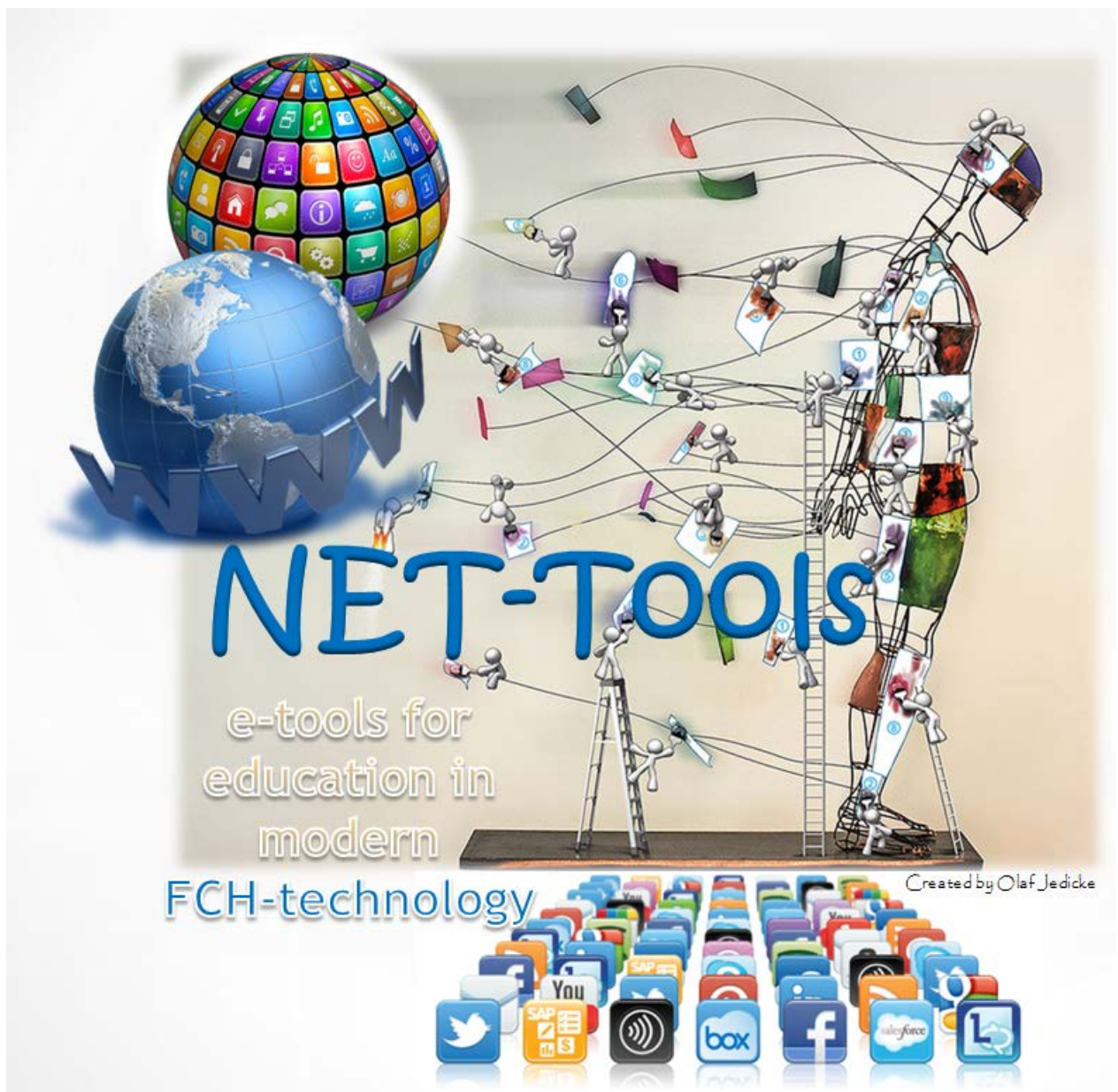


Novel Education and Training Tools based on digital applications related to hydrogen and fuel cell technologies

Deliverable D3.6:

Hands-on Training of Industrial Users, Session 1



D3.6: Hands-on Training of Industrial Users, Session 1

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Means of verification	MS3.3. Database of stakeholders for participation in e-Laboratory hands-on session 1. Milestone dedicated to WP3
Contributing partners (acronyms)	UU, NCSR, IEES, PersEE, UNIPG, KIT

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If deliverable does not get finished as scheduled in description of activity, please add a short explanatory statement. (To be done by responsible person of deliverable)

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1 Introduction

First hands-on training session on use of e-laboratory of NET-Tools project was hosted by UU as an online webinar on June 27th, 2018.

The hands-on session was organised in order to help users to understand the online engineering tools in various directions i.e. Safety, Fuel Cells, Renewable energy, Electrochemistry, Properties, Storage etc. and use them in their day-to-day activities, calculating different parameters in their field.

The scope of this session was to engage with and gain traction from a wider FCH community of industry, institutions, research organisations and universities concerning the further development of engineering digital tools. In particular, the NET-Tools partners wish to incorporate the demands and requests from industry and institutions others than the academic ones, in order to form the basis of the work to date.

From the interaction with users the consortium, received the feedback from using the e-Laboratory, which will help to advance the platform.

2 Invitations and number of addressees

In order to disseminate the information about the project outcomes and e-Laboratory, an invitation to attend had been distributed to the leading European stakeholders, including representatives from academia, working in hydrogen safety area, industry and regulating authorities. An advertisement for the webinar was also posted at the project website.

The invitation has successfully delivered to 8395 addresses. The emails were provided by partners, as shown in the Table 1 below.

Table 1 – Number of successfully delivered emails provided by partners.

Partner	Addresses number
IEES	12
UNIPG	691
KIT	18
UU	7674
Total:	8395

The Mailchimp online service was used to deliver the invitations and control the statistics, and an invitation letter is provided in Figure 1. The invitation has a registration button so that all who would like to attend should be registered.

Separate invitation and registration link were distributed by UNIPG partner to 691 recipients through the 2nd e-NEWSLETTER. The report on activity is presented in ANNEX 2: Report on 2nd e-Newsletter as an embedded pdf.



Dear Reader,

The NET-Tools project partners would like to invite you to attend our **1st Hands-on Session in the use of e-Laboratory**, which will take place online on **27th June 2018**.

