EDDIE Project Survey on Stakeholders Group

To improve the quality of the produced results and expand them in terms of geographical and sectoral representation, a new survey was designed, targeting both industrial and educational stakeholders. The recipients of the new questionnaire were both stakeholders that were contacted and had contributed before and also new ones. The analysis of their responses aims at validating the outcomes of the work presented in this document.

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To form the questions, the outputs of the analysis presented in the previous sections were utilized, extracting the major findings, and placing them against the judgement of experts in the energy sector. A Likert scale type of questions was used, requiring the participants to rate on a 5-scale basis, how significant they consider each skill gap presented.

Demographics

A first set of demographical questions aimed to acquire information regarding the background of the respondent. The whole spectrum of the energy sector is covered, with the Heating and Cooling sector being the less represented as seen in Figure 1 below. A total of 49 answers were collected for this analysis.
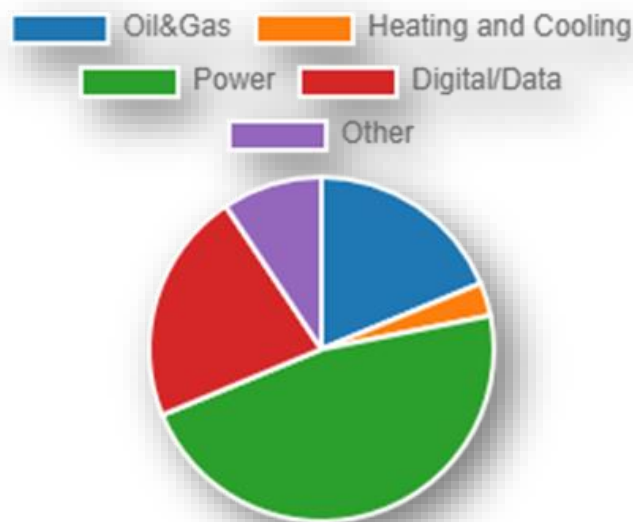

Figure 1. - Validation survey sectoral representation

There was also an adequate representation from both Industry and Education/training (Figure 2). Moreover, several participants were from research industry, public authorities, advisory companies, and regulatory authorities. Thus, there is a broad representation from the whole energy value chain. Similarly, as depicted in Figure 3 there were contributions from stakeholders active in several European countries.
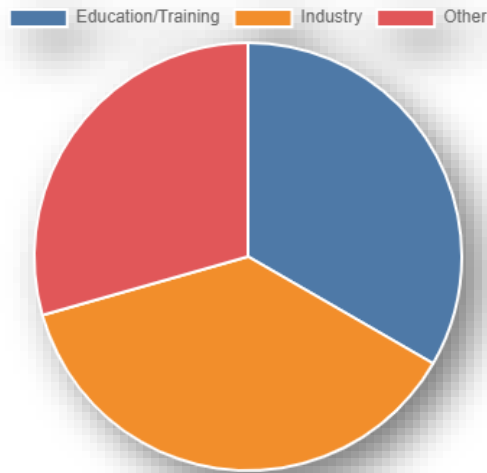
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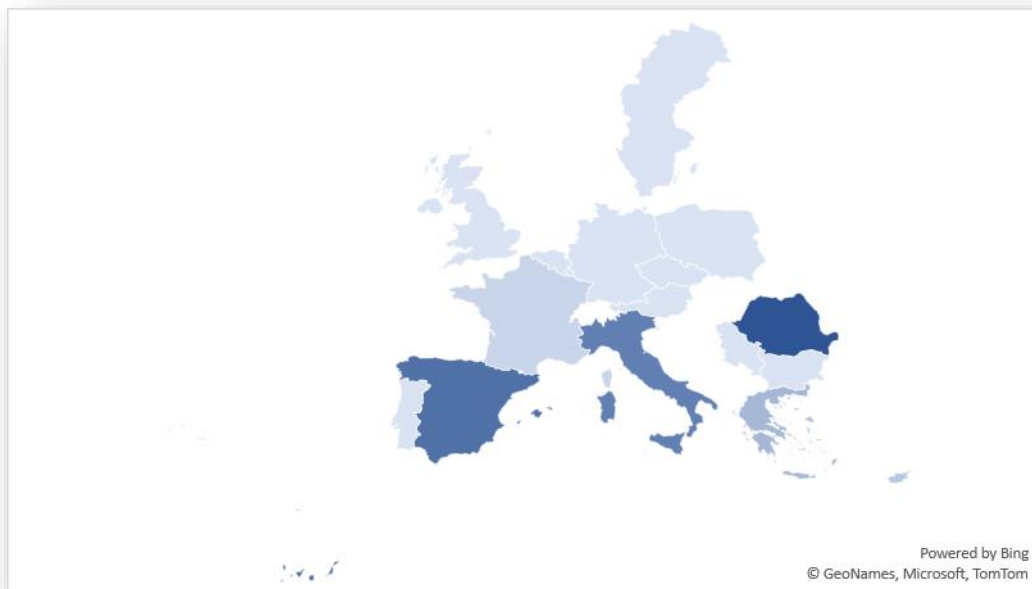
Figure 2. - Validation survey demographics

