The Valorisation Training Pilot Test and Validation Report

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Summary

This report documents the creation and development of STEM Valorisation training programme content and the piloting of the resultant programme, which is designed to support researchers as they valorise their research. *The program creation team represent a diverse set of relevant valorisation perspectives, providing a multi-stakeholder concept of valorisation.* The resulting STEM Valorise programme content included key points from the relevant academic literature, targeted necessary skills development to enable researchers to prioritise the most viable and attractive options from their research, and featured relevant content related to stakeholder engagement, entrepreneurship, and negotiation. The programme provided participants with a comprehensive understanding of the valorisation process and the tools and skills needed to turn their research into societal impact. The Valorisation programme for STEM Researchers was deemed successful and valuable for STEM researchers interested in achieving greater societal impact with their research. The same diverse team that developed the content for the programme, also delivered the pilot. This diversity allowed the participants to see a variety of relevant and sometimes differing perspectives of valorisation. The overall feedback regarding the programme was positive. Discussion and reflection among the team members highlighted potential improvements for future delivery of the programme and identified future skills needed to maximise valorisation, such as research prioritisation for multiple available options or channels for STEM valorisation.

Training programme creation

The STEM Valorise programme was designed to provide STEM researchers with a comprehensive understanding of the concept of STEM Valorisation and provide useful information on the related topics of stakeholder engagement, societal impact assessment, entrepreneurship, and negotiation. The STEM Valorise training programme for STEM Researchers was collaboratively created by the STEM Valorise team during 2022 (IO3). A June multi day meeting at ITUs campus in Istanbul provided a focus point for all of the prior project work and an intensive discussion and review process allowed the eventual overall structure, logic and sequence of the program to emerge. The challenge was creating a cohesive programme to cover a wide variety of topics with a logical flow and thereby to deliver the best possible programme on STEM Valorisation – a novel and as yet underdeveloped field. A comprehensive STEM Valorisation programme was developed and tested, with many indicators of success. Reflection and feedback by participants have also identified areas of training that could be further addressed for programme improvement.

Pilot structure

The programme pilot implementation (IO4) consisted of a mixture of training methods including, lectures, case studies, and interactive sessions online on the Zoom platform, with international registered participants from Ireland, France, and Turkey. A total of ten interactive sessions, each of 90-minutes duration allowed the participants to engage with their peers and with the instructors. Each session provided an opportunity for participants to work together in break out rooms, to

discuss relevant content and case studies, and to explore its relevance to their own STEM research, while receiving feedback and mentorship from the instructors.

Programme content during the 2022 pilot

The STEM Valorise programme is designed to support researchers as they valorise their research. This requires a multi-disciplinary approach with transversal skills development. An outline of the various units are provided, with some units reported together that have a thematic or content overlap. The contents of the complete programme are further illustrated in Annex 2.

The first 3 sessions provided an overview of the programme to learn about STEM Valorisation and this included discussion of the various trends and incentives affecting whether STEM research is valorised, or not. The academic literature focused on research valorisation and provided a starting point, in particular highlighting common barriers and drivers. These featured in sessions 1 and 3, with sample materials reprised in Table 1 and Figure 1.

Table 1. Drivers and barriers to valorisation.
Drivers
• An idea / research results likely to be worth valorising
• Intention & commitment (taking this programme helps set the intention)
• Capacity / resources including human capital of skills and networks
• Institutional policy and culture (e.g. incentives, control, ownership)
• Aligned incentives (researcher, university, business partner)
• Exclusivity to provide incentive to invest (intellectual property rights)
Barriers
• Ideas / research whose valorisation potential is not clear.
• Lack of common understanding of valorisation process
• Role ambiguity – e.g. lack of clarity of your role: are you a researcher and/or an entrepreneur?

Valorisation Cycle consisting of four overarching phases:

1. **Science** - an idea is researched and converted to a patent or publication;

2. **Business Development** - the idea/product is evaluated and used for industrial up scaling.

