

## Towards Modelling the Success Determinants of International Research Proposals

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### Abstract

The goal of the research is to understand the factors that determine the success of international research proposals. For this purpose, a multi-stage study will be carried out. The study will include a systematic literature review, semi-structured interviews with European Commission evaluators, and the development of the model of success determinants. Text analysis of historical proposals will enhance the knowledge of the success factors linked with applications' discourse and language. The proposed research will complement the existing literature as the study will be based on a comprehensive dataset covering all funded and rejected project applications under the European Union's Horizon 2020 Framework Program. The model will support the participation of Polish higher education institutions in European funds, whose acquisition is a key challenge for them, and provide an opportunity for the development of innovative research and international cooperation. It might also be useful for institutions in other countries, especially those that similarly to Polish institutions have a low share in acquiring European Union funds.

**Keywords:** Grant Funding, Research Funding, Success Determinants, Decision Making

### 1. Introduction

The European Union's (EU) funds play an important role in the support of innovation and economic development of Poland. They especially contribute to the enhancement of Polish research and education. The opportunities offered by EU funds are long-range because they help to establish close cooperation between the world of science and the world of business. Horizon Europe (2021-2027), with a budget of approximately EUR 95.5 billion, is the most ambitious research and innovation (R&I) program in the history of the EU. It was launched by the European Commission (EC) and replaced the Horizon 2020 (H2020) Framework Program [16].

It takes at least a month to write a typical research proposal [13]. However, the time required to prepare research applications is not directly comparable due to differences in the type of call, research field, and funding agency guidelines. Polish higher education institutions compete for European funds with excellent European universities that have comprehensive support systems for applying for research grants. Research on the determinants of the success of international research applications is important for increasing the acquisition of EU funds by Polish universities. University authorities should pay special attention to the process of applying for international grants, and provide applicants with specialist support in finding partners and preparing grant applications [28, 29]. Acquiring EU funds is a great challenge for Polish higher education institutions. Therefore, tools should be sought to support strategic decision-making in this area.

To date, little is known about the success determinants of international research funding proposals, in Poland especially. Literature, mainly devoted to the statistics of funded projects, deals with the Matthew effect in science, the hypothesis that outstanding scientists

and/or outstanding research institutions have an advantage in competing for funding [27], [31] and is primarily concerned with the bias of review panels [3], [26], [27]. The topic appears mainly in grey literature, websites and training materials. However, there is a lack of scientific studies that would explain in a comprehensive way the factors that influence the evaluation of research proposals. The main limitation of the to-date research on the determinants of the success of research proposals is that they are not systemic, comprehensive and conceptually coherent, but are mainly based on statistical and bibliometric methods (see section 2.2). While they may be accurate, they are inevitably biased from the point of view of researchers from non-reputable entities. To fill the research gap, we would like to intimately investigate the success factors of research proposals and develop a model that will help to understand the determinants of the success of international research proposals. In particular, we would like to answer the following research questions:

RQ1. What research proposal success factors have been identified in the literature?

RQ2. What research proposal success factors are identified by experts evaluating the applications?

RQ3. What research proposal success factors might be identified on the basis of historical application analysis?

RQ4. How might we model the success determinants of international research proposals?

Around one million applications were submitted to the Horizon 2020 framework program, of which only around 15% were accepted and obtained funding [14]. The European Commission currently has a huge database of accepted and rejected applications. We will try to analyse and interpret this data, using both traditional research methods and artificial intelligence methods, in order to understand the factors that determine the success of proposals. This research will contribute to the development of an information system, which will be a tool supporting decision-making at universities and facilitating the preparation of research proposals.

The next section presents the research background, followed by the research plan. Finally, the possible implications for research and practice are discussed.

## **2. Research Background**

### **2.1. Acquisition of EU Funds by Polish Institutions**

The results of Polish higher education institutions in applying for European grants under the 7th Framework Program (FP) and the Horizon 2020 program are not satisfactory [20]. The participation of Polish institutions in the H2020 budget is only 1.21%. 897 institutions received co-financing for 1,952 projects, of which only 333 were coordinated by Polish leaders. The total net funding was EUR 747.80 million [23]. The challenge for Poland is the insufficient activity of universities and academics in obtaining grants. We still observe relatively low participation in funds for the development of research and innovation by Polish higher education institutions. For example, Oxford University itself obtained EUR 527.48 million in funding from H2020, while all Polish universities only obtained EUR 207.43 million [14]. Poland is a low-performing R&I country, with a level of research excellence that is lower than the EU average [17]. The recent legislation in Poland has forced universities to change their expectations towards academic staff in order to achieve the highest possible categorization of disciplines and universities. Polish researchers are under pressure to publish their research in reputable journals. Therefore, there is a direct emphasis on applying for research grants and timely settlement of projects in the case of obtaining them.

