Developing and Implementing hands-on training on Open Science and Open Innovation for Early Career Researchers

D5.1 - Report with review of existing impact evaluations systems

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List of acronyms and abbreviations

CDH	Careers of Doctorate Holders
DIOSI	Developing and Implementing hands-on training on Open Science and Open Innovation for Early Career Researchers
ECOOM	Expertisecentrum Onderzoek en Ontwikkelingsmonitoring (Centre for Research & Development Monitoring)
ESCO	European Skills, Competences, Qualifications and Occupations
ESF	European Science Foundation
EUA-CDE	European University Association's Council for Doctoral Education
HE	Higher Education
HRRF	Human Resources in Research Flanders
LERU	League of European Research Universities
OECD	Organisation for Economic Co-operation and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
WP	Work Package

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Executive summary

This report is written within Work Package (WP) 5 of the DIOSI project (Developing and Implementing hands-on training on Open Science and Open Innovation for Early Career Researchers). The main goal of the Work Package is to enable measurable and actionable impact assessment of doctoral education in general, and of the Open Innovation and Entrepreneurship and Open Science courses in particular, through the development of the DIOSI Impact and graduate tracking framework. The review of existing impact evaluation systems described in this report is supposed to be a first step towards the development of that framework. As such, all methods and tools included in the review focus – at least to a certain extent – on evaluating the immediate and/or long-term impact of doctoral education.

The report is based on an extensive review of impact evaluation methods and tools described in literature, ranging from projects focused on the development of a graduate tracking system to research into the career trajectories of PhD graduates.

The report describes European initiatives for a graduate tracking system, as well as studies looking into careers of PhD graduates and/or the impact of doctoral education on skills and later outcomes of PhD graduates. Not only is the content and usefulness of the tools used reviewed, findings that could be relevant for the later development of the DIOSI Impact and graduate tracking framework, such as categorizations of skills or occupations, are also summarized. Moreover, the report describes different methodologies for graduate tracking along with the pros and cons of (a combination of) methods. This includes register-based vs. survey-based tracking, and within survey-based tracking the methods of 1.) graduate surveys, 2.) longitudinal cohort surveys, 3.) cross-sectional survey. Special attention is paid to finding a balance between cross-country comparability and institutional-level implementation. In order to maintain this balance, a mixture of joint decision making and individual responsibility for submission to graduates is suggested as a suitable solution for the European universities included in the DIOSI project.

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Three levels from the Rugby Team Impact framework are used to distinguish between different levels of impact covered by tools in our review: 1.) learning (e.g., improved knowledge, increased skill level), 2.) behaviour (e.g., reflective, self-aware, confident), 3.) outcomes (e.g., better research, improved qualification rates).

A set of tools to be assessed for applicability to the DIOSI framework was created by using a combination of expert consultation and the snowball method (i.e., consulting the bibliography in the documents suggested by the experts to find other relevant titles on the subject). We selected tools that: 1.) included doctorate holders in their target group, 2.) intended to measure certain outcomes that fit under one of the three impact levels on which doctoral education could reasonably have an impact, 3.) used a methodology that could be feasible for the DIOSI Impact and graduate tracking framework.

The following tools fit our selection criteria:

- Careers of Doctorate Holders (CDH; Auriol et al., 2013)
- 2017 Joint Career Tracking Survey of Doctorate Holders (European Science Foundation, 2017)
- EUROGRADUATE pilot survey (European Commission, 2020)
- Adoc "Core competencies of PhDs" (Durette et al., 2017)
- "What do researchers do?" (Vitae, 2010)
- "What do research staff do next?" (Vitae, 2016)
- "An evidence-based evaluation of transferrable skills and job satisfaction for science PhDs" (Sinche et al., 2017)

Arranging the impact measures from the tools reviewed according to levels 2-4 of the Rugby Team Impact Framework, we can see that immediate learning (level 2), the behaviour that is a result of that (level 3) and the more long-term outcomes (level 4) are all reasonably well covered in the existing tools. This will allow us to keep a balance between tracking impact on individual graduates and the wider impact on society. Eventually, we aim to include a wider range of level-4 indicators in our framework than can be found in the existing tools reviewed here, as we would also like to include the impact on the level of society (e.g., growth in the number of applications for doctoral programs, growth in technology-based companies, the number of start-ups).

