

Transform European Research and Innovation (T4ERI)  
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## **MS 7. MAP OF INHIBITORS/ BARRIERS TO MOBILIZING AND FLEXIBILISING RESEARCHERS' CAREERS**

Work done under T4ERI WP3 THE BEST CAREERS FOR THE  
BRIGHTEST MINDS

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WP3: The best careers for the brightest minds

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# INTRODUCTION

In the Framework of the Transfer for European Research and Innovation project (T4ERI), the University of Silesia, together with the University of Trieste and the University of Alicante, co-leads the WP 3, entitled "The Best Careers for the Brightest Minds". In December 2021, the concept and methodology of the work packages' tasks execution were accepted by the T4ERI alliance authorities. This enabled the task team to design and prepare research activities focused on the diagnosis phase. This map summarises the work carried out so far under the project and indicates further activities planned for implementation according to the project's adopted work schedule.

This project's phase aims to indicate and analyse the factors perceived as the main barriers to career development at all stages of research (R1–R4). The steps of the WP3 team's work essential for the map were as follows:

1. Survey and analysis of the barriers to flexibilising researchers' careers at all stages (R1–R4) – report 1
2. Survey and analysis of the framework condition of the mobility of the career path of early career researchers – report 2
3. Surveys and workshops focused on identification of the challenges that leaders of research teams (in science and science management) face and on identifying the critical competencies of research teams leaders – report 3

## REPORT 1 (written by Mateusz Paliga)

### AIM

The study aimed to investigate the relationships between the perceived barriers to career advancement, people management, personal career resources, work engagement, and career satisfaction in the light of the job demands–resources theory (Bakker & Demerouti, 2007; Bakker & Demerouti, 2017). The study was conducted among 542 academic workers from seven universities partnered in the "Transform 4 European Research and Innovation" (T4ERI) project. The online self-report survey was distributed among all academic teachers of seven universities partnered in the "Transform 4 European Research and Innovation" (T4ERI) project. The survey was available online via a link from the 30th of March 2022 till the 26th of April 2022. Participation in the study was voluntary, and the respondents did not receive compensation.

The institutional ethics committee of the University of Silesia in Katowice approved the above research project (decision number KEUS 221/O2.2022). The study was conducted according to the principles of the Declaration of Helsinki.

#### **SAMPLE:**

620 participants completed the questionnaires. However, 78 respondents failed to fill out the survey correctly. Data obtained from those respondents were excluded from the final analyses. Hence, the final pool of participants comprised 542 workers from the following higher education institutions: the University of Trieste (201 respondents; 37.1%), Vytautas Magnus University (94; 17.3%), the University of Silesia in Katowice (71; 13.1%), the University of Alicante (66; 12.2%), Sofia University (53; 9.8%), Saarland University (44; 8.1%), and Estonian Academy of Art (13; 2.4%). 272 (50.2%) of the respondents were women, 256 (47.2%) men, 2 (.4%) non-binary, and 12 respondents (2.2%) preferred not to disclose their gender. The participants represented five age groups: 24–34 (87; 16.1%), 35–44 (168; 31%), 45–54 (168; 31%), 44–64 (100; 18.5%), and over 64 (19; 3.5%). The respondents also represented four different types of status: R1 – First Stage Researcher (91; 16.8%), R2 – Recognised Researcher (109; 20.1%), R3 – Established Researcher (178; 32.8%), and R4 – Leading Researcher (164; 30.3%).

#### **METHODS**

**Perceived barriers to career advancement** (as a job demand) were measured using the instrument created by Briggs, Jaramillo, and Weeks (2011). The scale comprises 11 items grouped into three subscales: lack of culture fit (e.g., "Feeling like you are held to a higher standard than others"), exclusion from the informal networks (e.g., "Limited access to the informal networks"), and lack of mentoring (e.g., "Not enough mentoring (e.g., counselling about career opportunities)").

**People management** (as a job resource) was measured with the scale by Knies, Leisink, and Schoot (2017). The scale consists of 17 items with a 5-point Likert response scale from 1 = *strongly disagree* to 5 = *strongly agree*. The instrument allows computing an overall score and four dimensions of people management: supportive HR practices (e.g., "training and development",  $\alpha = .89$ ), implementation of the tailor-made arrangements (e.g., "my supervisor tailors employment conditions to my personal situation",  $\alpha = .56$ ), support of employees' commitment (e.g., "My supervisor shows an interest in how I do my job",  $\alpha = .92$ ), and support of

employees' career development (e.g., "my supervisor offers me opportunities to participate in training",  $\alpha = .93$ ).

