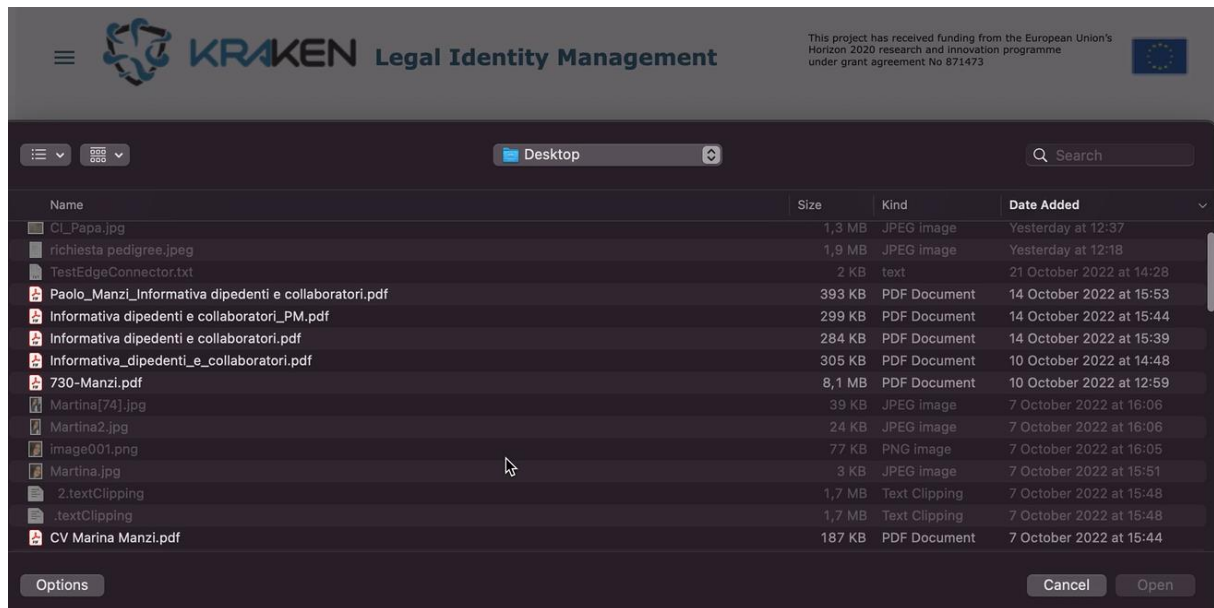
Figure 32b: User selects the document to be signed

An OTP is sent to the user mobile phone for identifying the phone (Figure 32c) which contains the selected identity VC (Figure 32c).
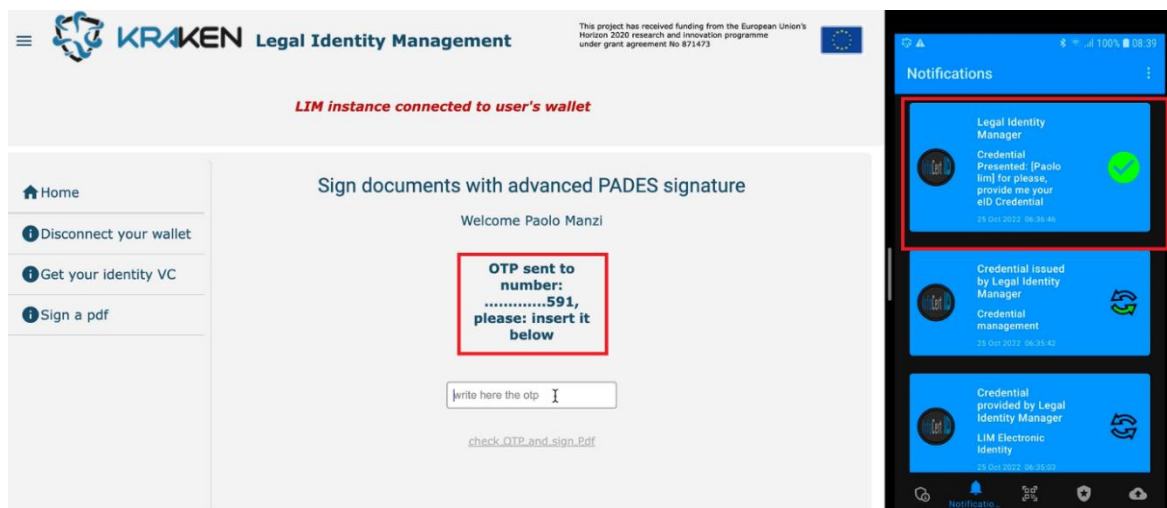
Figure 32c: User enters the OTP for verifying the mobile phone

