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**Guidelines: proposals and solutions to
challenges for developing skills in intellectual
property rights – open data for sustainability
and circularity**



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Executive summary

Intellectual property (IP) and intellectual property rights (IPR) are critical drivers for economic growth, allowing the valorisation of intangible assets in economies. Intangible assets play an increasing role in the global race for technological leadership, with the added value of IP growing across Europe (EUIPO Report on IPR infringement, 2019). The IPR-intensive industries also create about one-third of all jobs in the EU (EPO and EUIPO Report, 2019).

Within the scope of WP2 of the IPR4SC project, the consortium desired to understand the situation on skills on IPR, firstly through assessing the sentiment towards the IPR through various target groups and familiarity with the concept. After that, the survey tested skills of IPR application and IPR utilisation. We made a distinct emphasis on the idea of Green IP, including sustainability and circularity. The results show that general knowledge and awareness are modest; however, practitioners and SMEs see the potential and exploit the potential of IPR to support European innovation and growth.

We detected primary objectives as A) Improving the understanding of the importance of upskilling the topic of IP and IPR using contemporary pedagogical approaches. B) To improve the conditions for people entering the labour market to obtain the competence and skill to recognise the value of IP for the European innovation ecosystem. C) To improve people's awareness of the value of IP in processes of sustainability and circularity. D) To encourage the entrepreneurial and industry sectors to develop skills in IPR open data for innovation. E) Unleashing the potential of researchers to join the processes of Open innovation and technology transfer by developing research jointly with industry and protecting it via IPR.

The SWOT analysis revealed the main strengths in the availability of IPR data and open science; however, the main weakness is limited awareness and personal stance on IP protection combined with the lack of educational organisations offering training on IP as the main threat. However, the opportunity seems to be developing skills in IP informatics and IPR management (IP for business skills) to respond to new transitions.

The D.2.2 Guidelines – proposals and solutions to challenges defines five areas of intervention: a) Area 1 – Skills and knowledge about IPR, b) Area 2 – Skills for IPR application, c) Area 3 – Skills for IPR utilisation, d) Area 4 – IPR for Green sustainable and circular inventions, e) Area 5 – General recommendations to teaching topic of IP and IPR. The

recommendations targeting Area 1 are the recommendations mainly dealing with breaking the lack of awareness, along with promoting the skills and their relevance for innovation and new business models. Area 2 proposes strengthening the capacities of existing actors who already possess IPR skills. Area 3 outlines the target groups that are most prosperous in terms of IPR utilisation - SMEs, VET learners and HEI students. Area 4 detects the future development area; however, few respondents seem very knowledgeable about the topic. Area 5 is dedicated to several suggestions for approaching the challenges mentioned earlier. In skills development for current needs, contemporary measures should be applied.

The overall 15 recommendations are put forward targeting the listed areas. The recommendations are the following:

- Raise profile and visibility of the concept of IPR, promote the sense of practical use of IPR
- Increase the basic and theoretical knowledge of HEI students and VET learners
- Promote the professional and organisational needs for IPR skills
- Promote the relevance of organisations specialised in IPR as a valuable source of information
- Increase the skills to understand and assess the cost/benefit of IP application
- Build upon skills and services by most skilled ones – TTOs, patent offices
- Build upon skills to bridge the trust gap between the public and private sector
- Increase skills in the application of open data for the understanding of innovation potentials steaming from IPR
- Learn to define and identify the potential ways to use IPR
- Raise awareness on how IPR can be used in non-production innovation
- Skills to detect and fight infringements
- Raise awareness of the green, sustainable and circular IP
- Tailor the educational courses to demonstrate domain-specific examples
- Structure the training programmes in a multi-modular and level adjusted
- Ensure the ECTS and/or micro-credential recognition

Introduction

Intellectual property (IP) and intellectual property rights (IPR) are critical drivers for economic growth, allowing the valorisation of intangible assets in economies. Intangible assets play an increasing role in the global race for technological leadership, with the added value of IP growing across Europe (EUIPO Report on IPR infringement, 2019). The IPR-intensive industries also create about one-third of all jobs in the EU (EPO and EUIPO Report, 2019). The use of IPR is also on the increase since, in the last two decades, the volume of investments in IP has increased by 87% in the EU, almost triple the rise of the investments in tangible assets (DG FIN, 2017, European Economy Discussion Paper). IPR data is an extensive source of knowledge, with some predictions that as much as 80% of all technical knowledge in the world is only found in patents (Asche, 2017), which is available openly. The awareness of this data and the skills to interpret and exploit them allow for unlocking extensive benefits: from understanding the current state of technology, and enriching own inventive activities, to understanding future trends and emerging trends and who might be potential collaborators and competitors or potential licensees for technology transfer. This can be harnessed by various actors, from innovative start-ups to technology transfer offices to students that can activate their knowledge as soon as they enter the labour market. Nonetheless, there is a huge gap between the IPR savvy (typically larger organisations, e.g. enterprises or large TTOs) and the rest, which need to learn how to harness IPR data.