**Personal resources** were measured with 28 items from Hirshi, Nagy, Baumeler, Johnston, and Spurk's (2018) Career Resource Questionnaire. The items were grouped into three broader higher-order constructs with 9 underlying factors: human capital career resources (occupational expertise, job market knowledge, and soft skills), motivational career resources (career involvement, career confidence, career clarity), and career management behaviours (networking, career exploration, learning). Respondents indicate the extent to which they agree with each statement with a 5-point Likert scale from 1 = *not true at all* to 5 = *completely true*.

## ANALYSES

The statistical analyses were carried out in IBM® SPSS® Statistics 27 (Version 27.0.1.0) on the data from 542 respondents.

Perceived barriers to career advancement were assessed as low and moderately low. The participants' scores indicate moderately low to moderate levels of people management facets. The respondents assessed personal resources (human capital career resources, motivational career resources, and career management resources) as moderate to moderately high.

Descriptive statistics for work engagement indicate that respondents often (about once a week) experience vigour, dedication, absorption, and thus general engagement. Similarly, respondents indicated their career satisfaction as moderately high.

The results of the Kolmogorov-Smirnov normality test were significant in all the above cases ( $p < .001$ ), indicating a non-normal distribution of the variables.

Following the job demands-resources model (JD-R; Akkermans, et al., 2013; Bakker & Demerouti, 2007), perceived barriers to career advancement (as a job demand) were negatively related to personal career resources ( $\beta = -.06$ ,  $p < .05$ ) and work engagement ( $\beta = -.19$ ,  $p < .001$ ), while people management (as an example of job resources) was in the positive relation with personal career resources ( $\beta = .27$ ,  $p < .001$ ) and work engagement ( $\beta = .12$ ,  $p < .001$ ). Also, personal career resources produced a significant path to work engagement ( $\beta = -.57$ ,  $p < .001$ ). Lastly, in line with the theoretical premise of the JD-R model, work engagement was positively related to career satisfaction ( $\beta = .77$ ,  $p < .001$ ). Because there were direct and indirect (through personal career resources) paths from the perceived barriers to career advancement and people management to work engagement, the mediation analysis was performed in JASP (Version 0.16.0) using a

bootstrap method with 10.000 replications. This procedure indicated 95% confidence intervals for the direct, indirect, and total effects. Table 1.1. shows the results of the mediation analysis.

Table 1.1. Direct, indirect, and total effects in mediation analysis (general work engagement as the outcome variable and personal career resources as the mediator)

Predictor	Direct effect			Indirect effect			Total effect		
	Estimate	<i>z</i>	<i>p</i>	Estimate	<i>z</i>	<i>p</i>	Estimate	<i>z</i>	<i>p</i>
Perceived barriers to career advancement	-.15 [-.24;-.06]	-3.23	<.001	-.08 [-.11;-.03]	-3.31	<.001	-.22 [-.32;-.12]	-4.45	<.001
People management	.15 [.05;.25]	2.88	<.01	.15 [.10;.20]	5.65	<.001	.29 [.19;.40]	5.48	<.001

Source: own research

As hypothesized, perceived barriers to career advancement were negatively related to work engagement (total effect:  $\beta = -.22$ ,  $p < .001$ ), while people management produced a direct and positive path to work engagement (total effect:  $\beta = .29$ ,  $p < .001$ ). Introducing personal career resources as the mediator in the model resulted in the respective effects becoming lower but still significant (direct effects:  $\beta = -.15$ ;  $p < .001$  for the perceived barriers to career advancement and  $\beta = .15$ ;  $p < .01$  for people management). Therefore, personal resources were a partial mediator in the relationships of perceived barriers to career advancement (indirect effect:  $\beta = -.08$ ;  $p < .001$ ) and people management (indirect effect:  $\beta = .15$ ;  $p < .001$ ) with work engagement. The mediation models allowed to explain 2.2% of the variance in personal resources and 21.6% of the variance in work engagement.

Based on the theoretical premise of the job demands-resources model (Bakker & Demerouti, 2007), work engagement – a positive, persistent, and pervasive affective-cognitive state (Chrupała-Pniak, Paliga, Pollak, Rudnicka, 2018; Schaufeli & Taris, 2014) of mind related to work activities (Schaufeli & Bakker, 2004) – is a result of the existence of two job-related factors, namely job demands and job resources, that can be applied to various occupational settings, including the academia (Kraimer, Greco, Seibert, & Sargent, 2019). Job demands are physical, psychological, social, or organizational aspects of the job that require sustained physical and psychological effort on the part of the employee (Bakker, Hakanen, Demerouti, & Xanthopoulou, 2007). When high, they can evoke strain and are associated with physiological and psychological costs (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). Accordingly, job

resources refer to the physical, psychological, social, or organizational aspects of the job that reduce job demands and the associated physiological and psychological costs; are functional in achieving work goals; and stimulate personal growth, learning, and development (Bakker & Demerouti, 2007; Schaufeli, 2007). The JD-R model assumes that work engagement results from the available job resources co-existing with job demands. Such circumstances trigger a motivational process that results in employees feeling high energy and engagement. Subsequently, high work engagement leads to better organizational outcomes, including job satisfaction.