Figure 3. - Validation survey geographical representation

Results

The 5-point Likert scale used in the questionnaire rendered possible to assess the level of significance the participants considered each skill gap. Scores above 3 indicate that the respondent considers significant enough the skill gap under question. As depicted in **Error! Reference source not found.**4 and **Error! Reference source not found.**5 more than 50% of all participants have rated the skill gaps with at least a score of 3, indicating that the majority of the stakeholders have identified these gaps in their area of operation, yet, some of them do not have significant impact at this point. Nevertheless, in most of the skill gaps presented, there are several participants that have attributed scores of 4 and

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5, highlighting the importance of these gaps for a few stakeholders in the energy value chain. Data related skill gaps and cybersecurity are amongst the ones that seem to be the most impactful.
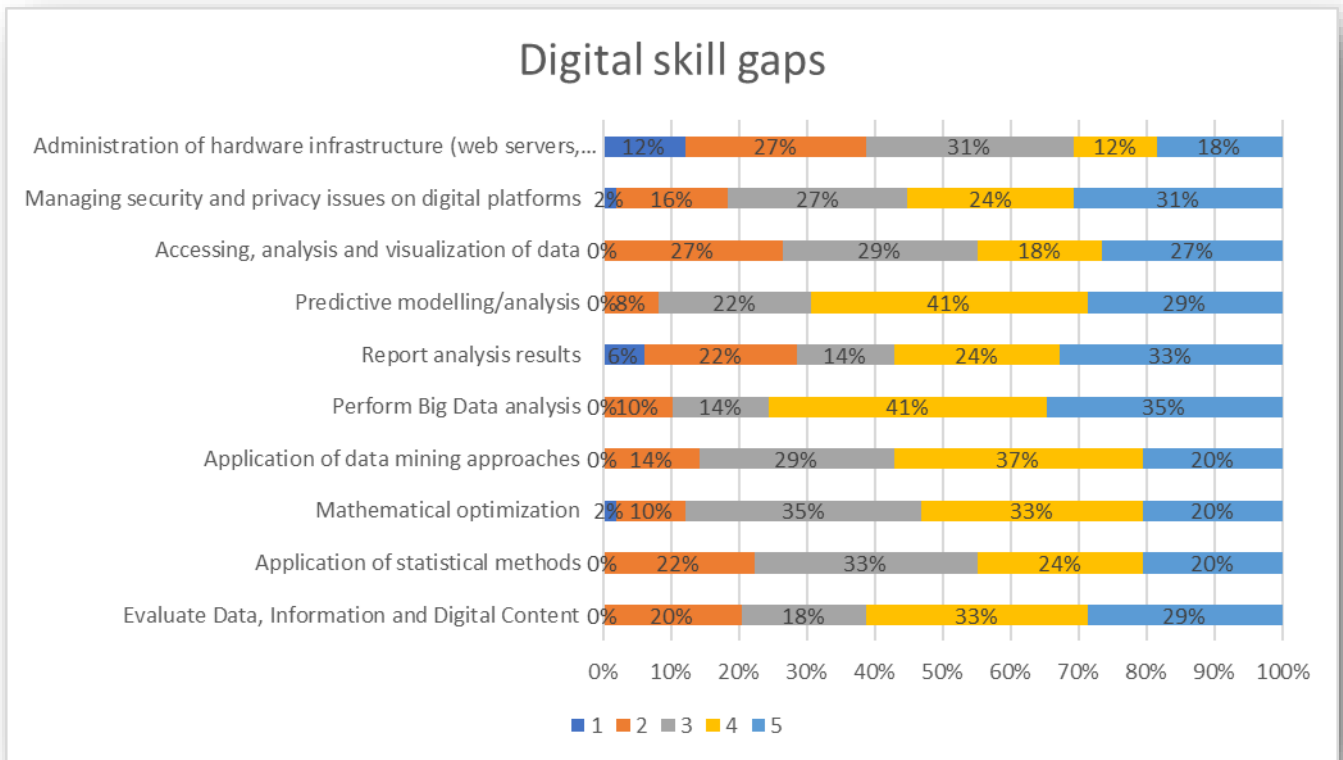
Digital skill gaps