Within the scope of WP2 of the IPR4SC project, the consortium desired to understand the situation on skills on IPR, firstly through assessing the sentiment towards the IPR through various target groups and familiarity with the concept. After that, the skills of IPR application and IPR utilisation were tested. A distinct emphasis was made on the concept of Green IP, including sustainability and circularity. The results show that general knowledge and awareness are modest; however, practitioners and SMEs see the potential and exploit the potential of IPR to support European innovation and growth.

Having said all this, several proposals for solutions were outlined in order to mitigate the detected gaps and shortcomings. Five areas of impact are proposed to be activated where specific recommendations are proposed. A total of 15 recommendations are put forward, all derived from detected problematic backgrounds and justified in survey results. The proposed solutions are shaped as recommendations and structured in a way to enable the highest level of exploitation possible within and beyond the IPR4SC project.

Objectives and audiences of the Guidelines

The main objective of the guidelines, proposals and solutions presented below is to structure a framework of future action to

- Improve the understanding of the importance of upskilling the topic of IP and IPR using contemporary pedagogical approaches.
- Improve the conditions for people entering the labour market to obtain the competence and skill to recognise the value of IP for the European innovation ecosystem
- Improve the awareness of people of the value of IP in processes of sustainability and circularity
- Encourage the entrepreneurial and industry sectors to develop skills in IPR open data for innovation
- Unleashing the potential of researchers to join the processes of Open innovation and technology transfer by developing research jointly with industry and protecting it via IPR

The primary needs of the target groups we detected are as follows:

- **HEI students** need to learn the green and digital skills reinforced by IP skills. Apart from that, a change in behaviour needs to be reached for young people to recognise the value and significance of IP.
- **VET learners** need upskilling to be more competitive in the labour market. The particular focus of VET students is on the intersection of IP and circular economy; however, they also need to learn the green and digital skills reinforced by IP skills.
- HEI students & VET students need examples of the added value of the IP process in general and in the Green, Sustainable and Circular economy field. Training materials will have to be designed and delivered to them in a simple, quantitative and comprehensive manner.
- **HEI teachers and VET teachers** need to include IP-related subjects in their courses and adequately broaden the scope of their teaching. The teachers need to be addressed to adjust the teaching syllabuses with not only the IP skills-related information but also with the IP digital tools and their usage. Apart from that, the teachers need to advocate for the change in behaviour on the utilisation of the IPR, along with the application of IPR in designated cases.
- **HEI technology transfer offices and IP practitioners** are currently the most knowledgeable on the topic. Therefore, their proximity to HEI teachers can be utilised. They can act as advocates for IPR and disseminate the knowledge to HEI

teachers and VET teachers (and VET organizations). HEI TTOs could reinforce their support activities to spinoffs and transfer technology from public research to the private sector. National legislation should support such initiatives by recognising the patent activity in applicative research for researchers, and legislative procedures for spinoffs should be enabled.

- **Innovative and deep-tech SMEs and start-ups** need to develop knowledge and awareness of the importance of IP for their innovation and technology transfer processes. The key employees (especially C-suit - CEOs, CTOs, COOs, ...) should be aware of the value of IPR for the company; they should recognise the opportunities arising from IP utilisation and application. Alongside this, they should be aware of the existing IP tools and databases and opportunities arising from efficiently using and applying those tools to their everyday innovative endeavours.

Methodology and framework of guidelines

The proposed guidelines are based on primary and secondary sources. The initial part focuses on desktop research focused on understanding the reality of the European Union in the fields of innovation, IPR and IPR patent data. The first part is coherently rounded with an understanding of Green IP, sustainability and circularity. The second part of the desktop research focuses on understanding the pedagogic aspect of learning. The examination of contemporary trends in pedagogic theories will help us evaluate and propose the most viable solution to ensure the results of the future WPs are up-to trends and can remain implemented in all environments. Additionally, the innovative tools in pedagogy will be examined to deliver the best background for the WP4 »IP4 Green« course and module design and implementation; for WP5 IP for digital skills – IPR simulation Lab, and WP6 IP for Entrepreneurship – IP Co-design Jam workshop. The role of the Covid-19 pandemic in pedagogical trends will also be reflected.

The proposals and solutions will also be based on collected and analysed primary data. The primary data was collected through quantitative and qualitative surveys of existing IPR and IPR-related skills among outlined target groups. The data and results are thoroughly presented in D.2.1 IPR4SC training needs analysis. The D2.2 capitalises on the work done in the first seven months of project implementation. Figure 1 demonstrates the inter-relatedness of the deliverables and the process flow guiding the preparation of D2.2 Guidelines: proposal and solutions to challenges discovered through skills analysis.

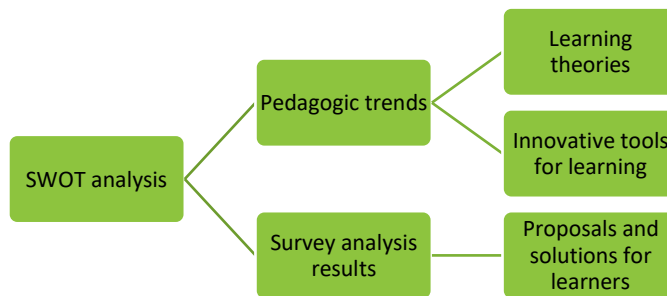


Figure 1: Structuring the guidelines on proposals and solutions

Current situation in the European Union

SWOT analysis was done to understand the current challenges and to better tailor proposals and solutions to the existing situations.