Two sessions are planned within the project. These sessions will help users to understand the online engineering tools in various directions i.e. Safety, Fuel Cells, Renewable energy, Electrochemistry, Properties, Storage etc. and use them in their day-to-day activities, calculating different parameters in their field. The consortium, in turn, will benefit from the interaction with users by getting the feedback from using it, which will help to advance the platform.

The scope of this session is to engage with and gain traction from a wider FCH community of industry, institutions, research organisations and universities concerning the further development of engineering digital tools. In particular, the NET-Tools partners wish to incorporate the demands and requests from industry and institutions others than the academic ones, have formed the basis of the work to date.

We encourage you to register and reserve a place at your earliest convenience. You will receive credentials to connect to the NET-Tools platform and its content in due course after the registration. The webinar will be split into several sessions - please check a box for each session you would like to participate in.

Looking forward to see you at webinar where we will discuss the implemented tools and you can receive answers on all your questions.

[Register](#)

Figure 1 – Invitation to hands-on session.

3 Registration

Upon pressing the registration, button/link the registration form pops-up prompting users to register, as shown in Figure 2.



Hands-on session registration

Please register for an online hands-on session on the use of e-Laboratory (NET-Tools). You will receive credentials to connect to the NET-Tools platform in due course after the registration. The webinar will be split into several sessions - please check a box for each session you would like to participate in

Email Address

First Name

Last Name

Company

Why you would like to attend the event

Please check the session you would like to attend:

- Safety tools
- Fuel Cells tools
- Renewable energy, electrochemistry and property tools
- Storage and separation tools

Subscribe to list

Figure 2- Registration form.

After registration, all attendees received the confirmation, as shown in Figure 3.



Dear *|FNAME|*,

Thank you for registering for the **1st Hands-on Session in the use of e-Laboratory.**

Your seat is confirmed for:

Date: 27 June 2018

Time: 11:00 am London, GMT +1

Shortly before the event you will receive the link to join the webinar.

But before the webinar you have an opportunity to login to our e-Laboratory platform to test and learn the available tools produced during the first year of the project. Please do it and be ready to ask questions and to give a feedback. You will have this account valid for 2 weeks before and 2 weeks after the webinar, after the account will get void and we will continue working on the platform improvement.

Here are the connection details:

URL: <https://elab-prod.iket.kit.edu/>

Username: **handson1806**

Password: **+e-laboratory+**

Finally, here's three things to remember:

- 1. BLOCK OUT 2 HOURS:** Make sure that you block out a full 2 hours for the webinar in your calendar and it's a good idea to put a sticky note on your computer so that you remember the time.
- 2. SHOW UP EARLY:** Even though it the webinar will be recorded make sure that you attend live and show up at least 5-minutes early so you could have chance to ask all questions. The software we use has an attendee limit and with dozens of people, we'll fill up fast.
- 3. USE A DESKTOP COMPUTER:** Make sure that you attend the webinar using your LAPTOP or DESKTOP computer. The webinar system we use doesn't behave well with mobile so using a computer will dramatically improve your experience and allow you to learn more.

We looking forward to see you at webinar *|FNAME|*, where we will discuss the implemented tools and you can receive answers on all you questions.

Figure 3 - Registration confirmation.

The total number of registered participants were 91 out of 8316 showing the response rate of about 1.1%. The registered audience was represented by top locations outlined in Figure 3.

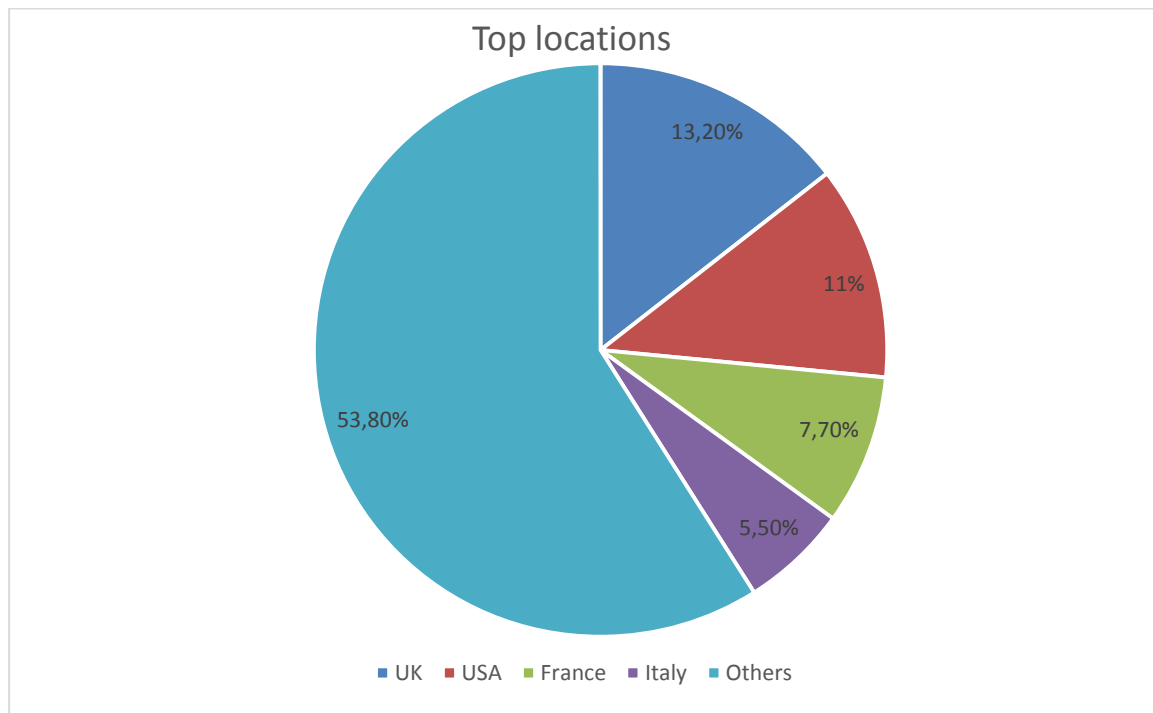


Figure 4 - Audience top locations.

Scheduled reminders were set up to inform attendees about the forthcoming event 1 day and 1 hour in advance, before the webinar.