A complete video recording of this process can be seen in the KRAKEN web page on the following link:

https://krakenh2020.eu/marketing-material/demo-videos

4.8.3 KWCT Company tool

Figure 33a and Figure 33b show some screenshot of the KWCT, a company tool to company employees for accessing company site by using SSI solution providing a VC issued by the company.
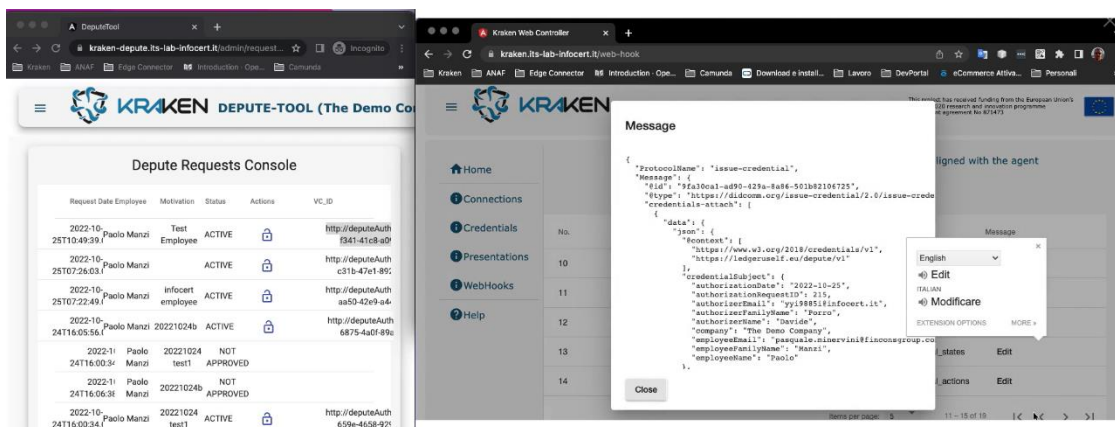
Figure 33a: Credential issued by the company
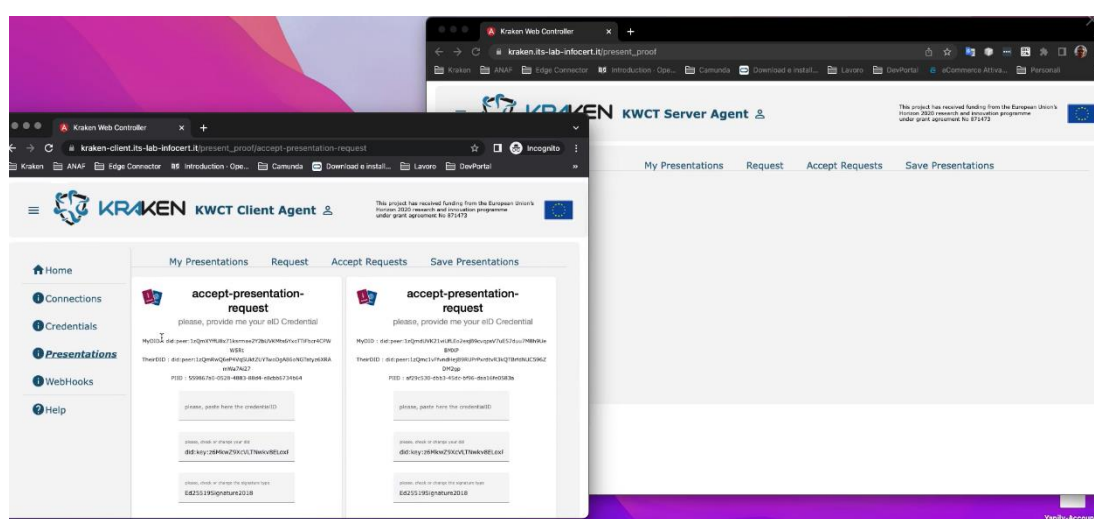
Figure 33b: KWCT managing presentations and credentials