### **2.2. Factors Influencing the Success of International Grant Applications**

The topic of the success factors of research proposals has been tackled by numerous researchers, who investigated various aspects of key success determinants. McCarthy [20] noted that the success of the collaborative H2020 research proposals was determined by

two main criteria: having an excellent scientific idea, and a thorough understanding of the evaluation process. Some research works analyse the networks of scientific institutions and their impact on the success of collaborative grant applications [1], [15]. Having a strong, influential network position in collaborative EU research is found to affect the participation in H2020, greatly-suggesting "closed clubs", to the detriment of less influential institutions [4], [9, 10]. Moreover, project coordination experience contributes to the successful acquisition of grants. This is all thanks to the learning outcomes that facilitate the development of a coherent application [11]. Further empirical research suggests that both the research capacity and scientific excellence of an organization increase the likelihood of receiving funding [3], [33]. Although some studies focus on the Matthew effect in science [27], [31], Bol et al. [3] has shown that previous funding in itself is not an advantage in obtaining later funding. Finally, the low success rate for partners from Central and Eastern Europe should be taken into account. This suggests that the more consortium partners are from this part of Europe, the less likely it is to be awarded a grant [22], [33].

### 3. Research Plan

We would like to investigate applications submitted to the Horizon 2020 Framework Program (FP). This is the perfect time to do such research as the program has just ended, and the entire data set from seven years of the lasting program is available. We would like to base our research on various types of data sources, including bibliometric (e.g. ranking), scientometric (e.g. EU databases), and sociometric (interview data). Inductive reasoning over the obtained results will be used to create the model. Thanks to methodological triangulation, it will be possible to collect data to assemble broad, deep, contextual knowledge. Triangulation makes it possible to minimize the imperfections and shortcomings of particular research methods used separately and to maintain the reliability and accuracy of inference, ensuring the credibility of research results [7]. Table 1. presents the research plan divided into stages.

**Table 1.** The research plan divided into stages.

Stage/RQ	Description	Research methods	Comments
1 / RQ1	Identification of research proposal success factors present in relevant literature	Systematic literature review (SLR) according to the PRISMA statement [21].	Web of Science, Scopus
2 / RQ2	Identification of research proposal success factors perceived by application evaluators	Semi-structured interviews with experts of the European Commission who evaluated applications in the H2020 program [5], [12], [25].	The interviews will concern the factors influencing the positive evaluation of international research applications. We will develop guided questions based on the SLR. We plan to conduct at least 15 interviews with EC experts from Poland and Spain who assessed various applications in the Horizon 2020 program. Spain has the highest increase in the effectiveness of obtaining grants under the Horizon 2020 program compared to the 7th EU FP. After the interviews, we will analyse the collected materials in the following steps: 1. Transcription of interviews; 2. Reading transcripts; 3 Data encoding; 4. Data conceptualisation; Data segmentation; 5. Data analysis; 6. Describing the results [5].
3 / RQ3	Identification of research proposal success factors on the basis of statistical analysis of historical applications	Quantitative and qualitative analysis of data from CORDIS and eCORDA[6].  CORDIS database (Community Research and Development Information Service) [6], data concerning founded projects, eCORDA database (external COmmon Research DATA warehouse) - raw data on	Descriptive statistics of funded and rejected proposals under the Horizon 2020 Framework Program. Comparative analysis of funded and rejected Horizon 2020 applications in terms of the composition of project consortia (partner countries and geographic location).  The procedure will include data preparation and cleaning, data analysis, and interpretation of results.

		applications submitted to the H2020 program that have not received funding	
4 / RQ3	Identification of research proposal success factors by the analysis of the text of historical applications	Text mining [2]. Texts of applications for research projects submitted under Horizon 2020 obtained from the EC will be used.	Analysis of the discourse of research proposals in terms of the clarity of the text and the language used, and the innovativeness of the idea. We will also analyse rejected applications, as comparing rejected and approved applications may better show the impact of writing styles on the evaluation process. We will use not only application summaries, but also other important parts: project description, project management, and implementation plan.
5 / RQ4	Development of the model of research proposal success determinants	Machine learning [18, 19].  CWTS Leiden Ranking [8], OECD REGPAT database - presents patent data [24].	Selection of research proposal success determinants and determining their measurement method and weights. Methods will be chosen that enable the selection of determinants and the assessment of their weights, e.g. genetic algorithms, discriminant analysis; sensitivity analysis [19].
6	Model evaluation	Ex-post evaluation of the proposals not used at the previous stages of the study.	This stage will allow the accuracy of the model to be assessed.