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1. Introduction

This report is written within Work Package (WP) 5 of the DIOSI project (Developing and Implementing hands-on training on Open Science and Open Innovation for Early Career Researchers). The main goal of the Work Package is to enable measurable and actionable impact assessment of doctoral education in general, and of the Open Innovation and Entrepreneurship and Open Science courses in particular, through the development of the DIOSI Impact and graduate tracking framework. The review of existing impact evaluation systems described in this report is supposed to be a first step towards the development of that framework. As such, all methods and tools included in the review are focusing – at least to a certain extent – on evaluating the immediate and/or long-term impact of doctoral education.

In terms of impact evaluation, it is difficult to measure the outcomes of doctoral training. Through surveys and graduate tracking, indications of behaviour change and learning can be traced in large lines. In Chapter 2, we provide a description of developments in the field of graduate tracking at a European level and of graduate tracking studies. Chapter 3 provides an overview of career-tracking methodologies and their advantages and disadvantages. In Chapter 4, the tools used in the European projects and graduate tracking studies described in Chapter 2 are in turn reviewed and organized according to various levels of impact (i.e., learning, behaviour and outcomes).

The report is based on an extensive review of impact evaluation methods and tools described in literature, ranging from projects focused on the development of a graduate tracking system to research into the career trajectories of PhD graduates. Some impact evaluation methods or tools that we came across in the literature review surveyed topics beyond the scope of our work package. These are not described extensively in this report, but we do provide the reasoning behind excluding them from our review.

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2. Developments in the field of graduate tracking and evaluation systems

2.1. Graduate tracking in Europe

There are several initiatives at European level aiming to get to systems of European-level graduate tracking. In chronological order, the first one to mention would be Careers of Doctorate Holders (CDH), a joint project by the OECD, the UNESCO Institute for Statistics and Eurostat. In this project, different data sources per country were used – dependent on availability within a certain country – to get an overall picture of the career tracks of doctorate holders and their experiences within those careers (Auriol et al., 2013).

In 2017, the European Science Foundation (ESF) conducted a Joint Career Tracking Survey of Doctorate Holders among nine partner organisations in various European countries (ESF, 2017). The questionnaire included sections on the doctoral education and transition from doctorate to the first position, as well as the employment situation, career experience, and mobility. The list of competencies and personal attributes from the aforementioned CDH project was used as the basis for creating a (non-exhaustive) list of competencies for this questionnaire. All participating partners had the opportunity to include organisation-specific questions.

Other more recent developments worth mentioning are the EU Expert group on Graduate tracking (Carver, 2020) and the European University Association's Council for Doctoral Education (EUA-CDE) Thematic Peer Group on "Career Development and Tracking in Doctoral Education" (European University Association, 2020). From these developments, certain concerns and prerequisites of European-level graduate tracking can be derived, for example:

- If there are already existing national surveys, you run the risk of survey fatigue when introducing a European-level survey.
- Data protection and GDPR concerns. Who owns, manages and has access to the data?
- Careful consideration of the methods, timing, scope and type of tracking exercise. Different tracking methods lead to different kinds of data and serve different purposes.
- Availability of financial resources and personnel.
- Ensuring that the statistical process for selecting graduates is based on a rigorous sampling methodology to allow for the collection of representative data, rather than being based on the pragmatic availability of graduate contact information, is a prerequisite for getting reliable data.

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In line with the aforementioned developments, the European Commission ([2020](#)) launched the so-called EUROGRADUATE pilot survey in eight countries (Austria, Czech Republic, Croatia, Germany, Greece, Lithuania, Malta and Norway) with the intention to lay the foundations for sustainable European wide graduate research. This survey covers all three different aspects higher education prepares graduates for: sustainable employment, their personal skills development and active citizenship. It should be noted, however, that although some of the respondents of this pilot survey had a PhD at the time of the survey, the target group of this survey included only bachelor and master graduates 1 and 5 years after graduation.

In Flanders, Belgium, the Centre for Research & Development Monitoring (Expertisecentrum Onderzoek en Ontwikkelingsmonitoring, ECOOM) is an interuniversity consortium with participation of all Flemish universities (KU Leuven, UGent, VUB, UAntwerpen and UHasselt). ECOOM ([2021](#)) uses a combination of administrative data sources and surveys to chart the careers of researchers and their subjective perceptions.