Skill	1	2	3	4	5
Administration of hardware infrastructure (web servers,…)	12%	27%	31%	12%	18%
Managing security and privacy issues on digital platforms	2%	16%	27%	24%	31%
Accessing, analysis and visualization of data	0%	27%	29%	18%	27%
Predictive modelling/analysis	0%	8%	22%	41%	29%
Report analysis results	6%	22%	14%	24%	33%
Perform Big Data analysis	0%	10%	14%	41%	35%
Application of data mining approaches	0%	14%	29%	37%	20%
Mathematical optimization	2%	10%	35%	33%	20%
Application of statistical methods	0%	22%	33%	24%	20%
Evaluate Data, Information and Digital Content	0%	20%	18%	33%	29%

Figure 4. - Skills gaps 1 - validation survey

Digital skill gaps

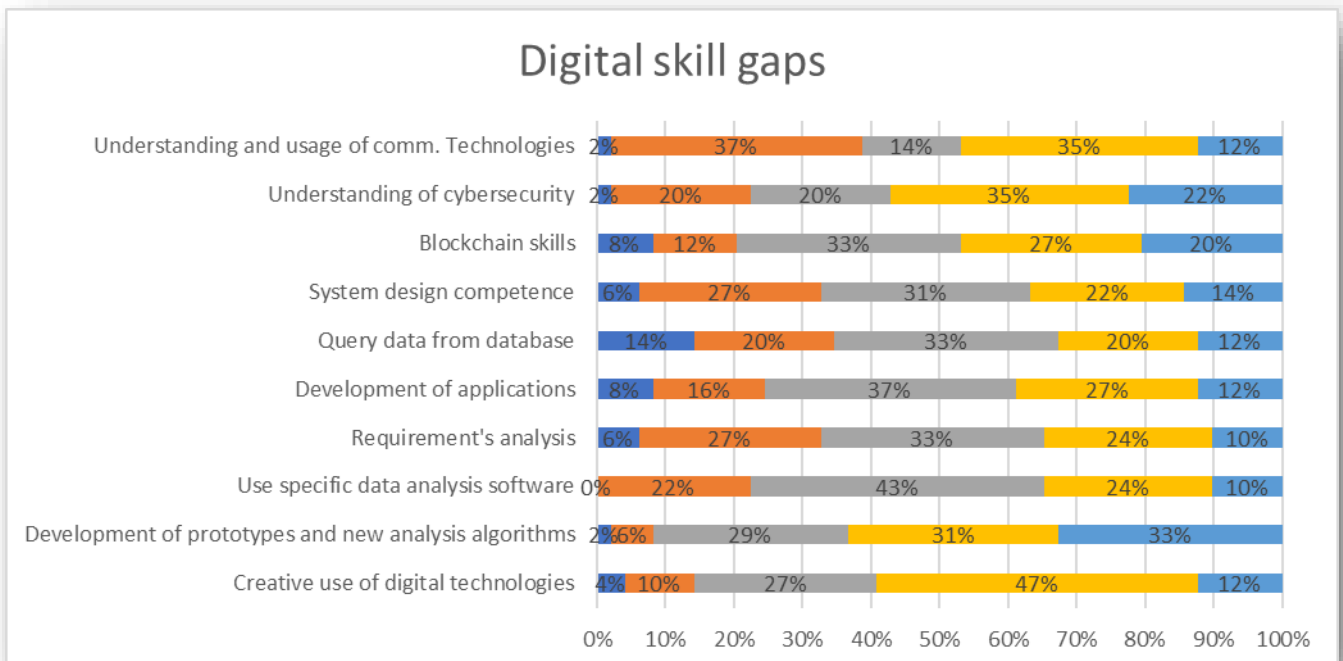| Skill	1	2	3	4	5
Understanding and usage of comm. Technologies	2%	37%	14%	35%	12%
Understanding of cybersecurity	2%	20%	20%	35%	22%
Blockchain skills	8%	12%	33%	27%	20%
System design competence	6%	27%	31%	22%	14%
Query data from database	14%	20%	33%	20%	12%
Development of applications	8%	16%	37%	27%	12%
Requirement's analysis	6%	27%	33%	24%	10%
Use specific data analysis software	0%	22%	43%	24%	10%
Development of prototypes and new analysis algorithms	2%	6%	29%	31%	33%
Creative use of digital technologies	4%	10%	27%	47%	12%

Figure 5. - Skill gaps 2 - validation survey