Strengths	Weaknesses
<ul style="list-style-type: none"> - Availability of IPR data is ever increasing - Interconnectedness of big data, including patent data - ICT advancements in data management and storage - Policy awareness of the importance of IP for innovation - Policy support for Green IPR - EU trends towards circularity and sustainability - Trend on life-long learning - ICT tools (eg. Virtual classrooms) to support easier learning 	<ul style="list-style-type: none"> - Limited awareness and personal stance on IP protection - Limited general knowledge of IPR - Expensive and time-consuming protection of IP - Limited sources of general knowledge on IPR - Limited personal interest in IPR application and utilization - Limited sense of personal use of IPR among young generations of students - Educational system is not recognized as potential source of knowledge on IPR
Opportunities	Threats
<ul style="list-style-type: none"> - Skill to analyse and understand IPR and innovation data across databases 	<ul style="list-style-type: none"> - Lack of interest from the universities and VET organisations to include topics of innovation and IP in their courses

- | | |
|--|--|
| <ul style="list-style-type: none">- Skills in IP informatics and IPR management (IP for business skills) to respond to new transitions- Upscale innovation potential of inventors and researchers with IP for business skills to contribute to spinoffs and academic entrepreneurial activity- Improve skills of VET and HEI learners systematically to become a competitive labour force contributing to strengthening the innovation ecosystem of the EU | <ul style="list-style-type: none">- Inability of the EU SMEs sector to recognize the potential in upscaling the IPR skills- Uneven development of EU countries due to countries not recognizing the potential of IP skills- Not understanding the potential of Green IP on the side of the industry. |
|--|--|

Areas of requested intervention

Based on the results of the two co-validation workshops, previous experiences and results of the IPR4SC Training needs analysis (D2.1). The five (5) general areas of recommendation are the following: Area 1: Skills and knowledge about IPR; Area 2: Skills for application; Area 3: Skills for utilisation; Area 4: IPR for green sustainable, and circular inventions; Area 5: General recommendations to studies.

Area 1: SKILLS AND KNOWLEDGE ABOUT IPR

Major skills gaps were detected among different target groups of the survey (see the results in D.2.1 IPR4SC Training needs analysis). These are skills for recognising the importance and potential of IPR. This includes awareness and application of IPR-related skills, along with understanding IPR processes and opportunities. This gap, somewhat surprisingly, also extends to HEI and VET professors. Most problematically, the skill gap is reflected in the lack of awareness of the benefits of learning relevant skills.

The recommendations targeting Area 1 are the recommendations dealing mostly with breaking the cycle of lack of awareness, along with promoting the skills and their relevance for innovation and new business models. Existing experts in the field, especially TTOs, patent attorneys and National Patent offices, can serve and be utilized as main promoters of the relevant skills.

Area 2: SKILLS FOR IPR APPLICATION

Following the detected gap in D2.1 IPR4SC training needs analysis; the gap only increases when it comes to detecting skills for the IPR application. In this regard, to mitigate the evident differences, we propose a tailored approach for each target group. Among those, the most specific and in need of skills are HEI students and VET learners, along with SME employees. HEI teachers and VET trainers follow. Overall, in this section, the focus should be on the so-called legal and bureaucracy-related skills. These are, among others, skills to fight infringements, buying IPR and using external technology.

Additionally, we propose strengthening the capacities of existing actors who already possess IPR skills. By doing so, they can better capitalise on their knowledge and become teachers who teach from their use cases and best practices. This way, we foresee the mitigation of another gap detected – the gap between the public and private spheres, where the latter exhibits low levels of IPR skills.

Based on all the above, Area 2 can be mitigated and affected only after Area 1 recommendations are met, as Area 2 can be understood as a step forward.

Area 3: SKILLS FOR IPR UTILISATION

IPR utilisations expand beyond distinguishing the limits of others' rights rather than all other innovation-spurring activities. Here the primary target groups are HEI students, VET students and SMEs. In this context, there is also a detected gap in learning how to utilise IPR to boost competitiveness, networking and knowledge exchange. The network creation can establish a firm and trustworthy value chain for companies, where IPR can be used to develop new business models.

Area 3 targets another field of missing skills among the most prosperous target groups working in the private sector: SMEs, VET learners and HEI students.

Area 4: IPR FOR GREEN SUSTAINABLE AND CIRCULAR INVENTIONS

The topic of green, sustainable, and circular inventions seems, to some extent, foreign not only to the less knowledgeable respondents but also to the ones with the most knowledge in IPR (TTOs, patent attorneys and other experts). Some minor knowledge is detected on the levels of general knowledge and awareness, but even those that seem knowledgeable enough experience hard times distinguishing between the green and sustainable and the rest of IP. On the other hand, SMEs do not seem very interested in innovation steps towards green and digital IP.