A complete video recording of this process can be seen in the KRAKEN web page on the following link:

https://krakenh2020.eu/marketing-material/demo-videos

4.8.4 Back-up credentials on SSI mobile app

The back-up system allows the user to back-up the credentials and key material in a cloud wallet, in case the mobile is lost or stolen the user can recover the credentials from the cloud wallet and installed it on a new smart device. Also, allows the use of several devices. Figure 34a shows the main screen of the back-up functionality in the SSI mobile app. After registering the device, the wallet content is exported to the cloud wallet or stored in a paper key (to be safely stored) completing the backup process. If the user lost her/his mobile 1, she/he can import the key material in another mobile 2 by importing the paper key by reading the QR code, which contains the credentials and key material from mobile 1 (Figure 34b). Once the backup restoring process is completed, the mobile 2 contains the credentials from mobile 1 (Figure 34c).
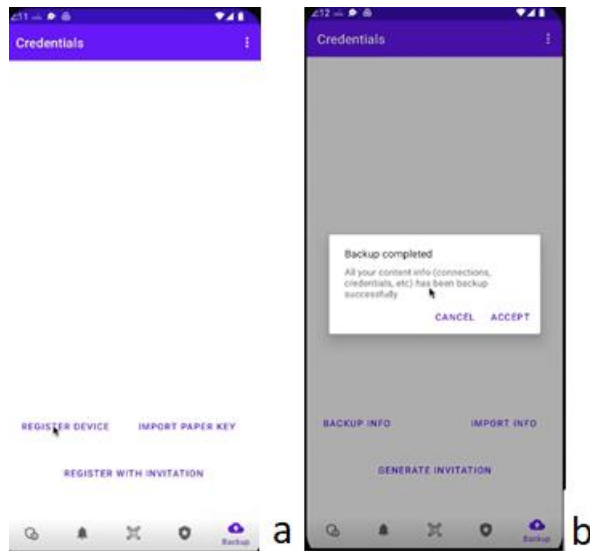
Figure 34a: a) Mobile app back-up functionality main screen. b) Completion of the back-up process

Mobile 1   Mobile 2   Mobile 2 scan key paper QR code
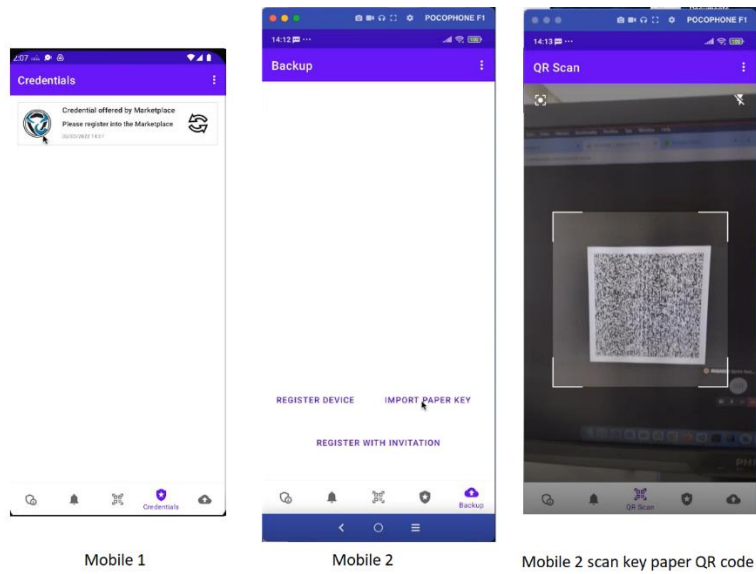
Figure 34b: Completion of the back-up process
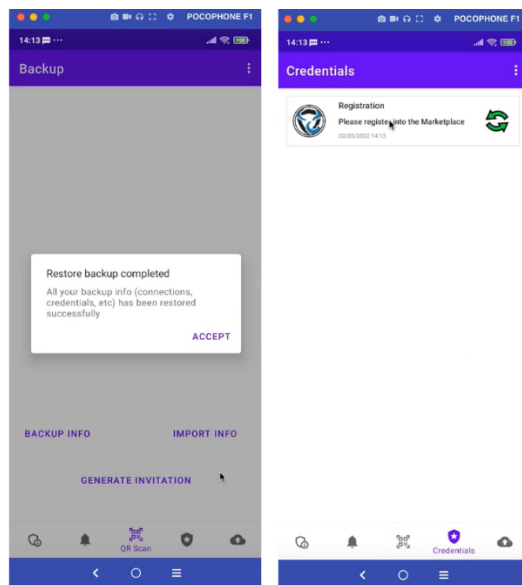
Mobile 2 restoring process