4 Platform and testing organisation

For the hands on session, the dedicated server was set up by PersEE at KIT facility and generic account was provided for all users to allow them to run and test the tools available up to date.

Here are the connection details:

URL: <https://elab-prod.iket.kit.edu/>

Username: **handson1806**

Password: **+e-laboratory+**

5 Registered statistics

During registration the question was asked: “Why would you like to attend the event?”. The answers can be divided into 5 main categories. Typical answer examples representing each category are shown below:

- Interest in the field
 - o To better understand the online engineering tools
 - o We are interested in hydrogen training tools
 - o Get to know the available numerical modelling tools related to hydrogen energy technology.
- Partner
 - o To see you did a good job :-)!
- Professional interest



- I work in the area of renewable energy
- Experienced Hydrogen Educator and Practitioner, keen to see the advantages of NET-Tools
- My research activities are focused on the development of energy systems with fuel cells and of electrolyser for hydrogen production using renewable sources, therefore I am interested in all the sessions.
- Online learning
 - To learn about Net-tools
 - Learning about e-laboratory
 - To learn
- Test tools
 - We would like to review the safety tools around hydrogen
 - To check the suitability of tools

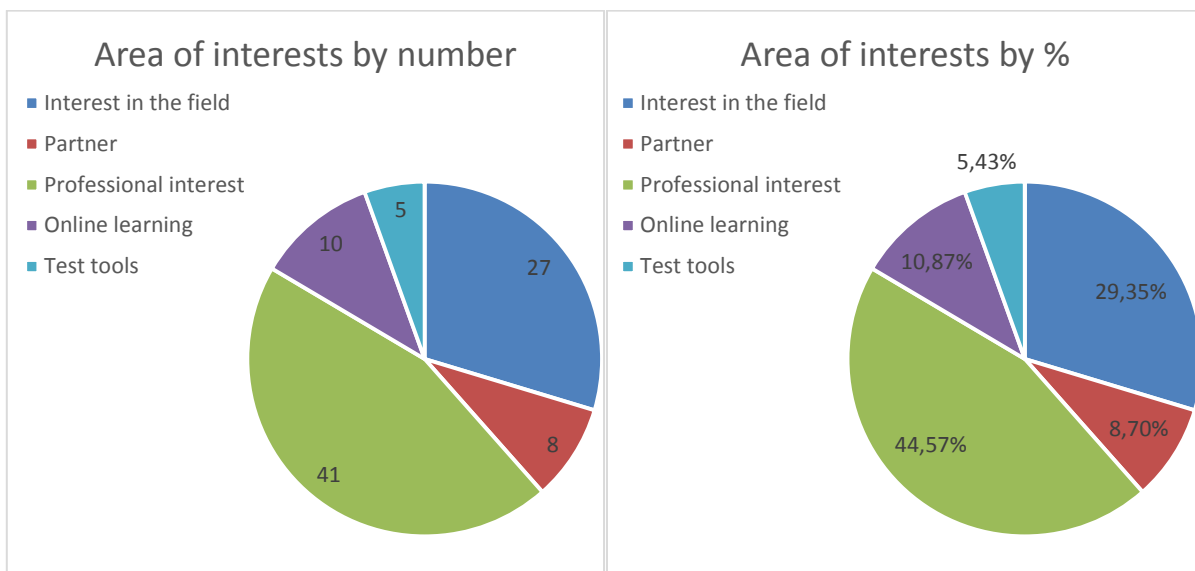


Figure 5 - Area of interests

It can be seen from the diagram that the majority of registered have professional interest nearly 45%, around 30% registered to express interest in the field, nearly 11% to learn and about 5.5% to test the platform. The rest 8.7% are participants from the consortium.

From Figure 6 it can be seen that industrial representatives registered for the session are 10% more than the academia and research group.

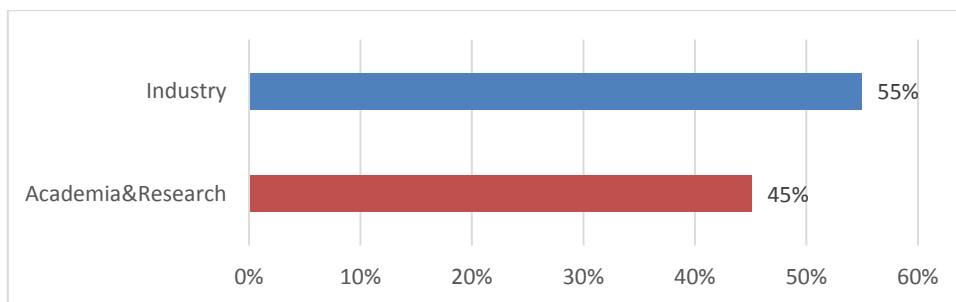


Figure 6 - Representatives by origin.



6 Hands-on organisation

The hands-on session was organised in the following way.

Two weeks before the session all registered received email with access to the e-Laboratory to test the tools. Every tool available on the platform has its own description and all the references.

During webinar, the presentation was given outlining all available current tools and those due to be delivered within the scope of the project. After the presentation attendees were encouraged to ask questions by means of online chat, while the presenter was reading them and answering by voice.

The webinar was recorded and the video was distributed together with feedback form to all who registered for the session.

Video is available from <https://youtu.be/FL-EUiodZ4>

The webinar had been attended by 28 participants. In addition to project members, participants included representatives from industry and academia.

7 ANNEX 1: Feedback results from hands on session

Online feedback form was prepared well in advance by PersEE to collect the feedback from participants of the hands-on session.