Area 4 targets the groups exhibiting the least knowledge, the SMEs. Special care is also dedicated to bridging the potential domain-specific gaps and general awareness of the potential of green, sustainable and circular IPR.



Area 5: GENERAL RECOMMENDATIONS TO TEACHING TOPIC OF IP AND IPR

Area 5 is dedicated to several suggestions for approaching the above-mentioned challenges. In skills development for contemporary needs, contemporary measures should be applied. This refers to the structures of training as they are to be developed. Here we suggest at least two levels: informal (to raise awareness and change behaviours) and formal to be taught in HEI and VET organisations (if possible, the domain-specific nuances should be addressed). The structure should be done to naturally guide an interested person through all stages, contributing to obtaining the widest range of skills in all IPR-related topics. Apart from the skill levels, an important part is the structure of the training – special care should be given to the balanced relation between online and offline activities using innovative learning approaches. Lastly, special emphasis should be placed on obtaining ECTS recognition for the developed training and elaboration on micro-credentials should also be considered. This way, courses will become more interesting for both VET learners and HEI students.

Delivering the skills of the future

Pedagogical approaches

Skills such as critical thinking, problem-solving, collaboration skills, creativity, digital literacy, and flexibility are frequently mentioned when discussing future skills. In this regard, lots of research and publication were delivered. Most of those only define and analyse the state of the art in pedagogical approaches. Nevertheless, some research specifically focuses on innovations in the pedagogies for the future. This chapter is dedicated to proposing a series of novel educational techniques with the potential to direct and alter teaching and learning. The idea being it lies in the belief that skills for the future in the field of IP and IPR need to be delivered in a future-oriented manner, following the latest development of pedagogical theory. The pedagogic techniques most frequently mentioned as most contemporary are analysed through five dimensions: (1) relevance to effective educational theories, (2) research evidence about the effectiveness of the proposed pedagogies, (3) relation to the development of twenty-first-century skills, (4) innovative aspects of pedagogy, and (5) level of adoption in educational practice.

The Organization for Economic Co-operation and Development (OECD, 2018) views its vision till 2030 regarding the education aims to the learner attributes as the learning of abilities to embrace difficult problems and the development of the individual as a whole, respecting common prosperity, sustainability and good health. For this reason, skills such as quality of life, well-being, civic engagement, social connections, education, security, life satisfaction and the environment are needed. Similarly, the OECD Learning Framework 2030 (OECD, 2018) stresses cognitive, health, and socio-emotional keystones, such as reading and numeracy, physical and mental health, morality and ethics, and computer literacy and data numeracy.

At this stage, the teachers would prefer to implement more active, innovative forms of education to meet diverse learning needs. Due to various constraints, teachers frequently resort to more traditional, conservative approaches to teaching and learning (Ebert-May et al., 2011; Herodotou et al., 2019). It becomes vital that the thinking of what works and for whom, in terms of learning and development, can give suggestions to teaching practitioners on how to adjust or update their teaching to attain acceptable learning results. The important fact is that the impact of ICT on reading, mathematics, and science in EU nations that have substantially invested in educational technology has been rough and with "no visible improvements" (OECD, 2015, p.3). Nevertheless, some publications evidence potentially innovative, evidence-based pedagogical approaches to guide teaching practitioners and transform learning processes and outcomes. Based on the OECD, Innovative pedagogical

reports, five approaches express potential for future education: **Formative analytics, Teach back, Place-based learning, Citizen inquiry, and Example-based learning.** We assess each of the listed ones in the next section.

- *Formative analytics* is concerned with assisting the learner in reflecting on what has been taught, what may be improved, which goals can be accomplished, and how to proceed."

- *Teach-back* allows two or more individuals to demonstrate progress toward a shared grasp of a hard issue. It begins with an expert, instructor, or more informed student conveying a topic to someone with less comprehension. The levels of knowledge and speed of grasping the topic are diverse within the same group of learners. The Teach-back method exploits these diversities. If it is effective, the person with more understanding may discuss the issue in greater depth. If the less-knowledgeable person has trouble teaching back, the more knowledgeable person attempts to explain in a clearer or alternative manner. The less knowledgeable individual explains it again and again until all parties agree.

- Learning possibilities are derived from their surroundings in *Place-based learning* collective situations. These assist learners in connecting abstract concepts. Classroom and textbook topics with practical application issues experienced in their communities. "Place" can have several meanings in learning about geographical locations. Still, the social and cultural aspects and fascinating cultural aspects entrenched into neighbourhoods interact with communities and ecosystems, including organisation and observing them.

- *Citizen science* is a growing activity that can help growth and progress in scientific learning. Active public engagement in scientific research fosters this. This is owing to its ability to educate the public, particularly young people, help the development of workplace skills, and contribute to the results of genuine scientific research. Citizen scientific activities are mostly found in informal learning environments, with little uptake in formal education.