3. **Market** – idea/product is introduction to the market and feedback from users is obtained

4. **Society** – the need in society is met and it feeds back into the research

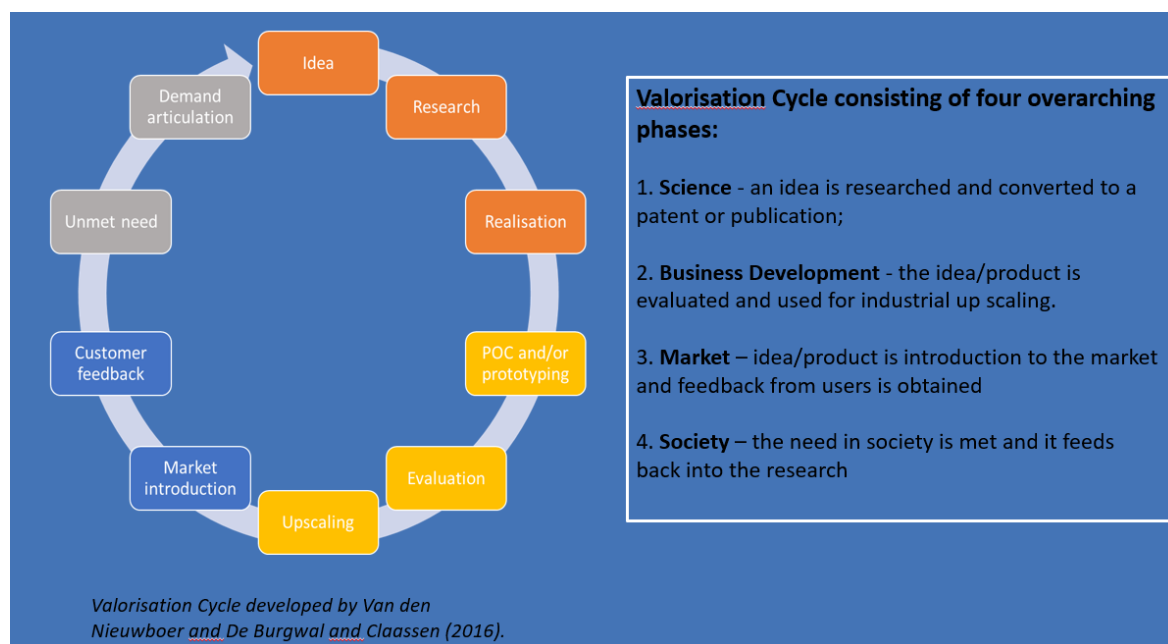Valorisation Cycle developed by Van den Nieuwboer and De Burgwal and Claassen (2016).

Figure 1 Valorisation Cycle Model of valorisation.

Session 2 provided a broad overview of the programme and its contents, in effect asking how do all the elements for STEM research valorisation fit together?. The aim of this session was to provide a deeper understanding the incentives (and barriers) of the stakeholders for valorisation, including those faced by STEM researchers themselves. This session worked to provide a deeper understanding in the participants of what t might inhibit valorisation of STEM research and again, sample training materials from this session are illustrated in Figure 2.
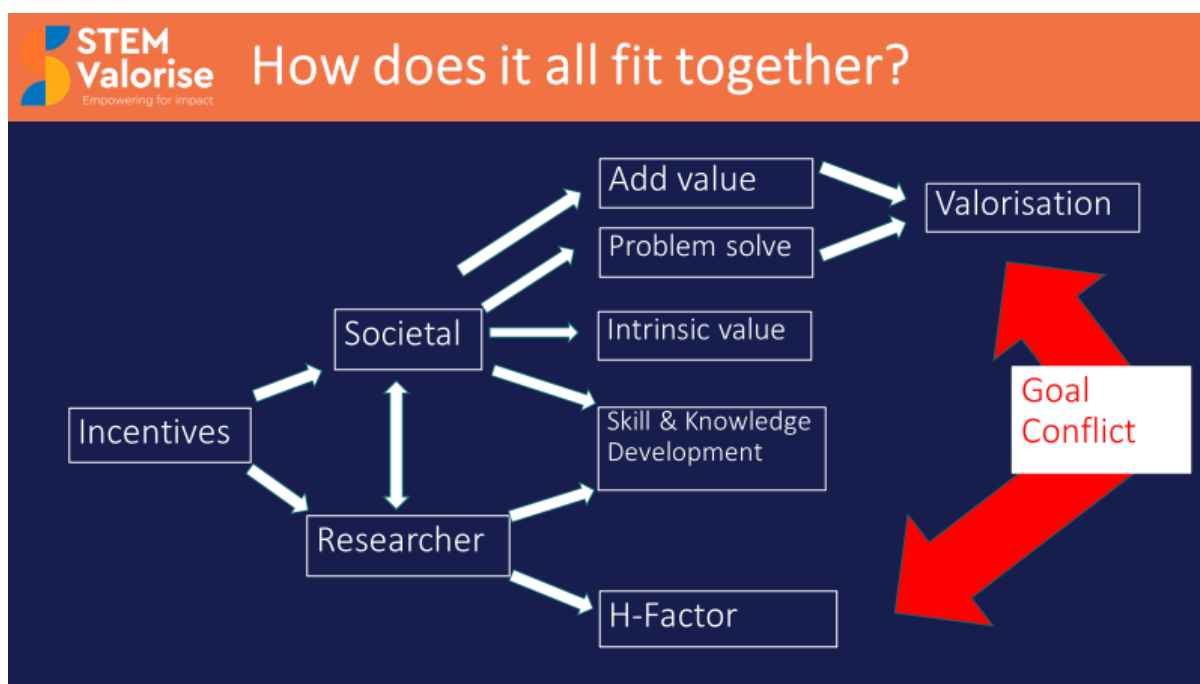