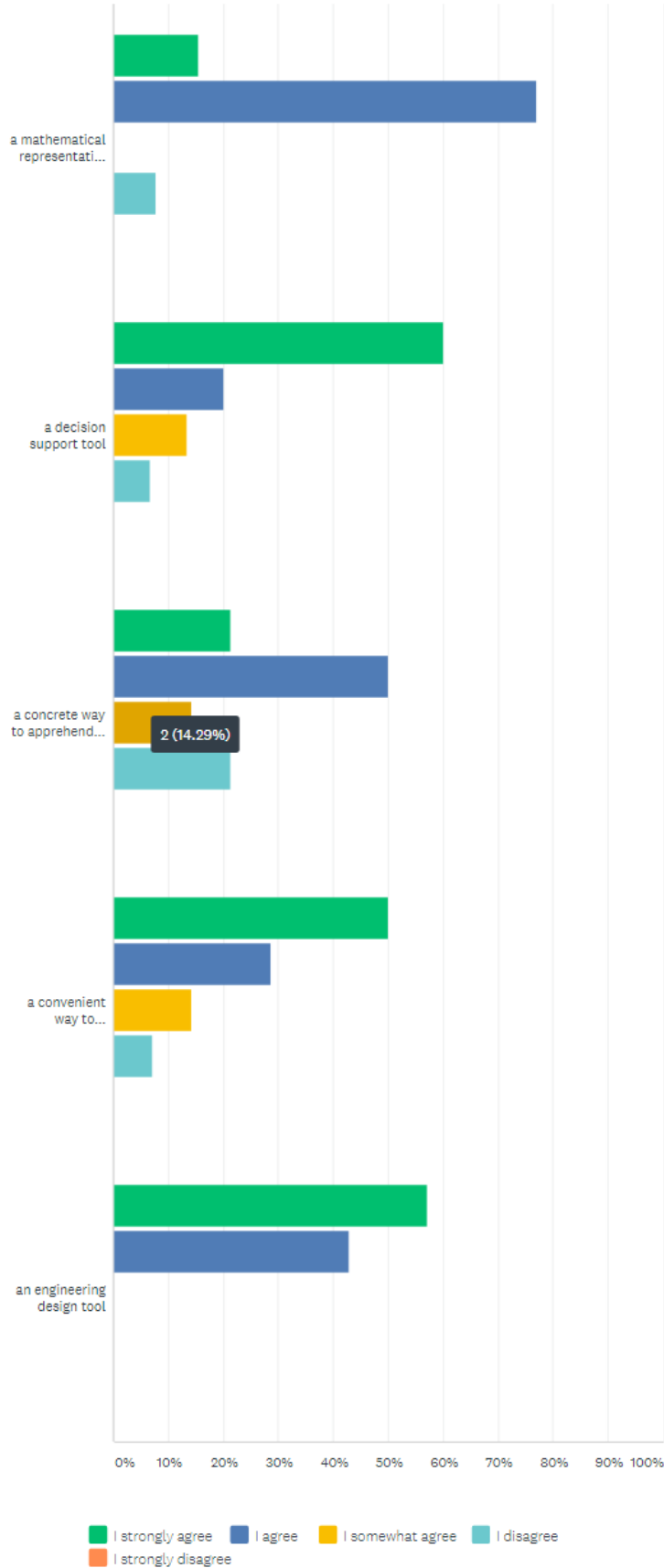
The feedback form contains 10 questions, and the results of the respondents are presented below. An online version is also available from <https://www.surveymonkey.com/r/FZ6P2CH>.



Q1

Essence of 'tool': What is a tool?

Answered: 15 Skipped: 0





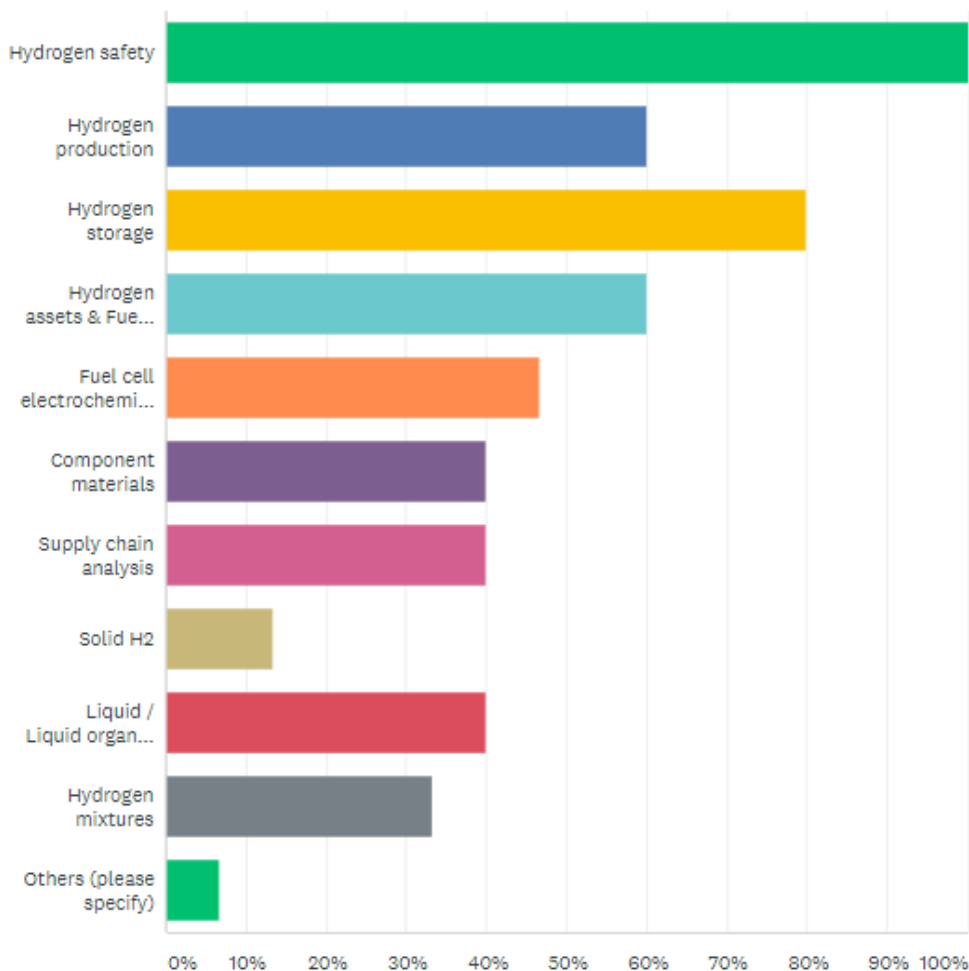
	I STRONGLY AGREE	I AGREE	I SOMEWHAT AGREE	I DISAGREE	I STRONGLY DISAGREE	TOTAL RESPONDENTS
a mathematical representation of a technical or economic behaviour	15.38% 2	76.92% 10	0.00% 0	7.69% 1	0.00% 0	13
a decision support tool	60.00% 9	20.00% 3	13.33% 2	6.67% 1	0.00% 0	15
a concrete way to apprehend a new scientific method	21.43% 3	50.00% 7	14.29% 2	21.43% 3	0.00% 0	14
a convenient way to exemplify a course and progress education	50.00% 7	28.57% 4	14.29% 2	7.14% 1	0.00% 0	14
an engineering design tool	57.14% 8	42.86% 6	0.00% 0	0.00% 0	0.00% 0	14