Figure 34c: Restored credentials in the additional device

A video recording of this process can be seen in the KRAKEN web page on the following link:

https://krakenh2020.eu/marketing-material/demo-videos

4.8.5 Use of Marketplace mobile app

Figure 35 presents some screenshots of the Marketplace mobile app manging the user account.
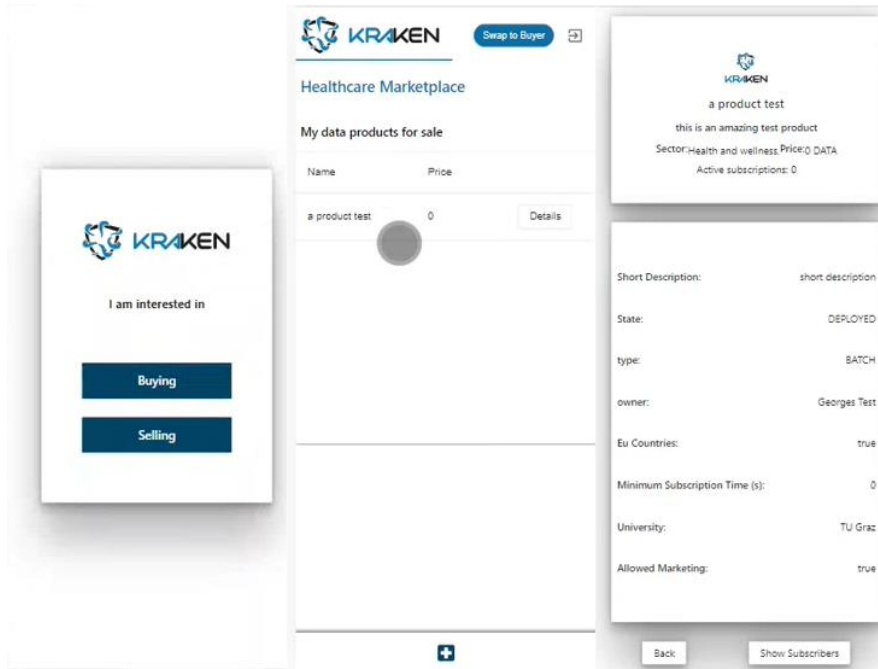
Figure 35: Marketplace mobile app user basic functionalities

A recording of this mobile app can be seen in the KRAKEN web page on the following link:

https://krakenh2020.eu/marketing-material/demo-videos

5 Conclusion

This document has provided results from the evaluation of the KRAKEN platform, final release, by 35 users belonging to the target user groups involved in the health and education pilots.

This second study complements the findings derived from the evaluation of the first KRAKEN marketplace release conducted in October 2021 with 15 users, whose results were reported in D5.7 "KRAKEN Marketplace testing and validation first report". The initial evaluation results were used in the third project year to improve and finalize the KRAKEN marketplace release for the health and education pilots.

Overall, the results regarding usability of the prototype release, measured on the SUS questionnaire, show an average score of 52.95 (SD 15.92) for the health pilot and an average score of 50 (SD 24.32) for the education pilot. These scores indicate that the KRAKEN platform usability is OK/Fair and reaches a marginal level of acceptance. These findings show that the KRAKEN usability should be improved in the case of its deployment in a B2C scenario, and that the status of the final release makes it more suitable to a B2B audience, having some technical expertise or knowledge in the domain of data sharing platforms. Results from the investigation of other main factors influencing the adoption of KRAKEN in the health and education domains shed further light on participants preferences, and main concerns in this cutting-edge technology field. In general, participants expressed appreciation for the KRAKEN concept and use cases, they provided suggestions and recommendations for supporting a future deployment of the platform in B2B and B2C scenarios.