According to the League of European Research Universities' (LERU) vision for doctoral education, "the modern doctorate is an excellent training for those who go into roles beyond research and education, in the public, charitable and private sectors, where deep rigorous analysis is required" ([LERU, 2010](#), p. 3). This broad scope of potential careers for PhD graduates of course needs to be taken into account when considering potentially useful graduate tracking methods or tools.

2.2 Graduate tracking studies

Apart from the European initiatives for a graduate tracking system described earlier, there are also studies looking into careers of PhD graduates and/or the impact of doctoral education on skills and later outcomes of PhD graduates. Before looking into the content and usefulness of the tools used in these studies, we will summarize the findings that could be relevant for the later development of the DIOSI Impact and graduate tracking framework, such as categorizations of skills or occupations.

Categorization of competencies

Adoc Talent Management, a recruitment agency based in Paris, Brussels and Montreal, has led several studies on doctoral competencies acquisition and development and found that, while PhD candidates specialize in specific topics within their theses, they also develop a common set of more general skills, the so-called 'core competencies' ([Durette et al., 2014](#)). These are skills that are equally likely to be acquired by PhD candidates from various disciplines. They assessed the competencies of PhD graduates through open-ended questions, the answers of which were analysed and grouped into six categories of core competencies. These categories could be used in

the DIOSI-framework, either for categorizing answers to open-ended questions or as a guideline for which competencies could be assessed across disciplines in a multiple-choice / rating scale format. The six categories are:

1. Knowledge and technical skills.
2. Transferable competencies that can be formalized (e.g. communication, innovation management and scientific monitoring, project management, time management and planning, and languages).
3. Transferable competencies that cannot be formalized (e.g. intellectual capacities, problem-solving skills, and teamwork skills).
4. Dispositions (i.e., rigor, critical thinking, creativity, and autonomy).
5. Behaviours commonly known as "soft skills" (e.g. stress management, perseverance, interpersonal skills).
6. Meta-competencies (i.e., learning capacity and adaptation capacity) vital to maintaining and developing one's pool of competencies over time, and to making good use of other competencies in professional contexts.

Adoc also developed the project "Emploi" ([2013-2017](#)), which was created in 2012 to obtain data on PhD graduates' career and skills development through cohort monitoring on short (1-3 years) medium (5 years) and long (10 years) term. The survey used for the cohort monitoring is also included as a tool in our overview.

Categorization of occupations after PhD graduation

Vitae is a non-profit programme supporting the professional development of researchers. Their report "What do researchers do?" ([Vitae, 2010](#)) describes an analysis of employment destinations and impact of doctoral graduates three years after graduation. The occupations reported by the doctoral graduates have been clustered into six 'occupational clusters':

1. HE research occupations, i.e., research staff employed in higher education.
2. HE teaching and lecturing roles.
3. Research (not in higher education (HE)), i.e., employed in research roles outside HE.
4. Other teaching occupations, outside HE.
5. Other common* doctoral occupations outside HE.
6. Other occupations.

* The commonality of doctoral occupations was based on the density and volume of doctoral graduates compared to the general workforce in these occupations according to the UK Labour Force Survey.

An evidence-based evaluation of transferrable skills and job satisfaction specifically for science PhDs was conducted by Sinche et al. ([2017](#)). In their analysis of these skills

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and job satisfaction they compared research-intensive and non-research-intensive occupations.

Research-intensive:
- Tenure track research
- Industry research
- Non-tenure track academic research
- Government research

Non-research-intensive:
- Teaching intensive careers
- Administrative
- Consulting
- Other
- Business development
- Science writing and communication
- Science policy
- Intellectual property
- Regulatory affairs

The categorization of occupations used by Vitae and the one used by Sinche et al. each have a different level of detail. Depending on the level of detail preferred for the DIOSI Impact and graduate tracking framework, one of the two categorizations can be chosen, or a combination could be made by mapping the more detailed categorization of Sinche et al. onto the six occupational clusters used by Vitae.