Q2



Scope of tools: What topics should the tools address? Tick when appropriate

Answered: 15 Skipped: 0



ANSWER CHOICES	RESPONSES	
Hydrogen safety	100.00%	15
Hydrogen production	60.00%	9
Hydrogen storage	80.00%	12
Hydrogen assets & Fuel cell techno economics	60.00%	9
Fuel cell electrochemistry	46.67%	7
Component materials	40.00%	6
Supply chain analysis	40.00%	6
Solid H2	13.33%	2
Liquid / Liquid organic H2	40.00%	6
Hydrogen mixtures	33.33%	5
Others (please specify)	6.67%	1
Total Respondents: 15		

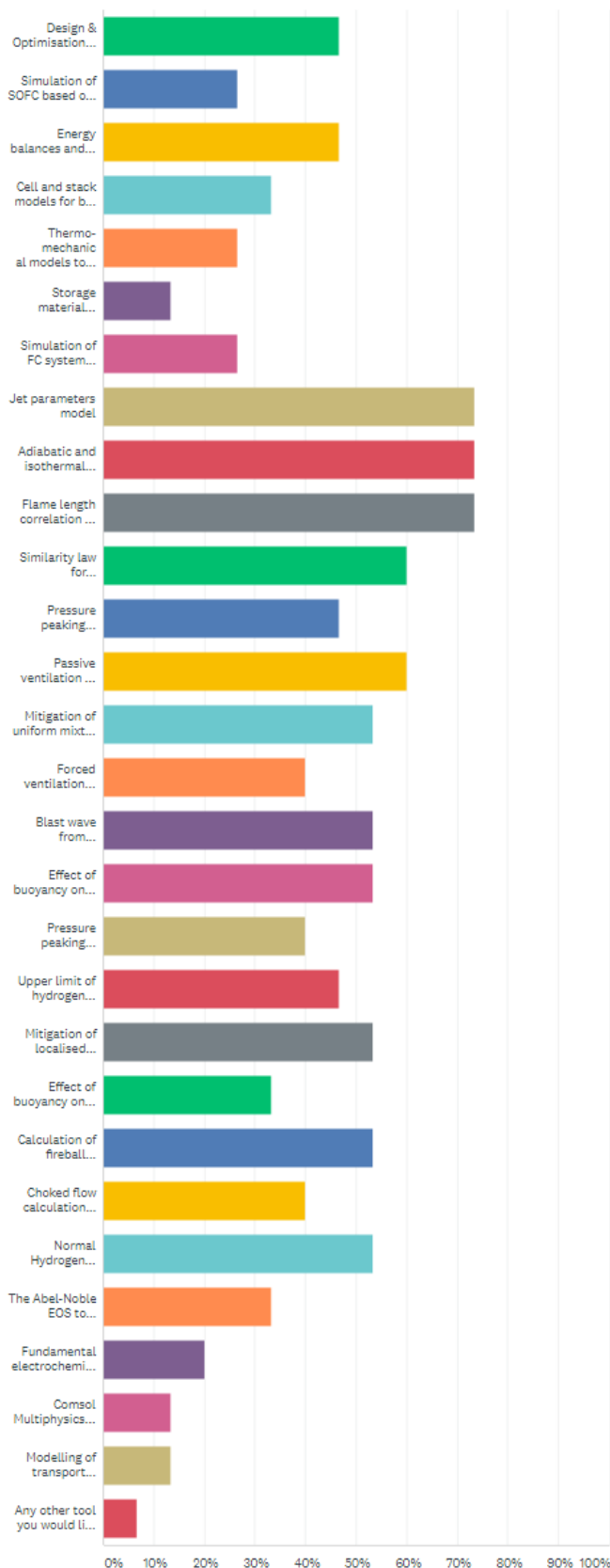


Q3



List of tools: Below the list of tools which Net Tools aims to deliver. Out of these, which are the ones you are planning to use? Tick when appropriate.