## 4. Implications for Research and Practice

### 4.1. Implications for Research

The most important expected results of the research are the following: 1) providing a deep insight into the determinants of the success of international project applications; 2) filling the research gap concerning the analysis of unsuccessful funding applications on the basis of the eCORDA database; 3) filling the research gap regarding the impact of the characteristics and composition of the entire project consortium on the success of the application, not only the scientific excellence of individual units; 4) broadening the knowledge on the patterns of selection of project consortium members for international cooperation within the framework of research grants. The proposed model of project application success determinants will contribute greatly to the existing literature and might be further exploited by the research community.

The novelty of the proposition stems from the broad selection of methods that answer the research questions considering different points of view. Attempts have been made to answer the question of determinants of the success of research applications using various tools, including bibliometry (mainly by evaluating the productivity of the principal researcher), statistical analyses, and analysis of the scientists' social networks. Most of the research uses data from bibliometric databases and focuses only on the data from funded projects [3], [22]. However, the success of a research proposal is a complex problem that does not solely depend on bibliometric indicators. Statistical analyses do not explain the complex process of proposal evaluation because the application's success is influenced by bibliometrically unmeasurable factors such as application writing style, text clarity, and innovativeness of the research idea [30], [32]. The conducted statistical and bibliometric analyses lack a holistic approach to the issue. In this research, a comprehensive approach to the development of the model will be used. To the best of the authors' knowledge, no such research has been done, at least not for the Polish case. No one has analysed the data for the entire Horizon 2020 Framework Program. Besides, we plan to also examine the applications that have been rejected, as most studies are only based on already funded projects. Hence, the novelty of the research is based on both the problem being addressed and the methods being employed.

### 4.2. Implications for Practice

The results of the project will be of interest to all stakeholders related to research funding. Knowledge about proposals' success determinants will contribute to overcoming the barriers to obtaining EU funds. The main purpose of our model is to make a preliminary assessment of the proposal, before submitting it to the call. The feedback obtained will

enable the improvement of the proposal draft in order to prepare the most competitive final version, and it will maximize the probability of the proposal's success. On the basis of the developed model, a tool will be developed that will support strategic decision-making in Polish higher education institutions. It might be used for the internal preselection of proposals prepared at universities by various research groups for the same calls (often only one application per call may be submitted by an institution). Finally, it will allow human resources, time, and money to be invested in only those applications that are likely to receive funding. It will also enable the inclusion of smaller Polish research units in the absorption of funds for research.

It should be noted that the research results might be of interest also for institutions from other countries, especially those which similarly to Poland acquire a less than average share of EU funds, e.g. Bulgaria, Croatia, Czechia, Estonia, Greece, Hungary, Italy, Latvia, Portugal, Romania, Slovakia, and Slovenia [14].

## 5. Conclusion

We are aware that answering the research questions formulated in the Introduction requires a lot of work and the answer to each of the research questions might be perceived as an individual path for research. However, we would like to present in this paper the full picture of how to achieve the main goal that is of interest to us – a comprehensive model that captures the determinants of international grant proposal applications.

## Acknowledgements

The publication has been financed by the subsidy granted to the Cracow University of Economics - Project no. 034/SD/2022/PRO.

## References

1. Balland, P.A., Boschma, R., Ravet, J.: Network Dynamics in Collaborative Research in the EU, 2003-2017. *European Planning Studies*, 27 (9), 1811-1837 (2019)
2. Biemann, C., Mehler, A. (eds): *Text Mining*. Springer International Publishing, Cham (2014)
3. Bol, T., De Vaan, M., Van De Rijdt, A.: The Matthew Effect in Science Funding. *Proceedings of the National Academy of Sciences of the United States of America*, 115 (19), 4887-4890 (2018)
4. Bond, M., Marín, V.I., Bedenlier, S.: International Collaboration in the Field of Educational Research: A Delphi Study. *Journal of New Approaches in Educational Research*, 10 (2), 190-213 (2021)
5. Brinkmann, S., Kvale, S.: *Doing Interviews* (2nd edition). SAGE Publications Ltd (2018)
6. *CORDIS Database* (2022), <https://cordis.europa.eu/pl>. Accessed March 22, 2022
7. Creswell, J.D., Creswell, J.W.: *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th edition). Sage (2018)
8. *CWTS Leiden Ranking* (2022), <https://www.leidenranking.com/>. Accessed March 22, 2022
9. Enger, S.G.: Closed clubs: Network Centrality and Participation in Horizon 2020. *Science and Public Policy*, 45 (6), 884-896 (2018)
10. Enger, S.G., Castellacci, F.: Who gets Horizon 2020 Research Grants? Propensity to Apply and Probability to Succeed in a Two-Step Analysis. *Scientometrics*, 109 (3/12), 1638 (2016)
11. Enger, S.G., Gulbrandsen, M.: Orchestrating Collaborative Projects: Inside ICT Networks in Horizon 2020. *Science and Public Policy*, 47 (3), 396-409 (2020)
12. Flick, U.: *Designing Qualitative Research* (2nd edition). SAGE Publications Ltd (2018)
13. Herbert, D.L., Barnett, A.G., Clarke, P., Graves, N.: On the Time Spent Preparing Grant Proposals: an Observational Study of Australian Researchers. *BMJ Open*, 3 (5), 1-6 (2013)