- *Example-based learning* uses worked examples as tools for learning the dynamics of a process. In cases where worked examples are paired with completion examples, the students gain more problem-solving skills than working with working examples only. The completion examples are worked examples where not all the steps in the process are revealed and remain hidden for the learners to discover by themselves.

Emergent learning techniques

Tackling the methods of *learning with ICT* are inevitable new techniques to boost the teaching-learning process. Almost three years ago, hybrid teaching was not an everyday habit in education. Inevitably, after the experience of the Covid-19 pandemic's reality, this situation was altered. Nowadays, teachers are supplementing the traditional method of teaching and learning with the physical presence with technology that engages students with different kinds of stimuli involved in activity-based learning. This last method captures the qualities of this new hybrid educator who must find his or her place between the connection of using technology and gadgets.

Some of these effective technologies are, for example:

- *VoiceThread* – a web service that allows users to upload PowerPoint slides, videos, photos, et al. and add voice narration to create multimedia presentations.

- *Blogging* as public posting (class blog). For example, students can be asked to post notes on the class blog. Teachers naturally reflect on what occurs in their classrooms and frequently question what they could have done better. This process can be aided by blogging, which allows instructors to retain a continuous personal record of their activities, decisions, thought processes, triumphs and failures, and challenges to deal with. Blogging might help you to organise your thoughts.

- *Prezi* as a tool of presentation. It is a flexible software for creating professional-looking presentations. It's similar to a free, trimmed-down version of PowerPoint. Prezi allows you to create presentations that are as informal or as formal as you like.

- This process of education with technology is accelerated by *social bookmarking*. It keeps the bookmarks online rather than in your favourite folder. The big advantage is that you may access them from any computer, not just the one where you saved them, by signing into your social-bookmarking account. This allows you to view your favourite websites from wherever.

- Much like lectures and news are *podcasts*. The files are shared with listeners who (can) download them. The flexibility and reusability of your lecture are the benefits of podcasting. It is advantageous for pupils who are deaf or hard of hearing.

- *Screencasts* have evolved as a popular online instructional tool. Screencasts are an efficient approach to communicating ideas, delivering curriculum, and soliciting student feedback. Screencasts can convey a specific topic, describe a step-by-step procedure, or give a PowerPoint presentation with narration and multimedia features.

- *Social media* as a community tool: Facebook, Myspace, YouTube, blogs, Twitter. There are concerns about social media that include loss of control, time commitment, unneeded information, and overload of information.

- *Lecture Capture* with, for example, TED - Short lecture, iTunes- apples.com/education/iPod touch- iPhone/ Free video lectures-18,000- freevideolectures.com, Videolectures.com- Great lecture exchange.
- *Usage of smart gadgets* such as Smartpens that can capture transmitted information, replay it and send it. It is similar to wirelessly transferring your thoughts wherever you are, at any time, and ready to discuss with students and vice versa. Or Smartboards that can help to interact with dynamic multimedia information, take notes in digital ink, store them quickly, and easily share this material with students.
- It is also worth mentioning: *Wikipedia*, personal Learning Environment-Extracurricular Learning, an open-source system to help design your class sessions - *Moodle*, platforms for businesses and sole proprietors with which they can create and deliver online and video conferences with their customers, colleagues, stockholders. Moodle classroom manages Webinars, Chatrooms, Discussion boards, Emails, Image creators etc.
- A game-based learning platform that is utilised in schools and other educational institutions as educational technology called *Kahoot*.
- *Google Classroom* is a free web tool built by Google for schools, that promise to make creating, sharing, and grading assignments easier and more paperless. Google Classroom's major goal is to simplify the process of exchanging files between teachers and students.
- *Evernote* notebook – a portable, searchable, and indestructible way to organise one's own notes, websites, photos, and links.

Guidelines for developing skills in IPR – open data for sustainability and circularity:

Recommendation #1: Raise the profile and visibility of the concept of IPR, promote the sense of practical use of IPR

Area of recommendation: 1. Skills and knowledge about IPR

Relevance and background: The research conducted by the IPR4SC team shows that 62,7% of the surveyed persons admit they have no knowledge of the concept of IPR.

Addressed weaknesses: Due to a lack of general awareness, the rates of IP protection are undermined, negatively affecting the conceptualisation of IPR and its benefits.

Target group:

- **implementers:** Educational system (HEI and VET), industrial organisations
- **beneficiaries:** General public, workforce, HEI students, VET learners, inventors, SMEs, policymakers

Implementation level: Organizational, Regional, National, EU level

Monitoring indicators:

- Annual population survey or similar testing of general knowledge

Concrete actions proposed:

- Webinars, workshops, informal training, social media publications

Recommendation #2: Increasing basic and theoretical knowledge of HEI students and VET learners

Area of recommendation: 1. *Skills and knowledge about IPR*

Relevance and background: Research results show many HEI students and VET learners exhibit confidence in their own knowledge and awareness of IP. However, they show very little theoretical knowledge of the topic and they seem just slightly more aware of the importance of IPR.

Addressed weaknesses: Limited knowledge of IPR leads to limited awareness of its potential, along with limited knowledge of its main characteristic. Limited knowledge and awareness may lead to (un)intentional IPR infringements.