On a more granulated level, occupations could be classified according to ESCO (European Skills, Competences, Qualifications and Occupations), the European multilingual classification of Skills, Competences and Occupations. ESCO works as a dictionary, describing, identifying and classifying professional occupations and skills relevant for the EU labour market, education and training. As such, it could potentially be used to determine which occupations or competencies would fit under the categories described before.

Transition from research to other occupations

As a follow-up on "What do researchers do?", Vitae ([2016](#)) published the report "What do research staff do next?", which no longer focuses on all PhD graduates, but only on research staff (postdoctoral researcher, research fellow, etc.) who left research posts in European universities or research institutes to work in other occupations and employment sectors. This project started off with a survey, which was in turn used to identify PhD graduates who transitioned from a research post to another occupation or employment sector. They were invited to share their story of why they transitioned to another job. Such a targeted approach of a specific subgroup could be suitable for the DIOSI framework as well, although it might be most feasible to embed such targeting in a survey through conditional questions rather than taking a step-by-step approach.

3. Graduate tracking methods

A first distinction that can be made in graduate tracking methods is that between register-based tracking (based on national statistics) and survey-based tracking (Carver, 2020). With register-based tracking, one is of course completely dependent on which data are available in registers. Survey-based tracking, on the other hand, allows for strong alignment of the questions included with the aims of the project. Certain information, such as current employment status, can be more reliable in register-based tracking than in survey-based tracking (European University Association, 2020), where respondents tend to give socially desirable answers. In survey-based tracking, it is fundamental to design the questionnaire properly, to ensure that the survey can reach its aims (Carver, 2020). Moreover, if multiple countries are involved in graduate tracking – as will be the case for DIOSI – coherence of questionnaires and comparable response rates in each country are important to take care of. In addition, the concerns and prerequisites mentioned in Chapter 1 should be taken into account when using survey-based tracking.

Table 1

Comparison of register- and survey-based tracking

	Register-based	*Survey-based*
Dependence on availability of data	X	
Possibility to align questions with project aim		X
Reliable non-biased information	X	
Risk of socially desirable answers		X
Coherence issues between countries		X
Potential selection bias when response rate is limited		X

Within the method of survey-based tracking, another distinction can be made between three types of surveys (Auriol et al., 2013; European University Association, 2020): 1.) graduate surveys, 2.) longitudinal cohort surveys, 3.) cross-sectional survey. Graduate surveys can be carried out as exit polls from individual institutions, or on a national or cross-national level. They are particularly suitable for collecting information on doctoral education and post-graduation plans, as they are distributed or carried out upon graduation or approximately six months to a year thereafter. More long-term outcomes can of course not yet be surveyed at that point in time. In longitudinal cohort surveys, a homogeneous population is followed over time with intervals that usually range from two to three years. This allows for prospective analyses of career tracks and developments. In contrast, a cross-sectional survey uses retrospective questions to get a long-term picture of career tracks from respondents

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that are in different stages of their career at the time of measurement. Digital alumni platforms can be a specific source of information for this type of surveying. No matter which method or combination thereof is chosen, understanding the limitations of the method and taking them into account is always important.

Balance between cross-country comparability and institutional-level implementation

Given the number of institutions involved in the DIOSI project, one of the challenges of the framework will be to find a balance between content elements that are comparable across countries, while leaving a certain amount of freedom to each institution in implementing the framework. The approach of the [Finnish Aarresaari network](#) could serve as a good practice to overcome this challenge. The Aarresaari network actively monitors the integration of academic graduates into working life. Comparing and combining results on a national level is made possible through active involvement of the individual universities in decision making on the questionnaire content, the time of data collection, and the method of implementation. Although each of these three aspects is based on a joint decision, each university is ultimately responsible for submitting the link to the query to its own alumni. Looking ahead to the development and implementation of the DIOSI Impact and graduate tracking framework, this methodology, with a mixture of joint decision making and individual responsibility for submission to graduates, could be suitable for the European universities included in this project as well.

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4. Review of relevant tools

After looking into the developments in the field of graduation tracking and evaluation systems in Chapter 2 and graduate tracking methods in Chapter 3, the actual review of relevant tools is presented in this chapter. First, a framework will be explained that is used to arrange the relevant tools according to existing levels of impact. This will be followed by a table in which the content of each of the relevant tools is structured according to the impact level that it assesses, as well as information on the methodology used.