Findings from this KRAKEN final piloting phase are relevant to inform the next KRAKEN exploitation activities, to facilitate a wide adoption of the KRAKEN solution by early adopters and stakeholders in the next months, as well as to inform the design community currently working on the development of innovative, user-friendly data sharing platforms.

Finally, this document provided details regarding the different processes of the four UCs for the health pilot and of the three UCs for the education pilot that were completed in the last KRAKEN project year.

Also, additional details related to process and components not included in the described use cases but developed during the lifetime of the KRAKEN project, including screenshots and videorecording of the processes.

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Annexes

Annex A

Information sheet and consent form presented to users involved in the second evaluation round

KRAKEN INFORMED CONSENT FORM

The user of the KRAKEN Platform second prototype:

I, hereby freely and voluntarily give my CONSENT to participate in the evaluation study of the KRAKEN Project to the benefit of the KRAKEN Consortium.

I understand and agree that my personal data will be processed during the recording of the activities pursuant to the KRAKEN Platform evaluation. These personal data (name, gender, age group, email address, occupation, video recording of answers and comments regarding the KRAKEN evaluation) will be processed for and on behalf of the KRAKEN consortium members as detailed in the information sheet, for purposes of testing of the technologies included in the Health and Education Pilot Cases, as developed during and for the KRAKEN research project. My personal data will be processed in a confidential manner, taking into account applicable data protection laws, and in compliance with the General Data Protection Regulation (GDPR).

Please read carefully the accompanying information sheet, which further details the personal data processing activities and the rights you have as a data subject.

Giving my consent, I confirm that:

1. I HAVE CAREFULLY READ and UNDERSTOOD THE INFORMATION SHEET

2. All questions that I posed have been answered to my satisfaction,

3. I AM FULLY AWARE THAT:

- It is my right to withdraw my consent for my participation and associated personal data processing from the evaluation study at any time without consequences,
- Any information about myself will be treated as confidential by research Consortium members, the European Commission and its expert project reviewers.
- My personal data will only be processed by the KRAKEN consortium and will only be used for purposes of research related to the development of the KRAKEN technology, demonstration, validation and training in use of the research tools developed, as detailed in the information sheet and in compliance with GDPR.
- Extracts from the pilot testing proceedings will be demonstrated before the European Commission Project Officer and the appointed Reviewers for the purpose of validating the KRAKEN project.
- In any publication resulting from the KRAKEN evaluation study, my personal details will not be revealed and it will not be possible to retrieve any data which might disclose my identity.

4. HAVING READ, UNDERSTOOD AND ACCEPTED ALL OF THE ABOVE,

I hereby agree, for legal and ethical purposes, to the participation in the KRAKEN evaluation study and to the use of my personal data that results there out.

Tap/click I agree / I do not agree

☐ I agree

☐ I do not agree

<div align="right">Signature</div>

KRAKEN INFORMATION SHEET – DATA COLLECTION FOR THE PILOT EVALUATION WITHIN THE FRAMEWORK OF THE KRAKEN PROJECT

You are being invited to take part in a research study in the framework of the KRAKEN project. Before you decide whether to participate it is important that you understand why the research is being done and what it will involve. Please take the time to read the following information carefully. If there is anything that is not clear, or if you would like more information, please get in touch with the research team (contact details at the end of this information sheet).

Purpose of the research

This research is carried out under the HORIZON 2020 project KRAKEN (Brokerage and market platform for personal data), funded by the European Commission under grant agreement No 871473.

The project develops a trusted and secure personal data platform with state-of-the-art privacy aware analytics methods, guaranteeing on metadata privacy, including query privacy. It aims to return the control of personal data back to users (data providers) throughout the entire data lifecycle. It will standardize different IT solutions thanks to featuring the (privacy-preserving) integration of independently obtained data sources from subjects consenting to different analyses. The project combines, interoperates, and extends the best results from two existing mature computing platforms developed within two H2020 actions: CREDENTIAL and MyHealthMyData.

You can learn more about the project at https://www.krakenh2020.eu/

Procedure description

The KRAKEN Platform testing will take place online from September 5th 2022 until September 30th 2022 and it will consist of two main sessions: one individual use of the platform for usability checking and rating, one group session moderated by the consortium partner FBK (Fondazione Bruno Kessler) where testers participating in the evaluation will be asked to answer some questions regarding key expectations and preferences for the future use of the KRAKEN Platform.