Figure 2. A model of valorisation considering the incentives of society and researchers including the potential for goal conflict.

Figure 3. Simple causal diagram example whereby we visually outline the causal chain of events from intervention to expected outcome.

Simple models and assumptions about what valorisation should be were presented and discussed with the participants (e.g., Figure 3). Other slightly more complex models describing the phenomenon of valorisation were also outlined – e.g. a self-perpetuating value creation cycle as outlined in Figure 1.

Sessions 4 and 8 introduced the key players, roles, and stakeholders within STEM valorisation, providing tools and structures for researchers to identify and assess those stakeholders most relevant to their own work and identified how best to communicate with different stakeholders. Building on these two sessions, **session 9** provided context and information about negotiation in the STEM research context. Negotiation is a key skill required to understand the motivations and drivers of relevant stakeholders and to develop the co-operative skills required to maximise research value. Theory and tools were provided to assist researchers to negotiate with their stakeholders and

decision makers and these tools provided practical information regarding valorising STEM research for the participants.

In session 6, *the methods for assessing societal importance ,including the Horizon Europe research impact indicators, were examined. This unit explored the wide variation in methods applied in various European countries. Considered to be the most developed and in depth framework currently available, this training unit presented an overview of the Research Excellence Framework (REF), developed and implemented in the United Kingdom. This REF model of valorisation reporting informs the allocation of approximately £2 Billion of research funding each year and it promotes the use of tools, such as structured case studies that feature a strong focus on evidence of impact for valorisation of scientific research. Other models for assessing research value were also discussed and included the RICE (Reach, Impact, Confidence, Effort) model, as well as the scale, tractability and neglectedness model. A scientific approach, which suggested that clear hypotheses and causal diagrams (Figure 3) could be used to outline the rational for each research option was suggested as naturally fitting the existing skillsets of STEM researchers. This scientific approach to valorisation of STEM research options would test the potential of research choices to valorise and could provide clarity for choices for valorisation much earlier in the research process.*

Session 5 and Session 7 *communicated an entrepreneurial perspective on how to increase the valorisation of STEM research and informed participants   how research can lead to product/service development and how tools such as the Business Model Canvas can inform the valorisation potential of STEM research.* This lecture featured the basics of entrepreneurship, such as market fit, and it explored how the skills of research and entrepreneurship differ and overlap. Case studies, including some from the STEM Valorise digital library of case studies, provided hands-on learning opportunities for the participants to analyse real-world examples and to learn from the successes and failures of others. Entrepreneurial processes and how STEM Researchers can apply their research and expertise in creating successful start-ups was outlined. A guest speaker, an experienced entrepreneur and industry expert with a STEM research background, shared insights and real-life experiences and provided participants with a chance to ask questions related to entrepreneurial routes to valorisation of their STEM projects.