Answered: 15 Skipped: 0





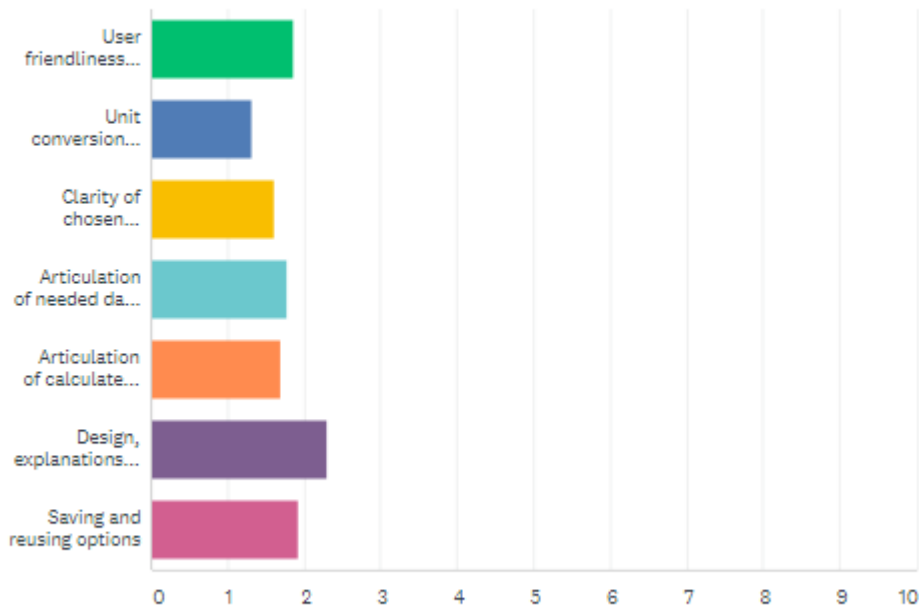
ANSWER CHOICES	RESPONSES	
Design & Optimisation of hybrid RES – Hydrogen autonomous power systems for isolated communities and sites	46.67%	7
Simulation of SOFC based on natural gas as fuel	26.67%	4
Energy balances and hydrogen costs for various electrolysis techniques	46.67%	7
Cell and stack models for both fuel cells and electrolysis	33.33%	5
Thermo-mechanical models to predict lifetime of high temperature FCs and electrolysis	26.67%	4
Storage material properties estimation and performance assessment based on a "materials-by-design" multi-scale approach	13.33%	2
Simulation of FC system integrated into mCHP application, including electrolyser operation	26.67%	4
Jet parameters model	73.33%	11
Adiabatic and isothermal model of blowdown of storage tank dynamics	73.33%	11
Flame length correlation and three hazard distances for jet fires	73.33%	11
Similarity law for concentration decay in hydrogen expanded and under-expanded jets and unignited jet hazard distances	60.00%	9
Pressure peaking phenomenon for unignited releases	46.67%	7
Passive ventilation in an enclosure with one vent: uniform hydrogen concentration	60.00%	9
Mitigation of uniform mixture deflagration by venting technique	53.33%	8
Forced ventilation system parameters	40.00%	6
Blast wave from high-pressure rupture without and with combustion	53.33%	8
Effect of buoyancy on decrease of hazard distance for unignited releases	53.33%	8
Pressure peaking phenomenon for ignited releases	40.00%	6
Upper limit of hydrogen inventory in closed space	46.67%	7
Mitigation of localised non-uniform deflagration by venting	53.33%	8
Effect of buoyancy on hazard distances for jet fires	33.33%	5
Calculation of fireball diameter for rupture in a fire of a stand-alone and an under-vehicle hydrogen storage tanks	53.33%	8
Choked flow calculation using NIST-EoS	40.00%	6
Normal Hydrogen thermo-physical properties using the NIST-EoS, (Helmholtz free energy based)	53.33%	8
The Abel-Noble EOS to calculate CGH ₂ mass in a volume at particular pressure and density	33.33%	5
Fundamental electrochemistry equations, design PEM, optimal porosity of gas diffusion electrodes, ionic conductivity: a. Electrochemical potential; b. Nernst equation; c. Faraday laws of electrolysis; d. Butler-Volmer equation; e. Tafel equation; f. Ionic conductivity g. Levich equation	20.00%	3
Comsol Multiphysics for simulation of hydrogen production and FCH technologies	13.33%	2
Modelling of transport processes in electrodes and electrolytes	13.33%	2
Any other tool you would like to see added?	6.67%	1
Total Respondents: 15		

Q4



Functionalities of the tools: How would you rate?

Answered: 14 Skipped: 1



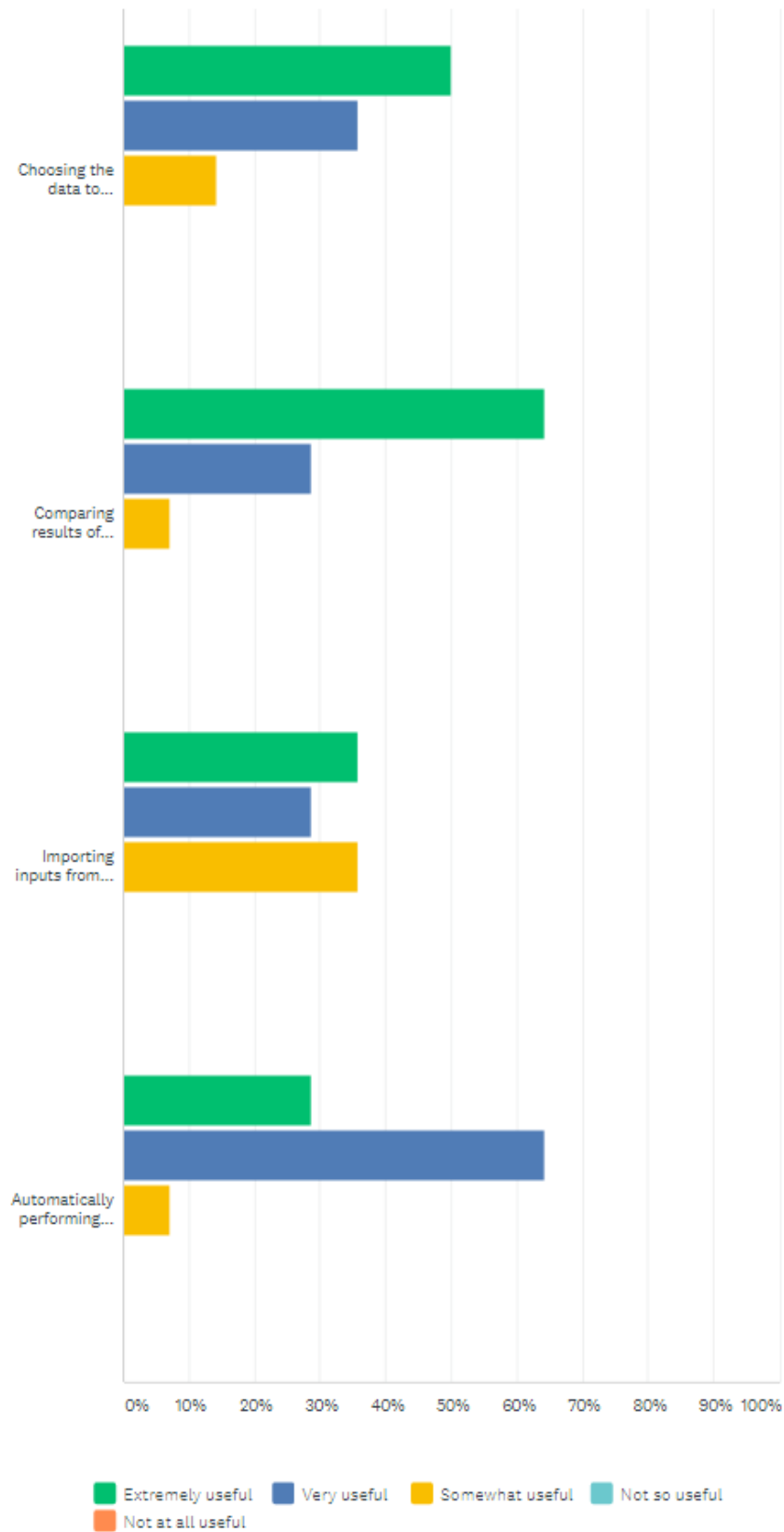
	EXCELLENT	GOOD	FAIR	TO BE IMPROVED	TOTAL	WEIGHTED AVERAGE
User friendliness of the interface?	42.86% 6	35.71% 5	14.29% 2	7.14% 1	14	1.86
Unit conversion possibilities?	69.23% 9	30.77% 4	0.00% 0	0.00% 0	13	1.31
Clarity of chosen dimensions of input parameters (single tools)	46.15% 6	46.15% 6	7.69% 1	0.00% 0	13	1.62
Articulation of needed data to start accurate calculation (sufficiency)	30.77% 4	61.54% 8	7.69% 1	0.00% 0	13	1.77
Articulation of calculated output (sufficiency)	38.46% 5	53.85% 7	7.69% 1	0.00% 0	13	1.69
Design, explanations and graphical articulation (schemes)	30.77% 4	23.08% 3	30.77% 4	15.38% 2	13	2.31
Saving and reusing options	38.46% 5	38.46% 5	15.38% 2	7.69% 1	13	1.92