Target group:

- **implementers:** HEI and VET teachers, TTOs, and other experts delivering knowledge
- **beneficiaries:** HEI students, VET learners, and other interested groups of learners

Implementation level: regional, national, EU level

Monitoring indicators:

- Monitoring the target values of people included and their knowledge progress

Concrete actions proposed:

- Development of training modules, webinars, other innovative informal learning techniques

Recommendation #3: Promote the professional and organisational needs for IPR skills

Area of recommendation: 1. *Skills and knowledge about IPR*

Relevance and background: The research conducted by the IPR4SC team shows that the main motivator to learn about IPR skills is professional development connected with Organizational demands. The organizational demands are inevitably related to innovation needs.

Addressed weaknesses: Limited personal interest to learn about IPR

Target group:

- **implementers:** Educational system (HEI and VET), industrial organizations
- **beneficiaries:** Workforce, HEI students, VET learners, inventors, SMEs, policymakers

Implementation level: Organizational, Regional, National, EU level

Monitoring indicators:

- Monitored rise in interest in the IPR within companies,
- Monitored interest in IPR-related skills within the industry

Concrete actions proposed:

- Webinars, workshops, informal training, training involving micro-credentials

Recommendation #4: Promote the relevance of organisations specialised in IPR as a valuable source of information

Area of recommendation: 1. Skills and knowledge about IPR

Relevance and background: The research conducted by the IPR4SC team shows that the organizations specialized in IPR (National Patent offices, TTOs, and similar) are not seen as the primary source of information for those less knowledgeable on IPR. They remain, however, a source of information for more knowledgeable users including students. Students with more knowledge can help bridge the gap in relation to the knowledge of the employers.

Addressed weaknesses: Limited sources of general knowledge on IPR.

Target group:

- **implementers:** TTOs, National patent offices, expert organisations
- **beneficiaries:** General public, workforce, HEI students, VET learners, inventors, SMEs, policymakers

Implementation level: Organizational, Regional, National, EU level

Monitoring indicators:

- Numbers of information requests, outreach activities

Concrete actions proposed:

- Webinars, workshops, informal training, social media publications

Recommendation #5: Increase the skills to understand and assess the cost/benefit of IP application

Area of recommendation: 2. Skills for IPR application

Relevance and background: The research shows that the potential applicants have a variety of arguments *against*: from the complex legal system to timing, price, uncertainty on whether the technology is worth protecting.

Addressed weakness: Limited sense of personal use of IPR among young generations of students.

Target group:

- **implementers:** IP experts, educational system (HEI and VET), industrial organisations
- **beneficiaries:** General public, workforce, HEI students, VET learners, inventors, SMEs, policymakers

Implementation level: Organizational, Regional, National, EU level

Monitoring indicators:

- Survey conducted among learners and students taking the course, monitored rising interest in the topic of IP

Concrete actions proposed:

- Formal courses evaluated by ECTS or micro-credentials, modules, Webinars, workshops, informal training, social media publications

Recommendation #6: Build upon skills and services by most skilled ones – TTOs, patent offices

Area of recommendation: 2. Skills for IPR application

Relevance and background: The most skilled actors in IPR have been shown to be the TTOs and patent offices. Their skills go two ways - they are aware of the IP protection process and are also skilled in technology descriptions. The latter is an especially problematic point for SMEs, as they encounter great difficulty in drafting the technology descriptions themselves.

Addressed weakness: Expensive and timely protection of IP

Target group:

- **implementers:** IP experts, TTOs
- **beneficiaries:** SMEs, inventors, SMEs, HEI teachers, VET educators

Implementation level: Organizational, National

Monitoring indicators:

- Number of conducted trainings,
- Number of persons/organizations involved in training

Concrete actions proposed:

- Workshops, on-the-job-experience, on-demand case-based training

Recommendation #7: Build upon skills to bridge the trust gap between the public and private sector

Area of recommendation: 2. Skills for IPR application

Relevance and background: The training needs and skills analysis shows the status quo where there is very little strategic networking between the private and public sectors. The IPR can serve as a tool to increase the trust gap between the two sectors. Knowledge of how IPR can be utilized to bridge the mentioned gap should be systematically deployed.

Addressed weakness: Inability of the EU SMEs sector to recognize the potential in up-scaling the IPR skills.

Target group:

- **implementers:** IP experts, TTOs
- **beneficiaries:** SMEs, inventors, SMEs, HEI teachers, VET educators

Implementation level: Organizational, National

Monitoring indicators:

- Number of conducted trainings,
- Number of persons/organizations involved in training

Concrete actions proposed:

- Workshops, on-the-job-experience, on-demand case-based training

Recommendation #8: Increase skills in the application of open data for the understanding of innovation potentials stemming from IPR

Area of recommendation: 2. Skills for IPR application

Relevance and background: The knowledge on how to approach the queries on potentially developed technologies is limited, hence the need to increase the skills in understanding open data. Especially SMEs do not recognize the potential or evaluate it as inadequate to their range of work.