4.1 Levels of impact

The Rugby Team Impact Framework ([Rugby Team, 2008](); Figure 1) is an evaluation model for training and development activity specifically tailored to the context of training and development of researchers in higher education (HE). Rugby Team is the former name of the Impact Evaluation Group, a sector-led working group supported by Vitae.

This framework is of course not an evaluation tool in itself, but is very helpful to distinguish between different levels of impact covered by tools in our further review. The framework takes a process perspective and acknowledges that impact can be as far-reaching as the level of economic and societal impact, as well as having a micro-level impact on an individual researcher.

Figure 1

Schematic representation of projected benefits at different impact levels (levels 0 – 4)
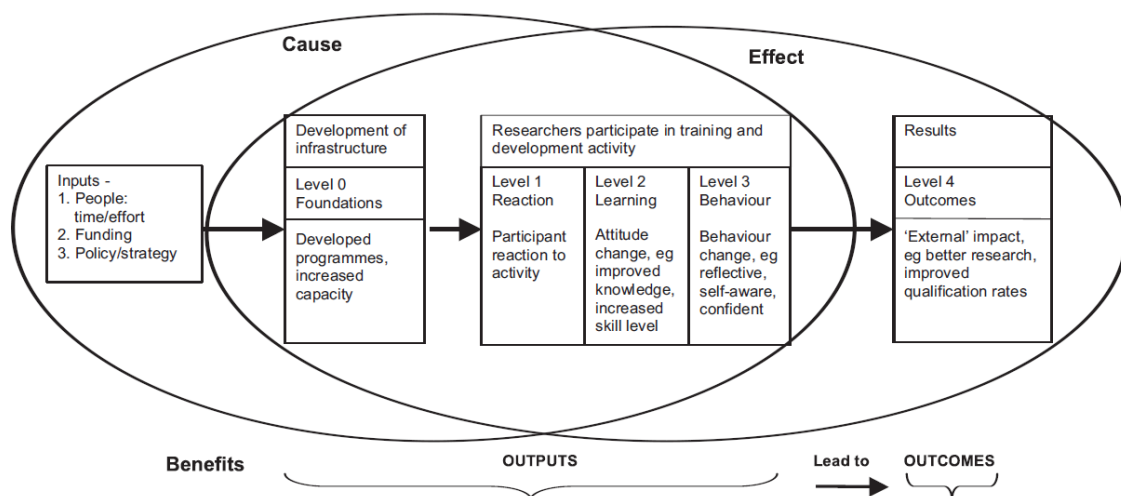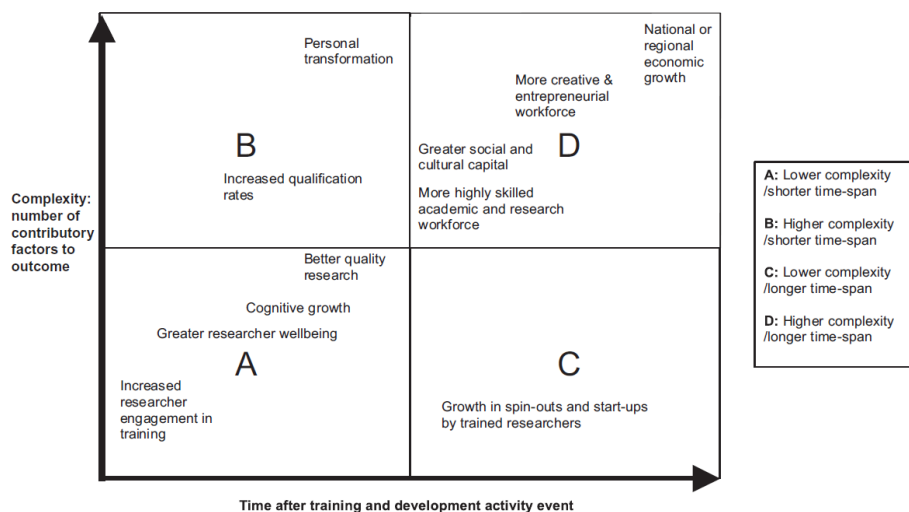

Note. From *The Rugby Team Impact Framework*, 2008, by Rugby Team. Copyright 2008 by Rugby Team.