Q5



Can you rate the usefulness of the following proposed features?

Answered: 14 Skipped: 1





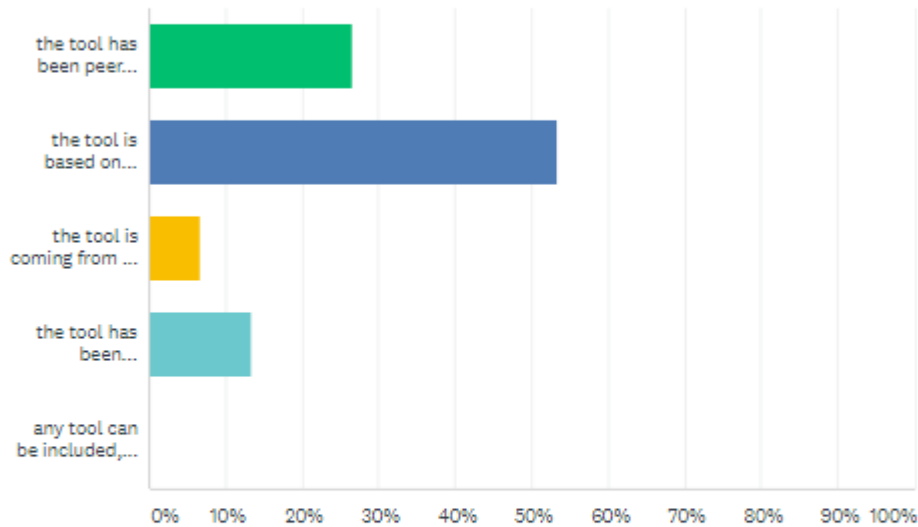
	EXTREMELY USEFUL	VERY USEFUL	SOMEWHAT USEFUL	NOT SO USEFUL	NOT AT ALL USEFUL	TOTAL
Choosing the data to visualize on charts (selection of axis)	50.00% 7	35.71% 5	14.29% 2	0.00% 0	0.00% 0	14
Comparing results of different calculations	64.29% 9	28.57% 4	7.14% 1	0.00% 0	0.00% 0	14
Importing inputs from file (excel, json...)	35.71% 5	28.57% 4	35.71% 5	0.00% 0	0.00% 0	14
Automatically performing multiple calculations, with variation of one input between selected limits	28.57% 4	64.29% 9	7.14% 1	0.00% 0	0.00% 0	14

Q6



Governance of the tools: What best describes the eligibility condition for a tool eligible to sit in eLaboratory

Answered: 15 Skipped: 0



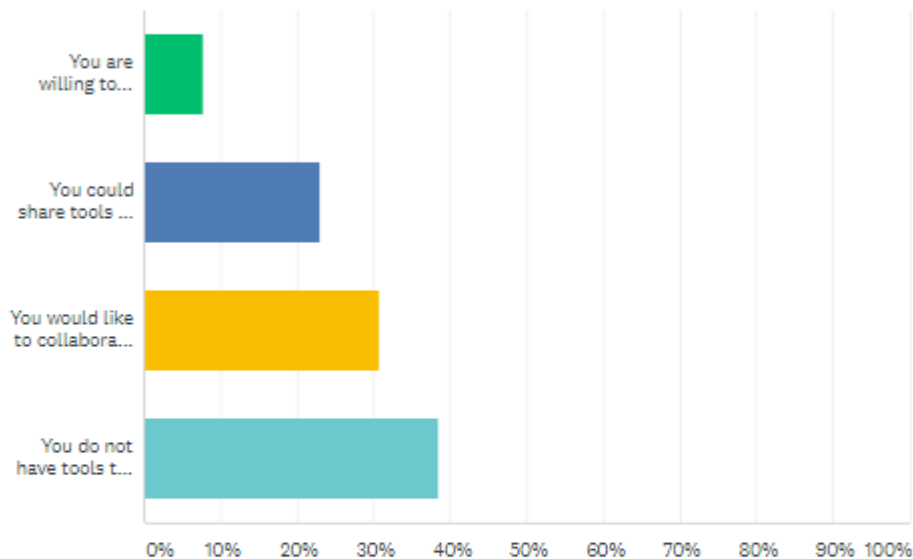
ANSWER CHOICES	RESPONSES	
the tool has been peer reviewed without publication	26.67%	4
the tool is based on peer-reviewed publication	53.33%	8
the tool is coming from a major educational institution	6.67%	1
the tool has been demonstrated in a significant environment	13.33%	2
any tool can be included, the users will rate them	0.00%	0
TOTAL		15

Q7



Further tool development: How do you see yourself in the development of eLab?