In session 10, a summary of the status quo in STEM research valorisation and the tools to navigate it was presented. This unit reprised the programme outline and materials and provided an opportunity for critiques and potential improvement suggestions. One such comment noted that the complexity of valorisation as a phenomenon was difficult to capture. The simple causal diagram in Figure 2 might be too simple to inform how STEM valorisation might be improved. In response to this critique, Figure 4, developed as part of the reflective processes, outlines causal assumptions that potentially underlie the valorisation concept and which usually remain unstated. For example, this more complex view of valorisation highlights that a major driver of valorisation is the societal importance of the topic itself. This societal importance does not rely on whether STEM research may result in an academic publication. For scientific publications, the main focus appears to be methodological quality and novelty rather than societal benefits derived from valorisation of STEM research.
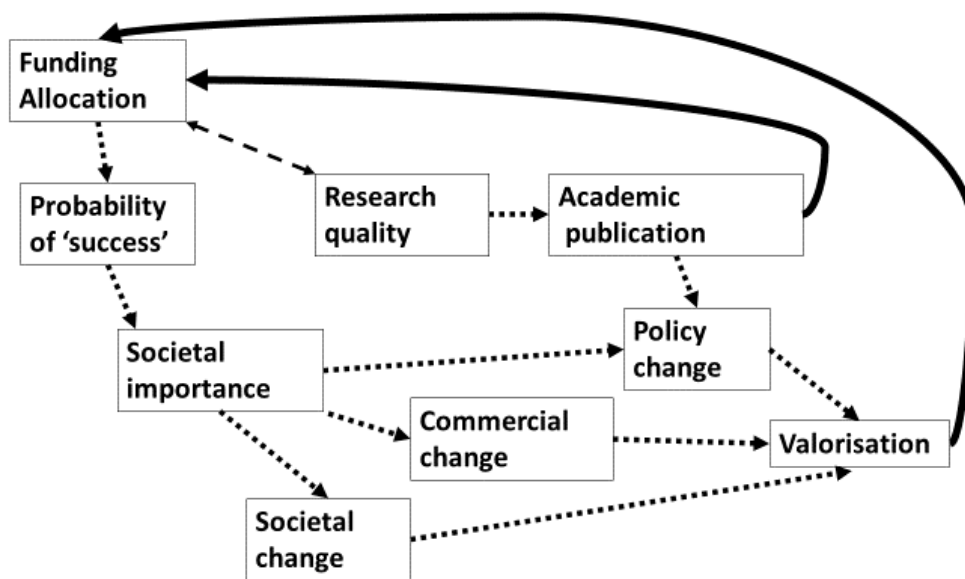
Figure 4 Complex Causal diagram: A visual outline of the causal chain of possible events from intervention to expected outcome. Dotted lines indicated uncertain or intermittent validity.

Participant feedback

Overall, the programme was well received by the participants, who reported the content to be engaging and informative. Many participants reported that they gained new insights and ideas that they could apply to their own STEM research. Notable comments from the participants include:

- 'Gave me a different perspective on my research project. Interesting because some people have different views to what you have stated in this course, so this course has been very important in making me understand that there is different ways to look at my work. Thank you.'
- 'Overall, it was an informative, interactive, and useful training course which enabled me to think bigger. I learned a lot how to valorize my product in terms of economic and marketing.'

The average rating for the programme based on 7 responses received was 4.1 (out of 5), with 6 participants providing a rating of 4 out of 5 and 1 participant scored the programme at the maximum 5 out of 5. Technical difficulties provided the key areas of dissatisfaction, with some participants reporting difficulty accessing the Zoom platform and dissatisfaction with the lack of recordings and supporting materials. Some of these issues arose from IT security systems within universities which are rather limiting for engaging outside of their own institutions.

Testimonials were solicited after the completion of the pilot programme from the participants, with the aim of informing future programme delivery. The following comments were received :

- "Having only just started my academic journey, I would have been ignorant to the concepts of research valorisation and commercialisation from the offset. The STEM Valorise course was a fantastic primer and a necessary indicator of a course correction from the beginning that I know will pay dividends for me in the near future." Andrew Kenneally, Ph.D Scholar

(Computer Science), MSc Cybersecurity, BSc Hons Computer Systems, Nimbus Research Centre.

- "The STEM Valorise course gave me an in-depth insight into the value that my research work can provide to society. The course also helped me understand the tools and skills required to increase the value of my work in the knowledge transfer and application of my research. The course was very engaging, with many opportunities to voice my own opinion or questions. I particularly appreciated the live workshop tasks in which I learned very useful skills such as in negotiation. The course introduced me to new perspectives on what it means to carry out research which I had not been aware of." **Leon Domoney - Masters Student of Sustainable Energy Engineering, at Munster Technical University**

Overall, the programme resulted in participants reporting increased knowledge of valorisation, research prioritisation, methods for engaging with stakeholders and for promoting the wider dissemination and uptake of research results.

