The analysis of the contribution of dissertations openness in the advancement of Open Science in Serbia

Abstract. The dissertation plays one of the key roles in defining the quality of doctoral studies on faculties and universities in Serbia. National Repository of Dissertations in Serbia (NaRDuS) was developed in 2014 due to absence of systematically approach in deposing thesis and unclarified process of applying for defending thesis. To support the efforts of initiative for Open Science in Serbia, at its beginning, NaRDuS expended its scope and was implemented in compliance within recommendations for Open Science.

1 Introduction

The open data and datasets are significant source for many upcoming researches, but Open Science represent much more. The main idea behind Open Science is to make data accessibly with equal right for all different communities and has no charge at all. This idea is something which is in correlation with process of publishing theses in Serbia. One part of law says that dissertation has to be publicly accessible for public insight. Also, having in mind that thesis, in process of defending, passes through many different institutions then the idea of having central repository comes up like possible solution.

The adoption of principles of Open Science seemed to be the right direction that should be followed, at the moment when the decision of "how to implement NaRDuS" was made. Today, thanks to the right decision, NaRDuS became the significant and trustworthy source of information.

NaRDuS is the repository that also follows and adopts the recommendations from other international initiatives. Over the years, certain improvements have been made with purpose to make this repository recognisable by communities that popularise the concept of openness. Adoption of OpenAIRE recommendations made possible for repository data to be part of European community [1]. Also, NaRDuS has been identified as repository that satisfied the conditions of NDLTD and today repository is part of this initiative. Recently, NaRDuS integrated persistent identifiers (PIDs) which pushed repository closer to adoption of FAIRness principles. All these adoptions go in favour that NaRDuS is repository which has adopted and implemented recommendations adhering to standardised solutions.

2 Before NaRDuS was established

Before NaRDuS was implemented the process of deposing thesis was delegated to each faculty and university so that institute could choose how they will archive thesis. Most of the institutions decided to depose their thesis by publishing them on web site. There were others

who had certain institutional infrastructure so they could depose theses in internal systems. On the other hand, there were institutions which faced with difficulties of establishing any kind of infrastructure so they kept process of defending and deposing thesis just in paper form. All this solutions bring serious problems like:

1. How to coordinate process on national level?
2. How to monitor and report institutional efficiency?
3. How to improve procedure when there is no standard?

This issue of having thesis in multiple copies in paper versions was significant problem for faculties and especially universities. The PhD candidates had obligation to provide more then enough copies of dissertation in paper format. This was quiet ineffective. The PhD candidate had to spend financial and paper resources for producing unnecessary copies mostly due to lack of coordination between institutions. The institutions wanted to simplified the process of deposing theses and to reduce paper consumption but they did not have technical solution to support initiatives.

Paper version reduced the accessibility to society and to participate in public insight. For PhD candidates, the lack of accessibility lead to impossibility of gaining recognition from science community. The visibility was on minimum, so number of possible application of analytic methods were limited.

3 Implementation of NaRDuS

Implementation of NaRDuS required changes on policy level before starting any developing of technical solution [2]. These obligations are regulated with the Law on Higher Education (Amendments published in the "Official Gazette of RS", no. 99/2014 of 09/11/2014. and entered into force on 19.9.2014). It is stipulated that "The University is obliged to establish a digital repository which permanently stores electronic versions of defended doctoral dissertation, together with the report of the Commission for evaluation of the dissertation, data on mentor and other Commission members, information about copyright protection, and that all the information contained herein make publicly available". Moreover, University have to submit to the central repository managed by the Ministry of Education a copy of the content that is stored in the university repository within the three months period starting from the date of the thesis defense.

Observing all approaches that faculties and universities had, NaRDuS was developed cautiously. Modelling procedure od deposing thesis required taking into account how each institution works. The main idea was to modify institution's approach but not forcing them to dismiss the entire practice they had so far. The majority of institutions, follows the standardisation in process of transferring metadata, digital version of thesis and thesis report. The adopted practise is that institution systems use OAI-PMH protocol for transferring.

To keep obligation of institutional person's responsibility for deposing thesis on minimum, NaRDuS functionalities were supported with video tutorials. So far, practise shows that responsible persons managed successfully to participate in deposing data. Later experiences show that even when responsible people changed inside the same intuitions, there were not issues for new one to catch up with so far established routine.