More precisely, you will be asked to attend the following testing phases:

- Phase 1: you will be asked to individually access and use the KRAKEN platform, to explore key functionalities included in its second prototype release. You will be provided by FBK with the list of tasks and guidelines to explore the KRAKEN platform and asked then to fill in a questionnaire to rate the level of usability of the prototype used, its perceived subjective quality and usefulness.
- Phase 2: you might be invited to join an online session (on MS Teams conference system, duration 1.5 hours) with other participants who attended phase 1, moderated by FBK, where you will be asked questions regarding your expectations and preferences for the future use of the KRAKEN platform. The session will be recorded for a subsequent quantitative and qualitative analyses of the participants responses that will be elaborated and reported anonymously for research purposes.

Your participation to this evaluation will be rewarded with an Amazon gift card of 50 Euros.

KRAKEN partners

1. Atos Spain s.a.
2. InfoCert S.p.A.
3. AIT Austrian Institute of Technology GmbH
4. Graz University of Technology
5. XLAB razvoj programske opreme in svetovanje d.o.o.
6. Katholieke Universiteit Leuven
7. Fondazione Bruno Kessler (FBK)
8. Lynkeus srl
9. TX Technology Exploration Oy
10. Stiftung Secure Information and Communication Technologies

Consent, privacy and data handling

You are asked to consent that your personal data will be used for the pilot testing of the KRAKEN platform, as described above. Your consent will be collected by the project partner FBK which is in charge of collecting and analysing the testing data for project reporting.

While the carrying out of the pilot test, the following categories personal data will be collected and used:

- Name and surname
- Gender
- Email address
- Age group
- Occupation
- Video recording of answers/comments regarding the KRAKEN evaluation

Data, collected in this testing phase, will only be accessible to FBK and partners involved in the Educational and Healthcare pilots.

Results from the evaluation will be presented before the European Commission Policy Officer and appointed Reviewers for the purpose of reviewing and validating the KRAKEN project.

Anonymised research results will be published in journal articles, conference presentations and via other modes of scientific exchange and dissemination.

Potential risk and discomfort

If, at any time, you should become tired or feel other forms of discomfort, you can simply quit the participation in the KRAKEN evaluation study.

The period for which the data will be stored

The data will be stored until the end of the KRAKEN project, i.e. until December 2022, and then permanently deleted. In some cases, e.g. because it is needed for the research purpose or because of a legal obligation, then the personal data might be retained for a maximum of one year after the termination of the project, unless otherwise indicated or requested by a supervisory authority or for auditing purposes.

Voluntary participation and right to withdraw from the research

Your choice to take part in the research is entirely voluntary. You are completely free to choose not to participate, or to withdraw your participation at any moment without any consequence.

Rights of the participant

You have all the rights stated in Chapter III of the GDPR (articles 13-22), and in particular:

a. You have the right to request from the controller **access to** and **rectification** or **erasure** of personal data or to **restrict processing** concerning yourself or to **object** to processing.
b. You have the right to **withdraw your consent,** the right to **refuse to participate** and to **withdraw** your participation, samples or data at any time —**without any consequences.**
c. You have the right to **lodge a complaint** with a supervisory authority.

For this purpose, you can contact:

- For the Education Pilot Case: Stefan More (TUG) [stefan.more@iaik.tugraz.at]
- For the Healthcare Pilot Case: Davide Zaccagnini (LYN) [d.zaccagnini@lynkeus.com]
- For the evaluation study: Silvia Gabrielli (FBK), [sgabrielli@fbk.eu]; Anna Benedetti, DPO (FBK), [privacy@fbk.eu]

Contacts

For any further doubt or clarification request, do not hesitate to contact the KRAKEN Project Coordinator, Juan Carlos Perez Baun (ATOS) at [juan.perezb@atos.net].

Annex B

Example of tasks and guidelines provided to users involved in the Health and Education pilots

KRAKEN Pilot user tasks and guidelines

Pilot users, for both the health and educational pilot, are invited to walkthrough the KRAKEN data marketplace and use the following list of tasks and guidelines to inspect the KRAKEN functionalities before providing their assessment of the platform in the online survey.