The obtained results – confirmed in the structural equation modelling and mediation analysis – suggest that perceived barriers to career advancement are negatively related to personal career resources and work engagement. Hence, it can be concluded that academic workers, when faced with adverse circumstances for their career, i.e., **lack of culture fit, exclusion from informal networks, and lack of mentoring, have to use up their own resources to cope with the difficult professional situation.**

Furthermore, unfavourable career conditions may lead – through a stress process (Bakker & Demerouti, 2007) – to lower work engagement and its negative individual and organizational consequences. Contrarily, **people management positively correlates with personal career resources and work engagement. This suggests that people management, as an example of job resources, can create a positive environment for workers, who can use their personal resources to take advantage of the circumstances and utilize whatever helps them achieve work goals and self-develop** (Bakker & Demerouti, 2007). The results also show that work engagement and career satisfaction are positively related, which is in line with the prior studies. Our investigation is another example of the positive consequences of work engagement for both individuals and organizations that take notice and care of their employees' well-being. Hence, the study suggests the need for a systemic and careful approach to career-related job demands and job resources, which can either help or hinder the functioning of academic workers.

## MAP OF INHIBITORS/ BARRIERS TO MOBILIZING AND FLEXIBILISING RESEARCHERS' CAREERS

**Table 1.2. Organizational constraints scale**

Respondents answered the question: *How often do you find it difficult or impossible to do your job because of ... ?* Possible answers 1 = *less than once per month or never*, 2 = *Once or twice per month*, 3 = *Once or twice per week*, 4 = *Once or twice per day*, 5 = *several times per day*.

	Relevance (hierarchical list)	<i>M</i>	<i>Me</i>	<i>SD</i>	<i>Frequency</i>
1.	Organizational rules and procedures	2,60	2,00	1,32	more than once or twice per month
2.	Interruptions by other people	2,52	2,00	1,34	more than once or twice per month
3.	Lack of equipment or supplies	2,16	2,00	1,26	more than once or twice per month
4.	Conflicting job demands	2,15	2,00	1,31	more than once or twice per month
5.	Poor equipment or supplies	2,12	2,00	1,20	more than once or twice per month
6.	Lack of necessary information about what to do or how to do it	2,04	2,00	1,11	more than once or twice per month
7.	Inadequate help from others	1,90	2,00	1,06	less than once per month
8.	Other employees	1,80	1,00	0,98	less than once per month
9.	Incorrect instructions	1,72	1,00	0,99	less than once per month
10.	Inadequate training	1,67	1,00	0,94	less than once per month
11.	Your supervisor	1,47	1,00	0,91	less than once per month

Source: own research; *N* = 542

Note: The most important barriers are highlighted in red

*M* – Mean, *Me* – Median, *SD* – Standard Deviation

Source: <https://paulspector.com/assessments/pauls-no-cost-assessments/organizational-constraints-scale-ocs/>

**Table 1.3. Perceived barriers to career advancement scale**

Respondents answered the question: *Please indicate the extent to which each factor has been a problem in your career advancement with your company, with 1 = no problem at all and 5 = very serious problem.*

	Relevance (hierarchical list)	<i>M</i>	<i>Me</i>	<i>SD</i>	<i>importance</i>
1.	Lack of mentoring	2,51	2,50	1,26	moderate problem
2.	Lack of culture fit	2,23	2,00	1,02	moderate problem
3.	exclusion from informal networks	1,99	1,50	1,13	low problem

Source: own research; *N* = 542

Note: The most important barriers are highlighted in red

Source: Briggs, E., Jaramillo, F., & Weeks, W. A. (2012). Perceived barriers to career advancement and organizational commitment in sales. *Journal of Business Research*, 65(7), 937–943. <https://doi.org/10.1016/j.jbusres.2011.05.004>



## **REPORT 2 (written by Yulia Kyrdoda & Mateusz Paliga)**

### **AIM**

his study examines how the well-established Job demands-resources model works within the academic context. In particular, the analysis focuses on the PhD students' context, determining the impact of study demands and resources on the engagement in studies and satisfaction with studies. To a greater extent, the research defined the perceived barriers to career advancement as study demands, while environmental career resources and PhD resources were represented as study resources. Also, students' personal resources, namely academic self-efficacy, were seen as mediators in the relationship between study demands/resources and engagement in studies.