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For the aims of the DIOSI Impact and graduate tracking framework, levels 2-4 of the Rugby Team framework seem most relevant. Although DIOSI will eventually develop its own framework, for the sake of this review we use the levels of the Rugby Team Framework to distinguish between more immediate and long-term impact.

One should be aware that the longer the distance (and time) between the input (i.e., the DIOSI Open Science and Open Innovation training), the more difficult it becomes to attribute the outcomes to the training and not to some other factor, as is illustrated in the Figure 2 below.

Figure 2

Potential outcomes as a function of complexity and the length of time after the training and development activity

Note. From *The Rugby Team Impact Framework*, 2008, by Rugby Team. Copyright 2008 by Rugby Team.

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4.2 Selection of tools

A set of tools to be assessed for applicability to the DIOSI framework was created by using a combination of expert consultation and the snowball method (i.e., consulting the bibliography in the documents suggested by the experts to find other relevant titles on the subject). Tools are included in the review table if they:

- Include doctorate holders in their target group;
- Are actual tools intended to measure certain outcomes and not, for example, frameworks that give an overview of the ideal skill set of a researcher;
- Assess concepts that fit under one of the three impact levels from the [Rugby Team Impact framework](#) relevant to the DIOSI framework (i.e., learning, behaviour and outcomes);
- Assess concepts for which it is reasonable that doctoral education could have an impact on them (e.g., tools assessing skills needs, social security, baseline interests or work satisfaction of researchers are excluded from the review, as well as tools assessing the impact of postdoctoral programmes);
- Use a methodology that could be feasible for the DIOSI Impact and graduate tracking framework; in other words, a methodology with a certain structuring and not, for example, completely open interviews or narratives.

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4.2 Overview of relevant tools

Table 2 includes all tools that have been selected based on the aforementioned criteria. Only the concepts or items relevant to the three impact levels that we focus on are listed explicitly. Questions like demographics are left out of the table for the sake of readability.

Table 2

Selected tools with methodology used and impact levels assessed

Tool	Impact level 2: learning	Impact level 3: behavior	Impact level 4: outcomes	Methodology
Careers of Doctorate Holders (CDH)	Competences & skills		- Early career research positions - Employment situation - Mobility (job-to-job & international) - Career-related experience	Derived from different data sources per country
2017 Joint Career Tracking Survey of Doctorate Holders	Competences: - Methodology - Registered innovation - Critical-analytical thinking - Career management - Employment context - Problem solving - Effective communication - Creativity - Flexibility - Networking - Subject knowledge - Project management - Team working - Leadership - Languages - Entrepeneurship	Importance of competences in current job	- Employment situation - Career-related experience, incl. statements about the value of the doctorate - Extent to which content of current work is related to doctorate degree - Mobility	Online survey

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	- Intellectual property			
EUROGRADUATE pilot survey	Basis provided for: - Social skills - Entrepreneurial skills - Advanced Literacy Skills - Advanced Numeracy Skills - Advanced ICT skills - Managerial / leadership skills - Personal development - Political interest and participation - Building a social network	Skills required in work: - Own field-specific skills - Communication skills - Team-working skills - Learning skills - Planning and organisation skills - Problem-solving skills - Foreign language skills - Customer handling skills - Advanced ICT skills	Employment: - Employment sector - Occupation - Number of jobs held since graduation - Type of employment contract - Size of organization - Monthly salary - Job satisfaction - The level of knowledge and skills required in the current job	Online survey
ECOOM Human Resources in Research Flanders (HRRF)		-	- Mobility - Transitions to non-academic labour market - Academic promotion of postdoctoral researchers	Database, data linked and coded by Trusted Third Party
ECOOM PhD Career track survey		- Skills crucial for current employment - Crucial skills lacking	- Employment status - Transitions to business and government institutions - Career progress	Online survey
Adoc Talent Management "Core competencies of PhDs"	Competencies developed during doctoral training			Open-ended questions
Adoc Talent Management "Emploi"		Determinants in career pursuit	- Professional situation after 1, 3, 5 and 10 years - Added value of doctorate on the job market	Online survey
Vitae "What do researchers do?"		Extent to which doctoral experience enabled to undertake the following:	Employment: - Employment circumstances - Employment sector	Online survey