The following table, Table 1, presents the descriptive statistics analysis, with the main indicators for the skill gaps identified and used in this questionnaire. They are sorted by the mean value from the "most significant" to the least.

Table 1. - Digital skill gaps - validation survey

Skill Gap	Mean	Std. Error	Median	Mode	Std. Deviation
Perform Big Data analysis	4,00	0,14	4	4	0,96
Predictive modelling/analysis	3,90	0,13	4	4	0,92
Development of prototypes and new analysis algorithms	3,86	0,15	4	5	1,02
Evaluate Data, Information and Digital Content	3,69	0,16	4	4	1,10
Managing security and privacy issues on digital platforms	3,65	0,16	4	5	1,15
Application of data mining approaches	3,63	0,14	4	4	0,97
Mathematical optimization	3,59	0,14	4	3	1,00
Report analysis results	3,55	0,19	4	5	1,32
Understanding of cybersecurity	3,55	0,16	4	4	1,12
Creative use of digital technologies	3,53	0,14	4	4	0,98
Accessing, analysis and visualization of data	3,45	0,17	3	3	1,16
Application of statistical methods	3,43	0,15	3	3	1,06
Blockchain skills	3,39	0,17	3	3	1,19
Use specific data analysis software	3,22	0,13	3	3	0,92
Development of applications	3,18	0,16	3	3	1,11
Understanding and usage of comm. Technologies	3,18	0,16	3	2	1,13
System design competence	3,12	0,16	3	3	1,15
Requirement's analysis	3,06	0,16	3	3	1,09
Administration of hardware infrastructure	2,98	0,18	3	3	1,28
Query data from database	2,96	0,17	3	3	1,22