The online self-report survey was distributed among the PhD students of seven universities partnered in the "Transform 4 European Research and Innovation" (T4ERI) project. The survey was available via an online link from the 30th of June 2022 till the 31st of July 2022. Participation in the study was voluntary, and the respondents did not receive compensation. The institutional ethics committee of the University of Silesia in Katowice approved the research project (decision number KEUS.221/02.2022). The study was conducted according to the principles of the Declaration of Helsinki.

### **SAMPLE**

Overall, 285 answers were collected. However, after data cleaning, the final sample consisted of 110 respondents. The obtained numerical results mainly from the high number of uncompleted questionnaires (165 respondents failed to complete the questionnaires) and mistakes made while answering at least one item designed to control participants' attention during filling out the survey (10 answers).

More precisely, the highest number of responses was gathered at the University of Trieste (n=39), followed by Saarland University (n=24) and the University of Silesia in Katowice (n=18). The other selected universities introduced respectively: Sofia University, St. Kliment Ohridski, and Vytautas Magnus University: – 10 answers each, Estonian Academy of Arts – 6 answers, and Alicante University – 3 answers.

Regarding the status of the participants, more than half of them were PhD students, not employed, with a full scholarship (n=56). The rest of the responders were divided into two

groups: students employed at the university (n=22) and those employed outside the university (n=32). The percentage ratio looks like 51%, 20%, and 29%, respectively. Regarding the year of studies at university, the first-year students are the most presented group in the sample (n=39). The second and third-year groups are almost similar: 25 and 27 answers, while the fourth-year students provided 19 responses.

The analysis has also shown the distribution of answers in terms of academic branch: "Humanities and the Arts" included 27 respondents, followed by "Medical and health sciences" with 26 respondents, and "Social sciences" with 23 answers. The sample also includes representatives from "Natural sciences" (n=19), "Engineering and Technology" (n=14), and "Agricultural and Veterinary sciences" (n=1).

## METHOD

**Perceived barriers to career advancement** as study demand were measured using the instrument by Briggs, Jaramillo, and Weeks (2011). The analysis includes two subscales, such as Lack of Culture fit (e.g., "Not feeling comfortable asserting your views because of possible consequences") and Lack of Mentoring (e.g., "Not having a supervisor who facilitates your career progress"). In total, the construct consists of 8 items, 4 per each subscale. Respondents indicate the extent to which each factor has been a problem in their doctoral studies with a 5-point Likert scale from 1 = no problem at all to 5 = very serious problem.

Two constructs represent study resources. The first one is **Environmental career resources** derived from the work of Hirschi et al. (2018). The construct includes two subscales as Career Opportunities with three items (e.g., "My university offers interesting career opportunities for me") and Organizational career support with three items (e.g., "My university actively supports my career development"). Respondents indicate the extent to which they agree or disagree with each proposed statement with a 5-point Likert scale from 1 = not true at all to 5 = completely true.

**PhD study resources** were measured by six items from Kulikowski et al. (2019). Respondents were asked to choose 1 if they have experienced a given situation during their studies or 0 if they haven't had such experience (e.g., "Being overloaded with tasks related to participation in classes for the PhD students").

**Academic self-efficacy** is represented as personal resources and is seen as a mediator. It includes two constructs, namely, Social and academic self-efficacy (e.g., "Talk to your professors") and Roommate (e.g., "Get along with others you live with"). The selected 8 items

were delivered from the work of (Solberg et al., 1993). Respondents indicate to what extent they feel confident to successfully complete the following tasks using a 10-point scale from 0 as not at all confident to 9 – extremely confident.

**Engagement in studies** was measured with UWES-9 by Carmona-Halty et al. (2019). This nine-item scale allows computing three dimensions of engagement: vigour (e.g., “When I’m doing my work as a student, I feel bursting with energy”), dedication (e.g., “My studies inspire me”) and absorption (e.g., “I feel happy when I am studying intensely”). Respondents were asked if they ever felt in the described way about their studies. All items are scored on a seven-point frequency rating scale ranging from 0 (*never*) to 6 (*always*).

**Satisfaction with studies** was developed by Nauta (2007) and consisted of 6 items. The original scale was modified in line with the research objectives. Mainly, the changes refer to changing the word “major” into “doctoral studies” (e.g. “Overall, I am happy with the PhD studies I’ve chosen”).