Data providers

1. Install the SSI app (Android apk, *make sure you have fingerprint activated on your phone*)
2. Install the Metamask wallet browser extension (See Instructions below)
3. Go to the KRAKEN marketplace landing page (desktop)
4. Initiate the Sign up process
5. Scan QR codes of the SSI app to link to the user account
6. Fill out user profile (*please feel free to use fake data*)
   a. *For first question in the form select that you are **not** sharing data or looking for data on behalf of an organization such as a private company or a research center*
   b. *Check both privacy policy and data provider and data consumer agreement disclaimers*
7. To complete the user registration process click 'next' and then go to the SSI app to accept the credential offered by the marketplace.
8. User receives an email upon completion of registration process. The email contains a code to link the user account to the marketplace mobile app.
9. Install the Marketplace apps from here
10. **For health data**: use the Framingham v3 dataset, which is publicly available.
11. **For educational data**:
    on the KRAKEN Edu Connector:
        Login to the Edu Connector
        Connect your Wallet App to the Edu Connector
        Export a Credential (Grade or Diploma) into the Mobile Wallet
        Provide a Credential (Grade or Diploma) to the University to be exported
        Display the Credential in the Wallet
    on the KRAKEN Marketplace:
        Create a data product with your credentials

12. Go to Publish Data on the marketplace homepage
13. Create "Batch" data product
14. Using the same Framingham v3 data set create "Analytics" data product
15. *After consumers sign up and buy data access:* from marketplace app monitor active data accesses and test other marketplace app's functionality.

Data consumers

1. Follow step 1 to 7 as above

Batch data purchase
2. Select a "Batch" product
3. Fill the "Batch data product" form
4. Complete the transaction, finalize the payment in Metamask
5. Download the data

Analytics data purchase
6. Select an Analytics data product
7. Add it to computation basket
8. Buy analytics package
9. Pay in Metamask
10. Review statistics results (Note: the computation is expected to take approx. 80 seconds for 1000 data entries in a dataset. For example, computing on a dataset with 100 rows and 5 columns should take approx. 40 seconds).

Marketplace Guidelines for User Testing

Before being ready to use the KRAKEN marketplace, there are various components that need to be set up in advance for a smooth experience. This section provides guidelines on what needs to be in place for users of the marketplace.

Partner and Third Party Software Requirements

To use the web-based KRAKEN marketplace, the following partner and third party software is required:

1) For registration and login with the marketplace: **SSI App** installed on mobile device using the SSI APK - Please make sure the fingerprint is activated on your phone (check on your phone settings>security>fingerprint).

2) To send and receive crypto payments: **Metamask Wallet browser extension**, which can be downloaded using the following link: https://metamask.io/

3) To store encrypted files for the batch and analytics Data Products: A third-party **cloud storage** that either A) has no CORS constraints, or B) If it has CORS constraints, it allows the user to configure the CORS policies so that the file can be downloaded from another domain outside of the cloud service (More on CORS below).

The System Usability Scale

The SUS is a 10 item questionnaire with 5 response options.

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system.

The SUS uses the following response format:

Strongly Disagree 1	2	3	4	Strongly Agree 5
○	○	○	○	○

Annex D

A-MARS scale, Section E, used for rating the subjective quality of the KRAKEN Platform

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SECTION E

App/e-tool subjective quality rating

19. Would you recommend this app/e-tool to people who might benefit from it?

1 Not at all - I would not recommend this app/e-tool to anyone

2 There are very few people I would recommend this app/e-tool to

3 Maybe - There are several people whom I would recommend it to

4 There are many people I would recommend this app/e-tool to

5 Definitely - I would recommend this app/e-tool to everyone

20. How many times do you think you would use this app/e-tool in the next 12 months if it was relevant to you?

1 None

2 1-2

3 3-10

4 10-50

5 >50

21. Would you pay for this app/e-tool?

1 No

3 Maybe

5 Yes

22. What is your overall star rating of the app/e-tool?

1 ★ One of the worst apps/e-tools I've used

2 ★★

3 ★★★Average

4 ★★★★

5 ★★★★★ One of the best apps/e-tools I've used

E. Subjective mean score = _____

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