Discussion

The presented STEM Valorise content was very well received by the participants. *The programme participants appreciated the diversity of presenters and of differing views of valorisation from the programme creation team. This diversity may have limited the overall programme coherence somewhat, but with broad definitions of the concept of valorisation in STEM research, this may be an inherent challenge in providing training for researchers . A reflective process preceeded the writing of this report and provided an opportunity to reflect on some mismatches that occurred between the project proposal and its implementation and completion. Future programs may need to incorporate a clearer theory of change and may require more focus on supporting the changes needed to enable not only increased valorisation but also to extract more and better societal value.*

Some logistical difficulties were encountered as the programme spanned 3 time zones, which changed during the programme delivery, due to different national implementations of daylight savings time. This provided difficulties for some students. Zoom platform access to the training provided some difficulties also. The request to have the materials available before the session to provide familiarity with the case studies prior to the unit delivery would also provide an improvement on the programme implementation. This will be addressed with the availability of these training materials on the STEM Valorise project website.

Combined researcher reflections have led to questions of where the focus should rest to improve valorisation. There appears to be a strong rationale for focusing more attention on pre research performance assessment, giving precedence on the research's potential to valorise. This could/should include assessments of a research topic's relative societal importance when compared to other potential research options within a project, with success defined in terms of societal impact combined with the chances of achieving that 'success'.

Conclusion

The STEM Valorise project aim was to improve the valorisation of STEM research from Higher Education Institutes, which remains low despite increased policy focus and supports. This Erasmus+ funded STEM Valorise project sought to empower new entrepreneurial STEM researchers and enable them to translate their research into societal impact. Following a 2-year collaboration, the STEM Valorise consortium researched, developed and implemented a comprehensive training programme and toolkit, specifically targeted for supporting valorisation efforts of early stage STEM

researchers. The research and development stages culminated in a 10-session programme, with each session of 90 minutes duration, which was delivered by a diverse range of lecturers from across the consortium partnership to a diverse group of STEM postgraduate students. Although a few small technical difficulties had to be overcome during this process, the programme implementation proceeded and was deemed a success, rating a score of 4.1 out of 5 from attendees, thus achieved and exceeded its target of 75% satisfaction. The programme not only developed the skills and knowledge of those who attended, it also improved the knowledge and skills of those who designed and delivered the valorisation materials. While this STEM Valorise project trained early stage researchers, our reflections on the experiences on this valorisation project have raised the question of earlier considerations during pre-project phases of possible valorisation outcomes and this may well provide a fruitful area of future research into STEM valorisation, as will extending the training on valorisation to a wider group of stakeholders, supervisors, funders, and others. The training materials and tools are now a resource that may be used to provide further training and those who have completed the training have indicated that the merit and benefit may well occur in their next research project or phase, where they may implement in practice what they have learned on this pilot programme.

Annexes 1 Form collecting feedback

Feedback from participants was elicited during the pilot of the STEM Valorise training programme. Each participant was asked 4 questions (see below) about each of the 10 sessions, and after completion, the same 4 questions were reframed to inquire about the entire pilot of the STEM Valorise programme.

1. What did you like about week x?
2. What was not useful in week x?
3. How could we improve week x?
4. Overall, how would you rate the value of week x?

Training Programme Schedule

Module	What you will learn
STEM Valorise Overview & Context	Get a better understanding of what this programme is about
Introduction to STEM Valorisation	What valorisation is and why it is important
Valorisation of STEM Research	Where valorisation is relevant in STEM research and how it manifests
Scanning and Mapping	Who the stakeholders in STEM valorisation are and how to identify them
Valorisation via Entrepreneurship	How to undertake valorisation through entrepreneurship
IP, Assessing and prioritising ideas & opportunities	Basics of IP and how to know which valorisation ideas and opportunities to pursue
Product Development & Business Model Canvas	How to use a Business Model Canvas and how to start when developing your product
External Engagement	How and why you should engage externally when valorising your STEM research
Negotiation Skills for Researchers	Basics of negotiation processes as a researcher
Course reflection, final questions, and wrap up	Round off your experience and have the opportunitiy to ask questions and gain final insights