## ANALYSIS

The perceived barriers to study advancement were assessed as **moderately low**.

Table 2.1. Barriers to study advancement

Variable	M	SD	Min-Max	Skewness (SE = .23)	Kurtosis (SE = .46)	K-S Test	Cronbach’s $\alpha$ reliability
Perceived barriers to career advancement - lack of culture fit	2.15	1	1-5	0.69	-0.43	0.14*	0.80
Perceived barriers to career advancement - lack of mentoring	2.39	1.14	1-5	0.56	-0.67	0.12*	0.86

Source: own research

Note. \*  $p < .001$ . Legend. M – Mean, SD – Standard Deviation, SE – Standard Error, K-S Test – Kolmogorov-Smirnov Test.

Regarding environmental career resources, respondents evaluated them as **moderately low**.

Table 2.2. Environmental career resources

Variable	M	SD	Min-Max	Skewness (SE = 0,23)	Kurtosis (SE = 0,46)	K-S Test	Cronbach’s $\alpha$ reliability
Environmental career resources - Career opportunities	2.16	0.92	1-5	0.63	0.20	0.15*	0.88
Environmental career resources - Organizational career support	2.29	1	1-5	0.53	-0.15	0.14*	0.94

Source: own research

Note. \*  $p < .001$ . Legend. M – Mean, SD – Standard Deviation, SE – Standard Error, K-S Test – Kolmogorov-Smirnov Test.

The analysis was performed among 110 PhD students from seven universities partnered in the “Transform 4 European Research and Innovation” (T4ERI) project.

The results confirmed that in the academic environment, as in any other, job demands are negatively related to job engagement; in our case – study demands and engagement are negatively related to the studies. Throughout the analysis, we identified the lack of cultural fit and the lack of mentoring as the main barriers for doctoral students. Furthermore, the findings revealed that a lack of mentoring has a more significant impact than a lack of fit. These arguments are consistent with the previous studies (Lindén et al., 2013; Young et al., 2019), highlighting the vital role of mentors in students’ engagement in studies and their overall satisfaction. In the meantime, study resources were proved to have a significantly positive impact on engagement in studies. Despite the trivial difference, it is worth mentioning that PhD study resources are revealed to be more influential than environmental career resources. In the context of environmental career resources, organizational career support appeared to have a more significant impact than career opportunities. The potential reason for that might be the strong link between encouragement and emotional health, which, in turn, relates to the outcome favourable to employees, for instance, job satisfaction, or favourable to organizations as worker’s commitment (McClenahan et al., 2007; Rhoades and Eisenberger, 2002). Considering the academic field, as noted by Stubb et al. (2011), feeling support from the scholar community at the university reduces the stress of the PhD students and their exhaustion and anxiety, whereas it increases study engagement. Besides, in line with the prior studies (Bakker and Demerouti, 2017; Schaufeli, 2017), our analysis included personal resources, which play a mediating role in the JD-R model. The evidence exposed that academic self-efficacy as a mediator is represented by social and roommates’ academic self-efficacy. However, we found statistical confirmation only of the direct effect of the perceived barriers on engagement in studies.

Overall, the relationship between study demands/resources and personal resources needs further investigation, considering the specific academic context. Moreover, given the case of PhD students, the research requires more evidence to understand the nature of the relationship between engagement in studies and satisfaction with studies.

## MAP OF INHIBITORS/ BARRIERS TO MOBILIZING AND FLEXIBILISING EARLY RESEARCHERS' CAREERS – made by Mateusz Paliga

### Career inhibitors among PhD students

The analysis includes perceived study demands and perceived barriers to career advancement among the PhD students. The lists in Table 1 and Table 2 are presented in order regarding the significance of each inhibitor.

#### *Study demands among the surveyed PhD students*

Table 2.3. Study demands among the surveyed PhD students (order of significance)

#	Study demand	% of "yes" answers
1.	Inconvenient location of buildings in which classes take place.	60,9
2.	Lack of supervisor's time for a PhD student.	56,4
2.	Being overloaded with tasks related to participation in classes for the PhD students.	55,5
3.	Lack of classes conducted by experts.	55,5
4.	Lack of ambition among the academic workers to compete with the best universities in the world.	50,9
5.	Classes schedule – classes taking place very early or very late during the day.	44,5
6.	Little possibilities of financing own research.	41,8
7.	Lack of information about grants and scholarships for the PhD students.	40,9
8.	Not taking into account PhD students' opinions when making decisions by faculty / institute authorities.	39,1
8.	Too many PhD students under the supervision of one supervisor.	39,1
9.	Obligatory participation in classes that teach nothing but are time-consuming.	38,2
9.	Lack of support from the supervisor in preparing a dissertation.	38,2
10.	Unclear rules of receiving scholarships.	37,3
11.	No access to a good Wi-Fi connection.	35,5
12.	Lack of academic workers' respect for PhD students.	34,5
13.	Not being paid for teaching students.	32,7
14.	Lack of courses and classes developing the skills needed in scientific work.	30,9
15.	Treating PhD students as a 'cheap labour force'.	30
15.	Lack of the possibility to work and study on PhD studies at the same time.	30
15.	Being too overloaded with work by the supervisor.	30
16.	Lack of studying space for the PhD students.	29,1