Similarly, as with the skill gaps, the participants were asked to rate the gaps of knowledge in a list of digital technologies, where each technology represents a set of skills and they easier for the respondents to assess. The results are presented in Figure 6 below, and it is evident that the outcomes from the previous skills become more concrete. Big Data/Data Analytics, Cybersecurity and Artificial Intelligence are the rated as the most significant gaps by the participants. Blockchain and IoT are also among the top-rated gaps in the list.
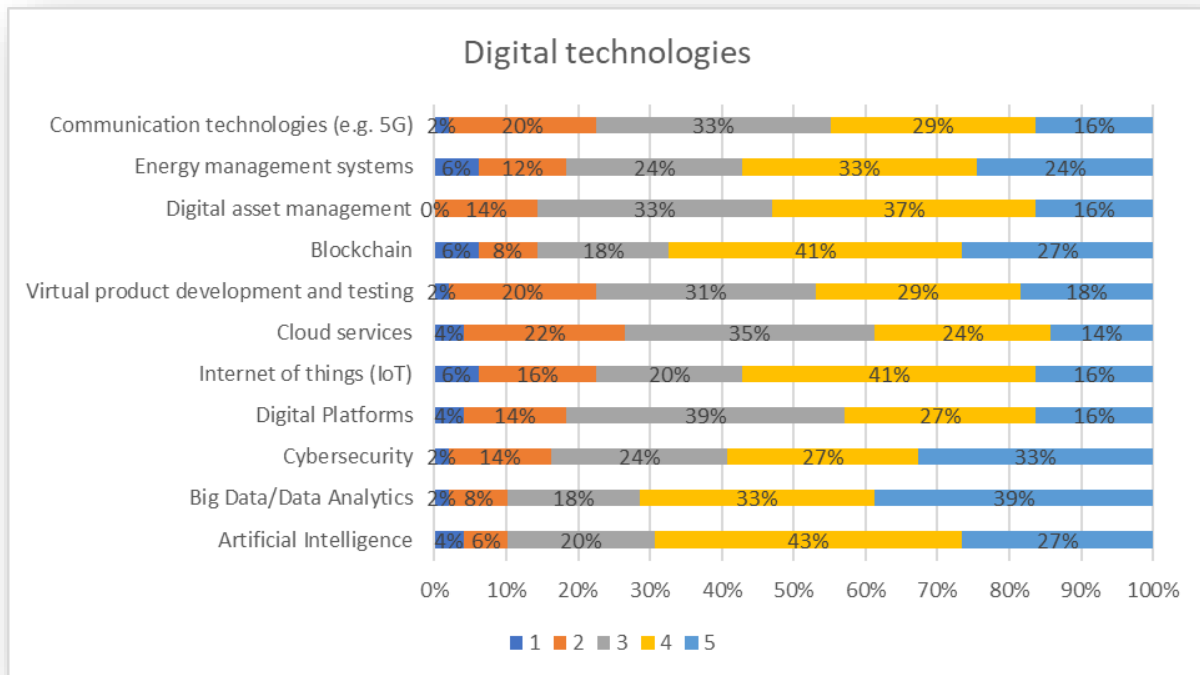
Figure 6. - Gaps in digital technologies

As it was done with the previous list of skill gaps, the main descriptive statistics indicators are calculated and presented in the following table, Table 2, presenting in a sorted way the most significant gaps as they were rated by the participants.

Table 2. - Digital Technologies – statistics

Skill Gaps - Digital technologies	Mean	Std.Error	Median	Mode	Std. Deviation
Big Data/Data Analytics	3,98	0,15	4	5	1,05
Artificial Intelligence	3,82	0,15	4	4	1,03
Cybersecurity	3,73	0,16	4	5	1,13
Blockchain	3,73	0,16	4	4	1,13
Energy management systems	3,57	0,17	4	4	1,17
Digital asset management	3,55	0,13	4	4	0,94
Internet of things (IoT)	3,45	0,16	4	4	1,14
Virtual product development and testing	3,41	0,15	3	3	1,08
Digital Platforms	3,37	0,15	3	3	1,05
Communication technologies (e.g. 5G)	3,37	0,15	3	3	1,05
Cloud services	3,22	0,16	3	3	1,09