Additionally, IPR and Open data can be identified as complementary, especially for academic research activity. HEI professors and researchers should be aware of this potential if desiring to boost and accelerate the development of new knowledge.

Addressed weakness: Inability of the EU SMEs sector to recognise the potential in up-scaling the IPR skills

Target group:

- **implementers:** IP experts, TTOs
- **beneficiaries:** SMEs, inventors, SMEs, HEI teachers, VET educators

Implementation level: Organizational, National

Monitoring indicators:

- Number of conducted trainings,
- Number of persons/organisations involved in training

Concrete actions proposed:

- Workshops, on-the-job-experience, on-demand case-based training

Recommendation #9: Learn to define and identify the potential ways to use IPR

Area of recommendation: 3. Skills for IPR utilisation

Relevance and background: The survey conducted showed a specific gap worth addressing: it is both HEI and VET students, but also SMEs who have minimal knowledge of the potential ways in which the IPR can be used to one's own advantage. Learning this would be advantageous for the competitiveness of the SMEs and for the students' personal stance on the job market.

Addressed weakness: Limited sources of general knowledge on IPR, Limited personal interest in IPR application and utilization

Target group:

- **implementers:** HEI teachers, VET teachers
- **beneficiaries:** HEI students, VET learners, SMEs, inventors,

Implementation level: Organizational, National

Monitoring indicators:

- Number of conducted trainings,
- Number of persons/organizations involved in training
- Number of HEI and VET institutions committed to delivering the course

Concrete actions proposed:

- Training module, workshops, webinars

Recommendation #10: Raise awareness on how IPR can be used in non-production innovation

Area of recommendation: 3. Skills for IPR utilisation

Relevance and background: The survey results show little knowledge of IPR being used in non-production innovation. Concerning these skills in management, PR and especially relationship building for collaboration are lacking. The skills to be open to buying IPR from others are essential in this respect – including licensing, services, etc.

Addressed weakness: Limited general knowledge sources on IPR and personal interest in IPR application and utilisation.

Target group:

- **implementers:** HEI teachers, VET teachers
- **beneficiaries:** HEI students, VET learners, SMEs, inventors,

Implementation level: Organizational, National

Monitoring indicators:

- Number of conducted trainings,
- Number of persons/organisations involved in training
- Number of HEI and VET institutions committed to delivering the course

Concrete actions proposed:

- Training module, workshops, webinars

Recommendation #11: Skills to detect and fight infringements

Area of recommendation: 3. Skills for IPR utilisation

Relevance and background: Very few innovators or SMEs (3%) reported encountering a situation where they decided not to defend their IPR when the infringement was detected. As for the knowledge on infringements, the lack of detection does not signify the skill is not needed – the skill on detecting infringements is also needed in order to not break other IP rights.

Addressed weakness: Limited sources of general knowledge on IPR

Target group:

- **implementers:** HEI teachers, VET teachers
- **beneficiaries:** HEI students, VET learners, SMEs, inventors,

Implementation level: Organizational, National

Monitoring indicators:

- Number of conducted trainings,
- Number of persons/organisations involved in training
- Number of HEI and VET institutions committed to delivering the course

Concrete actions proposed:

- Training module, workshops, webinars

Recommendation #12: Raise awareness of the green, sustainable and circular IP

Area of recommendation: 4. IPR for green, sustainable and circular inventions

Relevance and background: The knowledge seems low among all respondents including the most knowledgeable ones. Also, SMEs knowledgeable about IPR demonstrate having difficulty distinguishing between green, sustainable and the rest of IP. SMEs do not seem in any hurry in their innovation steps towards green and digital IP.

Addressed weakness: Inability of the EU SMEs sector to recognise the potential in upscaling the IPR skills. Inability to recognize the potential of green, sustainable and circular innovation.

Target group:

- **implementers:** IP experts, educational system (HEI and VET), industrial organisations
- **beneficiaries:** General public, workforce, HEI students, VET learners, inventors, SMEs, and policymakers.

Implementation level: Organizational, Regional, National, EU level

Monitoring indicators:

- Number of institutions implementing the course
- Number of enrolled HEI students, VET learners, number of SMEs included in module
- Survey conducted among learners and students taking the course, monitored raised interest in the topic of IP

Concrete actions proposed:

- Formal courses evaluated by ECTS or micro-credentials, modules, Webinars, workshops, informal training, social media publications

Recommendation #13: Tailor the educational courses to demonstrate domain-specific examples

Area of recommendation: 4. IPR for green, sustainable and circular inventions

Relevance and background: The additional divide is visible in terms of understanding and being aware of the potential of IP for green, sustainable and circular inventions. As there are specific technology domains that fit the green and sustainable, the training can focus on the circular inventions.

Addressed weakness: Inability of the EU SMEs sector to recognise the potential in upscaling the IPR skills. Inability to recognise the potential of green, sustainable and circular innovation.