17.	Lack of information about possible career paths after the PhD studies.	27,3
18.	Lack of contact with the world-famous scientists.	20,9
18.	Inappropriate work of the university's administrative staff.	20,9
19.	High level of competition between the PhD candidates.	16,4
20.	Lack of financing of scientific publications.	15,5

Source: own research;  $N = 110$

Note: The most important ones are highlighted in red

Scale's source: Kulikowski, K. Potoczek, A., Antipow, E., & Król, S. (2019). How to Survive in Academia: Demands, Resources and Study Satisfaction Among Polish PhD Students. *Education Sciences: Theory & Practice* 19(4), 65–79. <https://doi.org/10.12738/estp.2019.4.005>

Wording of the instruction from the survey: *The following statements are the study resources and demands. Please choose 1 in case you have experienced a given situation during your studies. In case you haven't experienced given demand or resource choose 0.*

### ***Perceived barriers to career advancement among the surveyed PhD students***

Table 2.4. Perceived barriers to career advancement among PhD students (order of significance)

#	Perceived barrier	M	Me	SD
1.	Lack of mentoring	2,39	2,25	1,14
2.	Lack of cultural fit	2,15	2,00	0,97
3.	Exclusion from informal networks	2,04	1,50	1,10

Source: own research;  $N = 110$ .

Note: The most important barriers are highlighted in red

Scale's source: Briggs, E., Jaramillo, F., & Weeks, W. A. (2012). Perceived barriers to career advancement and organizational commitment in sales. *Journal of Business Research*, 65(7), 937–943. <https://doi.org/10.1016/j.jbusres.2011.05.004>

Wording of the instruction from the survey: *Please indicate the extent to which each factor has been a problem in your doctoral studies with 1 = no problem at all and 5 = very serious problem.*

## **REPORT 3 (written by Barbara Kozusznik & Katarzyna Więcek-Jakubek)**

### **AIM**

The task 3.3 team's work was focused on the preparation and implementation of two workshops – the first concentrated on the identification of challenges that leaders of research teams face (in the area of science and science management), and the second that aims to identify the key competences of research teams leaders and then to build a map of the leader's competences in the academia (in the area of science and science management).

The two workshops entitled "Challenges Facing research team leaders. Towards competences of entrepreneurship and innovativeness in science and science management" were scheduled for February and March 2022. The participants' representatives of the T4ERI alliance: the University of Trieste, the University of Alicante, Saarland University, The Estonian Academy of Art., Sofia University, Vytautas Magnus University from Lithuania, and the University of Silesia in Katowice.

The first online workshop, "Challenges facing research team leaders. Towards competencies of entrepreneurship & innovativeness in science & science management", was organized via MS Teams Platform (February 10th, 2022).

The workshop's main goal was to discuss and identify challenges that leaders of research teams face (in science and science management).

## **PARTICIPANTS**

The workshop participants were researchers representing various levels of career development (from R1 to R4, according to the *European Framework for Research Careers*). The main assumption was that each university – member of the T4ERI alliance would delegate at least two representatives (one representative of R1/R2 and one representative of R3/R4 – if possible, with the experience of being a leader of a research team). As a result, fourteen participants took part in the event.