14. H2020 Country Profiles (2022). [https://ec.europa.eu/info/research-and-innovation/statistics/framework-programme-facts-and-figures/horizon-2020-country-profiles\\_pl](https://ec.europa.eu/info/research-and-innovation/statistics/framework-programme-facts-and-figures/horizon-2020-country-profiles_pl). Accessed June 11, 2022
15. Hoekman, J., Scherngell, T., Frenken, K., Tijssen, R.: Acquisition of European Research Funds and Its Effect on International Scientific Collaboration. *Journal of Economic Geography*, 13 (1), 23-52 (2013)
16. Horizon Europe (2022), [https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe\\_en](https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en). Accessed June 10, 2022
17. Horizon Europe - Work Programme 2021-2022 Widening Participation and Strengthening the European Research Area. European Commission (2022), [https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2021-2022/wp-11-widening-participation-and-strengthening-the-european-research-area\\_horizon-2021-2022\\_en.pdf](https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2021-2022/wp-11-widening-participation-and-strengthening-the-european-research-area_horizon-2021-2022_en.pdf). Accessed June 10, 2022
18. Jung, A.: *Machine Learning: Foundations, Methodologies, and Applications* (1st edition). Springer (2022)
19. Kubat, M.: *An Introduction to Machine Learning*. Springer International Publishing, Cham (2015)
20. McCarthy, S.: Success Rates in Horizon 2020 Letter from Industry. *Journal of Innovation Management* McCarthy JIM, 5 18-22 (2017)
21. Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G., Group, P.: Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *Annals of Internal Medicine*, 151 (4), 264-270 (2009)
22. Paier, M., Scherngell, T.: Determinants of Collaboration in European R&D Networks: Empirical Evidence from a Discrete Choice Model. *Industry and Innovation*, 18 (1), 89-104 (2011)
23. Poland in Horizon 2020 - statistics (2022), <https://www.kpk.gov.pl/analizy-i-statystyki>. Accessed June 10, 2022
24. REGPAT OECD (2022), <https://www.oecd.org/sti/inno/intellectual-property-statistics-and-analysis.htm>. Accessed June 10, 2022
25. Sagan, A.: *Metodologia Badań Ekonomicznych*. Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie, Kraków (2016)
26. Schiffbaenker, H., van den Besselaar, P., Sandström, U., Mom, C.: Explaining Gender Bias in ERC Grant Selection-Life Sciences Case. In: *STI 2018 Conference Proceedings*, pp. 346-352. Leiden (2018)
27. Smith, C., Boyack, K., Klavans, R.: Toward Predicting Proposal Success: An Update. In: *ISSI 2019 Proceedings*, pp. 770-781. Rome (2019)
28. Szczepaniak, W.: Planning the Costs of EU Projects at State Universities. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, 65 (2), 150-158 (2021)
29. Szczepaniak, W.: Safety of the EU Project Management System in Public Universities. *System Safety: Human - Technical Facility – Environment*, 2 (1), 39-46 (2020)
30. van den Besselaar, P., Mom, C.: The Effect of Writing Style on Success in Grant Applications. *Journal of Informetrics*, 16 (1), 101257 (2022)
31. van den Besselaar, P., Sandström, U.: Early Career Grants, Performance, and Careers: A Study on Predictive Validity of Grant Decisions. *Journal of Informetrics*, 9 (4), 826-838 (2015)
32. van den Besselaar, P., Sandström, U., Schiffbaenker, H.: Studying Grant Decision-Making: a Linguistic Analysis of Review Reports. *Scientometrics*, 117 (1), 313-329 (2018)
33. Wanzenböck, I., Lata, R., Ince, D.: Proposal Success in Horizon 2020: A Study of the Influence of Consortium Characteristics. *Quantitative Science Studies*, 1 (3), 1136-1158 (2020)