Answered: 13 Skipped: 2



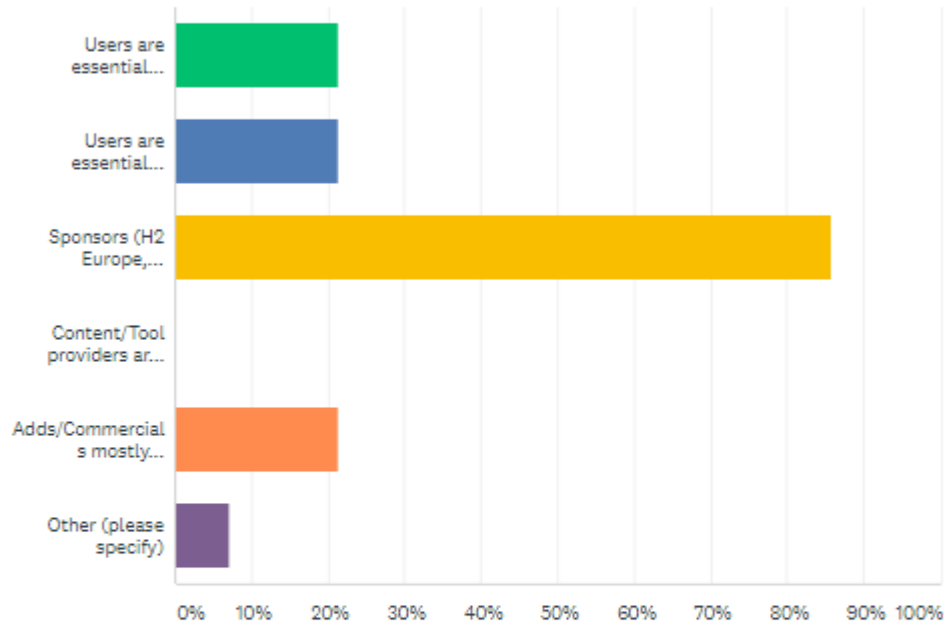
ANSWER CHOICES	RESPONSES	
You are willing to share the tools you have developed yourself in a format required by eLab guidelines	7.69%	1
You could share tools if the integration work is done by third parties at no cost	23.08%	3
You would like to collaborate on the development of future tools	30.77%	4
You do not have tools to share but you could consider helping the promotion/dissemination of eLab	38.46%	5
TOTAL		13

Q8



Business model of eLab: What are the options you see viable to support the development of eLab at the end of Net Tools project?

Answered: 14 Skipped: 1



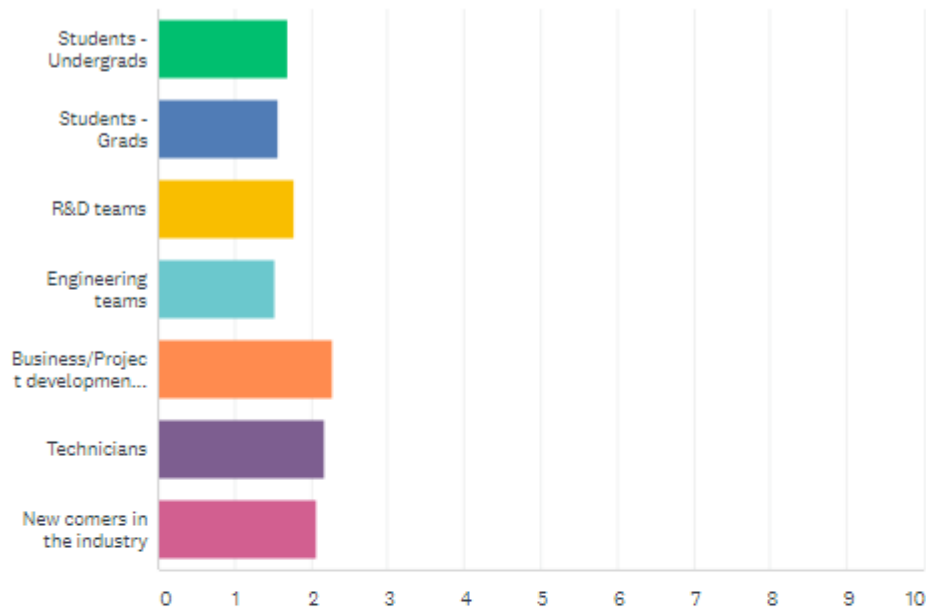
ANSWER CHOICES	RESPONSES
Users are essential contributors: they pay based on their use	21.43% 3
Users are essential contributors: they pay a yearly fee	21.43% 3
Sponsors (H2 Europe, Corporates) are essential contributors: eLab should be kept open to all!	85.71% 12
Content/Tool providers are essential contributors: they pay for the integration of their tools	0.00% 0
Adds/Commercials mostly contribute to finance eLab	21.43% 3
Other (please specify)	7.14% 1
Total Respondents: 14	

Q9



eLaboratory Users: : Who will most likely use eLab?

Answered: 15 Skipped: 0



	CERTAINLY	MOST LIKELY	UNLIKELY	CERTAINLY NOT	TOTAL	WEIGHTED AVERAGE
Students - Undergrads	38.46% 5	53.85% 7	7.69% 1	0.00% 0	13	1.69
Students - Grads	50.00% 7	42.86% 6	7.14% 1	0.00% 0	14	1.57
R&D teams	46.15% 6	38.46% 5	7.69% 1	7.69% 1	13	1.77
Engineering teams	46.67% 7	53.33% 8	0.00% 0	0.00% 0	15	1.53
Business/Project development teams	20.00% 3	40.00% 6	33.33% 5	6.67% 1	15	2.27
Technicians	16.67% 2	50.00% 6	33.33% 4	0.00% 0	12	2.17
New comers in the industry	25.00% 3	41.67% 5	33.33% 4	0.00% 0	12	2.08



Q10



We would appreciate if you could give us some information about you

Answered: 11 Skipped: 4

ANSWER CHOICES	RESPONSES	
Name	100.00%	11
Company	90.91%	10
Address	0.00%	0
Address 2	0.00%	0
City/Town	0.00%	0
State/Province	0.00%	0
ZIP/Postal Code	0.00%	0
Country	100.00%	11
Email Address	90.91%	10
Phone Number	0.00%	0



8 ANNEX 2: Report on 2nd e-Newsletter

27/8/2018

NET TOOLS #2 (copy 01)

NET TOOLS #2 (Copy 01)

Sent

Thu, May 10, 2018 4:14 am