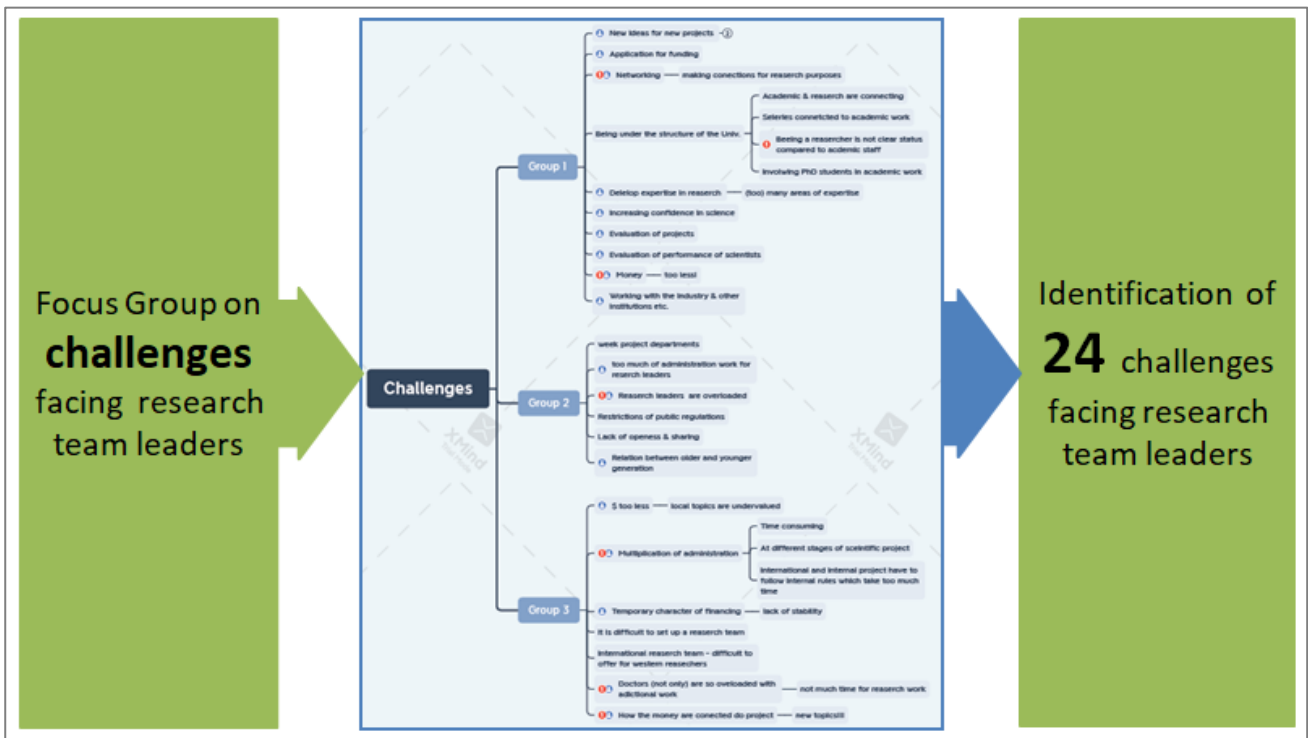
## **METHODS**

Group discussion on challenges that the leaders in research teams face and common identification of key challenges was preceded by work in subgroups R1–R4.

The challenges were mapped during the forum presentation of the results of each of the subgroup's work. As a result, a list of challenges that leaders of research teams encounter (in science and science management) was created.

Based on the set of challenges of the research team leaders, which were mapped during the first online workshop, the task team identified twenty-four challenges which were used to prepare an online survey titled "Challenges facing research team leaders – follow-up questionnaire". Figure 1 presents the graphic summary of the challenges mapping process.

Figure 3.1. Challenges that research team leaders face – a graphic illustration of the map developed during the 1<sup>st</sup> workshop



Source: own research

The follow-up questionnaire aimed to give each of the first workshop participants the possibility to confront their own opinion with the material obtained during the meeting as a result of the work of the whole group. Moreover, the applied procedure allowed to reduce the risk of distortion of the obtained material as a result of typical phenomena in the course of group processes.

The survey was conducted via MS Google Forms. It started on February 21st, 2022 and finished on February 23rd, 2022. An invitation to participate in the survey was sent to fourteen of the first workshop participants. Eight of them completed the form.

The task of the survey respondents was to report their opinion by assigning to each of the twenty-four challenges its frequency, importance and probability that it will occur at a particular stage of researcher career development (R1 – R4). A Likert scale was used to assess the abovementioned features:

- a. **frequency** – from 1 [*never*] to 5 [*continually*],
- b. **importance** – from 1 [*not important at all*] to 5 [*very important*],
- c. **probability** – from 1 [*very unlikely to happen*] to 5 [*very likely to happen*].