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		- Be innovative in the workplace - Make a difference in the workplace - Access immediate or short-term job opportunities in chosen career - Progress towards long-term career aspirations - Enhance social and intellectual capabilities beyond employment - Enhance their quality of life generally	- Occupation - Number of jobs held since graduation - Type of employment contract - Size of organization - Annual salary - Satisfaction with career Opportunity in current job to: - Conduct research - Interpret research data - Critically evaluate research findings - Draw on detailed knowledge on which research degree was based - Use general disciplinary knowledge - Use research skills developed as a research student - Use generic skills developed as a research student - Work autonomously - Work as part of a team - Work under close supervision - Have responsibility for supervising the work of others	
Vitae "What do research staff do next?"		- Making the transition: approaches, challenges, helpful factors (incl. value of transferable competencies) - Key transferable competencies needed for successful	- Mobility - Achievements / academic success (publications, grant funding and fellowships, prizes) - Reasons for leaving HE research - Current work satisfaction	Initial online survey, followed by structured interviews

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		performance in current role: communication, critical thinking, problem solving, team work and collaboration, independent working, project management, adaptability, time management, networking	- Former & current career aspirations - Current employment status, sector and occupation	
Sinchet et al. (2017)	Skills developed in doctoral training: - Discipline-specific knowledge - Ability to gather and interpret information - Ability to analyse data - Oral communication skills - Ability to make decisions and solve problems - Written communication skills - Ability to learn quickly - Ability to manage a project - Creativity/innovative thinking - Ability to set a vision and goals - Time management - Ability to work on a team - Ability to work with people outside the organization - Ability to manage others - Career planning and awareness skills	Which skills important for success in current position? - Discipline-specific knowledge - Ability to gather and interpret information - Ability to analyse data - Oral communication skills - Ability to make decisions and solve problems - Written communication skills - Ability to learn quickly - Ability to manage a project - Creativity/innovative thinking - Ability to set a vision and goals - Time management - Ability to work on a team - Ability to work with people outside the organization - Ability to manage others - Career planning and awareness skills	- Employment - Postdoctoral training - Job satisfaction	Online survey
DocEnhance survey[1]	Questionnaire content has been requested but cannot be shared in this report (yet), given the phase of the DocEnhance project			

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[1] https://all-digital.org/projects/docenhance/

5. Conclusions

The DIOSI Impact and graduate tracking Framework will be developed against the background of multiple developments aiming at a European graduate tracking system. The work that has already been done in this respect in various European projects shows us which concerns and prerequisites should be taken into account when developing the DIOSI Impact and graduate tracking framework. By proposing a modular setup that allows for individual universities to make their own choices and adapt to their particular context, our project already anticipates on some of these concerns or prerequisites.

The European graduate-tracking projects, as well as other studies into the careers and experiences of doctorate holders, provide not only examples of tools but the results of these studies can also give input for our framework. In particular, categorizations of core competencies and occupations are likely to be relevant for the future framework.

Various methods and combinations thereof are available to track the careers and experiences of graduates. Each method has its advantages and disadvantages. Which one is the most suitable depends, amongst other things, on the aims and available resources. In an international project like DIOSI, it is extremely important to take care of coherence of questionnaires and comparable response rates. The methodology of the Finnish Aarresaari network, with a mixture of joint decision making and individual responsibility for submission to graduates, could be suitable for the European universities included in the DIOSI project as well.

Arranging the impact measures from the tools reviewed according to levels 2-4 of the Rugby Team Impact Framework, we can see that immediate learning (level 2), the behaviour that is a result of that (level 3), and the more long-term outcomes (level 4) are all fairly well covered in the existing tools. This will allow us to keep a balance between tracking impact on individual graduates and the wider impact on society. Eventually, we aim to include a wider range of level-4 indicators in our framework than can be found in the existing tools reviewed here, as we also would like to include the impact on the level of society (e.g., growth in the number of applications for doctoral programs, growth in technology-based companies, the number of start-ups). Moreover, we will make sure to explicitly cover the skills targeted by the training developed in WP 3 and 4 in the impact indicators of the DIOSI framework.

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