4 Results

Development of NaRDuS with focusing on adaptation of Open Science recommendations led to development of new tools which are based on data deposed in NaRDuS. The example is results achieved by *Opservatorija društvenih inovacija* (ODI) [3]. The ODI community

made different analyses which entirely or partially are based on NaRDuS data. Those analyses include:

1. How likely is to graduate (doctoral studies) within 3 years [3]?
2. The workload of teaching and research staff [3]
3. Distribution of mentorships and memberships in the commissions for the defence of doctoral dissertations [3]
4. Influence of investments in science at faculties and on the number of doctorates issued by a given faculty in the observed period (2014-2018) [3]
5. The impact of changing the law in the area of graduation deadlines [4]
6. Participation of institutions from the Republic of Serbia in Horizon 2020 [5][6]

NaRDuS expended technical limitation and added features which improved overall statistics. Deposited metadata have complex correlation with each other. Developing visualisation that can simplify those connections was produced as system upgrades [7]. The Fig. 1 shows the part of visualisation module responsible for presenting deposed data. Data are crossed by categories like: from which universities comes thesis, from which faculties comes thesis, faculty's science field and year of defending. All visualisations are updated every day. Used data is synchronised and exported on daily basis in .json format which is standardised format in context of Open data.
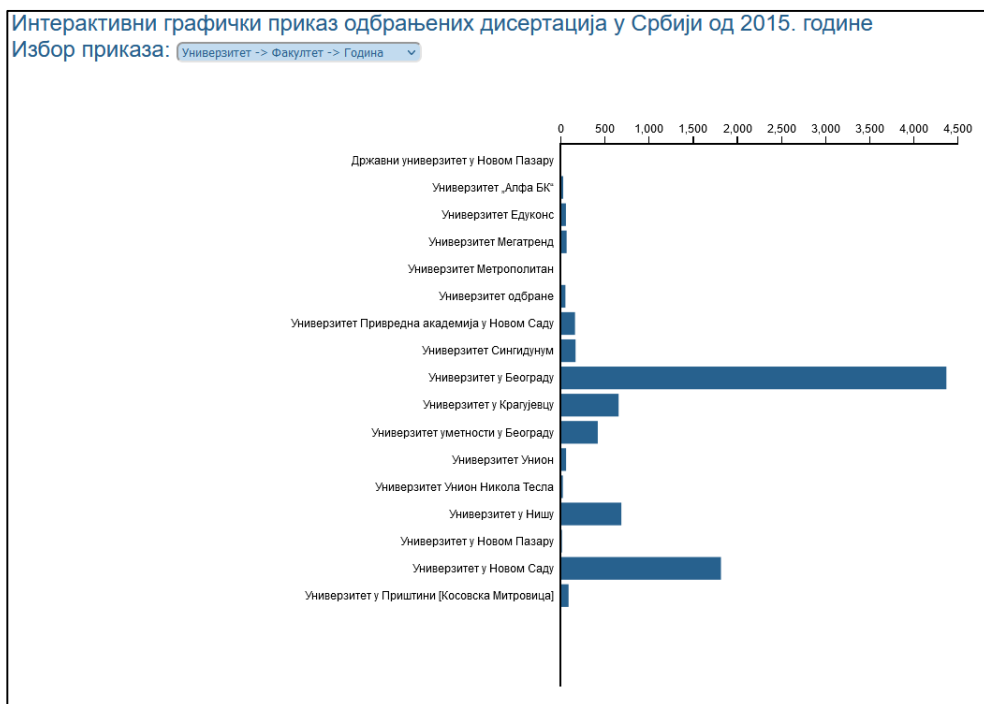

Fig. 1. NaRDuS visualisation module

PID integration opened possibilities for further adoption of Open Science recommendations. Beside of participating in FAIRness adoptions, PIDs solved other issued that stayed opened for years. The example is the absents of standardised identifiers, liked DOI. Due to PIDs integration, repository network now has mechanism to follow and identify theses.

5 Conclusion

Establishing NaRDuS helped institution in making decision of implementing their institutional repository. Thanks to adoption of Open Science principles, NaRDuS supported further researchers based on deposed data. Also, NaRDuS is in position of following upcoming updates in field of Open Science due to previous integration and implementation of recommendations in standardised manner.

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