Target group:

- **implementers:** HEI professors, VET professors, IP experts
- **beneficiaries:** General public, workforce, HEI students, VET learners, inventors, SMEs, policymakers

Implementation level: Individual, Organizational, Regional, National, EU level

Monitoring indicators:

- Number of institutions implementing the course
- Number of enrolled HEI students, VET learners, number of SMEs included in module
- Survey conducted among learners and students taking the course, monitored raised interest in the topic of IP

Concrete actions proposed:

- Formal courses evaluated by ECTS or micro-credentials, modules, Webinars, workshops, informal training, social media publications

Recommendation #14: Structure the training programmes as multi-modular and level adjusted

Area of recommendation: 5. *General recommendations to studies*

Relevance and background: Based on everything read, the suggestion on structuring the training for IPR skills is the following: The training should benefit from the contemporary pedagogic theory and also it should benefit from currently available teaching tools. An ideal form would be a combination of synchronous and asynchronous learning. At the same time, it should be structured to cover several levels of knowledge: from informative to advanced. Where applicable, it can be domain-specific. It would be welcome to have an initial assessment for the user to self-assess the pre-existing level of knowledge.

Addressed weakness: The educational system is not recognised as a potential source of knowledge of IPR. Lack of interest from the universities to include topics of innovation and IP in their courses.

Target group:

- **implementers:** IP experts, educational system (HEI and VET), industrial organisations
- **beneficiaries:** General public, workforce, HEI students, VET learners, inventors, SMEs, policymakers

Implementation level: Organizational, Regional, National

Monitoring indicators:

- Number of modules and difficulty levels delivered
- Pre-training and post training self-assessment

Concrete actions proposed:

- Pre-recorded videos, problem-based learning, synchronous and asynchronous learning, virtual classroom.

Recommendation #15: Ensure the ECTS and/or micro-credential recognition

Area of recommendation: 5. *General recommendations to studies*

Relevance and background: For all learners, a jointly recognised quality of studies/training is becoming more and more critical.

The ECTS system ensures recognition between HEI institutions, whereas the micro-credentials ensure the recognition of skills gained outside the HEI institutions.

Addressed weakness: The educational system is not recognised as a potential source of knowledge on IPR. The universities lack interest in including innovation and IP topics in their courses.

Target group:

- **implementers:** IP experts, educational system (HEI and VET), industrial organisations
- **beneficiaries:** General public, workforce, HEI students, VET learners, inventors, SMEs, and policymakers.

Implementation level: Organizational, Regional, National

Monitoring indicators:

- Number of modules and difficulty levels delivered
- Pre-training and post-training self-assessment

Concrete actions proposed:

- Pre-recorded videos, problem-based learning, synchronous and asynchronous learning, virtual classroom.

Dissemination strategy of the proposed guidelines

The presented guidelines will be promoted by all project partners and made available on the project website. The guidelines will be promoted on the social media of project partners and the project itself.

Project partners are committed to circulating the document to their regional/national policymakers and to Higher education institutions, vocational education centres and all relevant stakeholders who gave their permission to be informed about the progress and deliverables of the project IPR4SC. The document will also be disseminated with the assistance of the Associated Strategic partners. The proposed guidelines aim to be replicated in all countries of the European Union and therefore express a high level of exploitation.

The present guidelines will be disseminated in the following manner and channels:

- Uploaded and accessible on the IPR4SC website
- Communicated in the project newsletter and social media
- Emailed to local/national/EU stakeholders who listed their emails in the project databank
- Presented at events in which project partners are participating
- Circulated in various personal networks where project partners are involved.

Finally, the IPR4SC consortium will strive to implement the D2.2 in its upcoming activities, especially in WP4, dedicated to the development of training materials.

Conclusions

Several meaningful conclusions can be drawn from D2.1 Training needs analysis and featured in D2.2 IPR4SC guidelines - proposals and solutions to challenges. We noted several vast challenges, especially the ones emerging from the knowledge divide (among different target groups major knowledge gaps can be detected). The existing knowledge divide can be mitigated through targeted training. The training needs to occur on different levels - from informal (contributing towards raising awareness) to more formal (through training organisations - HEI and VET organisations). The upcoming activities of WP4, WP5 and WP6 will target these issues.

Apart from the educational gap, another gap was detected. It is the gap related to implementation. This gap can be mitigated by increasing the knowledge of the benefits, and practical utilisation. In this context, the public-private divide is somewhat visible, as we detected strong positions of public TTOs knowledgeable in how IP can work but less skilled in how to adopt new technologies. On the other hand, SMEs are knowledgeable concerning adopting technologies, but not many see IPR as a source of knowledge, let alone know how to use the IPR to secure supplier chains and relationships.

Having said all this, several proposals for solutions were outlined to mitigate the detected gaps and shortcomings. Five areas of impact are proposed to be activated where specific recommendations are proposed. A total of 15 recommendations are put forward, all derived from detected problematic backgrounds and justified in survey results. Each of the recommendations is analysed through the challenge it is addressing, target groups, and implementer/receiver distinction. For each, the proposed definitions of work and monitoring the progress are displayed. Some of the recommendations remain to be addressed and mitigated within the domain of the IPR4SC, others will wait for a similar initiative to capitalise on them.

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