Table 3.1. Challenges that research team leaders face – matrix of analysis levels

Stage of researcher career development	Frequency [1 to 5] F	Importance [1 to 5] I	Probability [1 to 5] P
R1 – First Stage Researcher (Up to the point of PhD)			
R2 – Recognized Researcher (PhD holders or equivalent who are not yet fully independent)			
R3 – Established Researcher (Researchers who have developed a level of independence)			
R4 – Leading Researcher (Researchers leading in their research area or field)			

Source: own research

## RESULTS

The results of the conducted survey showed that the crucial barriers are:

- 1) **lack of stabilization**, indicated to be among the 3 top challenges for R1 & R2 [applies to I/F/P],
- 2) **expertise in research work** indicated as the second most important barrier,
- 3) **pressure to publish** indicated to be among the 3 top challenges for R1 & R2 & R3 [applies to I/F/P],
- 4) **evaluation of scientist performance** indicated to be among the 3 top challenges for R4 [applies to I/F/P],
- 5) at R1 & R2 & R3, among the 3 top challenges with the highest average, were also **overloading with organizational work and dealing with administrative work**,
- 6) **making and developing networking for research purposes** indicated to be among the 3 top challenges for R2 & R3,
- 7) **raising/applying for funds to conduct research and research team recruitment** is indicated to be among the 3 top challenges for R3 & R4.

The analysis of the obtained results also indicated **similarities in the range of challenges perceived to be the most frequent, important, and probable** for the first two (R1–R2) and then – the last two (R3–R4) levels of the research team leaders' career development. The detailed results of the follow-up questionnaire are presented in Attachment 7.3.

The survey summary material was sent to the workshop participants before the second online edition was conducted.

## CONCLUSIONS

In summary, the results of the above research [1–2] and workshops [3] make it possible to map brakes/barriers in mobilizing and making the careers of scientists more flexible at all stages of R1–R4 in three groups of factors (organizational, information and communication, support; see

Table 4) which will be explored through interviews with dyads (study planned for November and December 2022).

Research has many limitations, the main limitation being the size and representativeness of the sample. Despite the efforts made by the research team to cover the entire population of academic teachers and doctoral students at partner universities, both in the group of employees and in the group of doctoral students, a high drop-out was observed. Therefore, the obtained results should be treated with caution. The collected empirical material confirms that the study involved people who feel engagement in work/study several times a week, which may suggest a high level of internal motivation of the respondents. Intrinsic motivation in the job demands-resources model can play the role of personal resource strengthening job resources and minimizing the effect of job demands. The preliminary quantitative analysis of the obtained results shows that there are some common barriers (organizational, communication and social support barriers) regardless of the stage of development of a scientific/academic career, e.g., inappropriate procedures and organizational rules, shortages in equipment and access to research infrastructure, overload with duties (work); lack of feedback and scientific mentoring, insufficient internal communication and social support.

The next stages of research under WP3 will include both expert interviews and dyads to deepen the qualitative analysis concerning the above factors hindering the development of academic careers.

Table 4.1. Three categories of barriers/ inhibitors of academic careers development

	<b>Inhibitors</b>	<b>Organizational factors</b>	<b>Lack of information</b>	<b>Lack of social support</b>
<b>R2-R4</b>	Organizational rules and procedures Interruptions by other people Lack of equipment or supplies Conflicting job demands Poor equipment or supplies <Lack of necessary information about what to do or how to do it	x	x	x
<b>R1-R4</b>	Lack of mentoring Lack of culture fit	x	x	x
<b>R1/ PhD Candidates/ students</b>	Inconvenient location of buildings in which classes take place. Lack of supervisor's time for a PhD student. Being overloaded with tasks related to participation in classes for the PhD students. Lack of classes conducted by experts. Lack of ambition among the academic workers to compete with the best universities in the world. Classes schedule - classes taking place very	x	x	x

	<p>early or very late during the day.</p> <p>Little possibilities of financing own research.</p> <p>Lack of information about grants and scholarships for the PhD students.</p> <p>Not taking into account PhD students' opinions when making decisions by faculty / institute authorities.</p> <p>Too many PhD students under the supervision of one supervisor.</p> <p>Obligatory participation in classes that teach nothing but are time-consuming.</p> <p>Lack of support from the supervisor in preparing a dissertation.</p> <p>Unclear rules of receiving scholarships.</p> <p>No access to a good Wi-Fi connection.</p> <p>Lack of academic workers' respect for PhD students.</p> <p>Not being paid for teaching students.</p> <p>Lack of courses and classes developing the skills needed in scientific work.</p> <p>Treating PhD students as a 'cheap labour force'.</p> <p>Lack of the possibility to work and study on PhD studies at the same time.</p> <p>Being overloaded with work by the supervisor.</p> <p>Lack of studying space for the PhD students.</p> <p>Lack of information about possible career paths after the PhD studies.</p> <p>Lack of contact with world-famous scientists.</p> <p>Inappropriate work of the university's administrative staff.</p>			
R1-R2	Lack of stabilization,	x	x	x
R1-R3	Overloading with organizational work, dealing with administrative work,	x	x	x
R2-R3	Exclusion from the informal network/ research network	x	x	x

Source: own research

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