

# Factors influencing Lithuanian researchers' use of open access repositories as a publishing channel

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## Abstract

**Introduction.** *The affordances of repositories for scientific information are emphasized in various international and national governmental and research financing documents. However, the researchers do not upload their full-text publications into the repositories as intensively as it is expected. The aim of the paper is to establish which factors and to what extent affect the intention of Lithuanian researchers to use open access repositories as a publication channel.*

**Methods.** *The model of the theory of planned behaviour was employed to better understand the intentions of Lithuanian researchers to deposit their publications to research repositories. A representative questionnaire survey was carried out to collect the data. The 545 respondents of the survey were the Lithuanian researchers who have a doctoral degree and work at Lithuanian state universities or state research institutes.*

**Analysis.** *The obtained data were analysed using statistical analysis (correlation). The connections between intention to submit publications to open access repositories and attitudes, perceived norm, perceived control, past open access publishing behaviour, occupational and demographic characteristics were analysed.*

**Results.** *The study has identified the factors affecting the open access publishing behaviour of Lithuanian researchers and the strength of their influence with regard to it. It was found that the most significant factors which affect Lithuanian researchers' intention to submit their publications to repositories are perceived norm, perceived control and past open access publishing behaviour. The age and seniority of researchers are also significant.*

**Conclusions.** *Lithuanian researchers differ from the general context of open access publishing behaviour in that the influence of norms on the intention to submit publications to open access repositories is greater than that of researchers in other countries, and the attitudes, although positive, are less significant. The remaining factors are affecting their publishing behaviour similarly as in the studies from other countries. Lithuanian researchers representing social sciences and humanities are slightly more likely to submit publications to the repositories than researchers representing the natural science, medicine and technology.*

**Keywords:** *open access, repositories, self-archiving, survey, Lithuania*

## Introduction

Some of the biggest changes in digital publishing of scientific publications are connected with the emergence and development of open access. It can be understood as free-of-charge access to scientific publications for all internet users through open access journals and repositories of research information (Budapest Open Access Initiative, 2017). The repositories of scientific information are one of the ways of implementing open access, so called green open access. This happens when authors upload their scientific publication to the institutional or other repository and create free-of-charge access (Suber, 2012).

Various international and national governmental and research financing bodies emphasise the importance of submission of scientific publications to the repositories in their documents or research publications. The affordances of repositories for scientific information are related to wider availability of research results, visibility of a research institution or a researcher, advancement of science and long-term preservation of scientific publications. The repositories of research information become significant not only because they create conditions for wider dissemination of research publications, but because research production of a scholarly institution or community is processed, systematised and preserved for a long time.

However, despite the emphasised benefits of research repositories for many interested groups, the researchers do not upload their full-text publications into the repositories as intensively as the institutions governing research and establishing policies expect. This contradiction raises a question: why do the researchers disregard the possibilities of research repositories and do not use them as a channel of publication for their research publications?

This particular question relates to the information production as a significant part of information behaviour, namely, of information transfer and exchange established as part of information behaviour by Wilson in 1994. It has been specifically noted within scholarly and scientific communication even earlier (Meadows and Buckle, 1992). It is significant that information behaviour studies have explored information transfer and exchange not only as a process on interaction between people or in the groups, but also as the production of information assets, such as reports, patents, articles, software codes or books by researchers (Hirsh and Dinkelacker, 2004). This type of studies looked into the choices of researchers about usage of retrieved information, but also on choices of output formats, e.g., writing an article or a book chapter, or modes of work, e.g., allocating time for writing, hiring an editor, choosing a channel of communication. Our research question is related to the latter issue and a very particular channel of publication – open access repository. Many information behaviour scholars conducted a variety of research studies to explore the attitudes and behaviour of researchers in relation to this particular channel of publication.

There were numerous surveys of wider or narrower scope conducted by researchers mostly in a particular university or a group of higher education institutions. Thus, Kim's study (2010) involved 17 Carnegie doctorate universities with DSpace institutional repositories, surveyed 684 business faculty professors and produced 41 interviews with them. Singeh et al. (2013) have conducted a survey of Malaysian scholars and scientists in five major universities of the country. A number of studies focused on specific cases of a single university in Norway (Moksness and Olsen, 2017), Sweden (Macevičiūtė and Wilson, 2013), India (Shajitha and Abdul Majeed, 2019), the United States (Yang and Li, 2015) or Australia (Narayan and Luca, 2017). There are also studies drawing on international research networks, such as Park (2007; 2009) or Nicholas et al. (2012). Creaser et al. (2010) conducted a survey of 3,139 researchers in European Union countries and conducted discussion groups presenting four scenarios of open access development to them. We can also find studies limited to the representatives of specific disciplines or research areas (usually in one or several institutions), such as engineering sciences (Mischo and Schlembach, 2011) or humanities and social sciences (Narayan, et al., 2018).

However, we have not found a comprehensive study covering the whole population of researchers in one particular country, though it may reflect specific historical and socio-cultural features of the development of scholarly communication and publishing context.

Previous research has identified barriers and motivators for uploading the texts in open access institutional repositories, which was also noted in a systematic review of the literature by Gul et al. (2021). The review implies that the motivation has been changing over time, though the authors of the review do not emphasise this. We too have noted that in earlier studies the motivation factors to upload publications to the repositories of research information included the wider dissemination of research results (Creaser, et al., 2010), better visibility of a researcher (Nicholas, et al., 2012), and the wish to support the idea of open access for all internet users as well as understanding of the norms to submit publications to repositories as established in the research area or institution (Kim, 2010). Technological skills (the more advanced technological skills of researchers, the more inclined they are to use open access repositories) and active marketing of repositories by librarians or other staff also affect the motivation to upload publications (Kim, 2010; Nneka Eke, 2011) as well as an example of active colleagues (Nicholas, et al., 2012). Later research has identified that the awareness of institutional repositories has transformed the visibility of the researchers into more concretely understood benefits, such as, increased citations (Dawson and Young, 2016; Bangani, 2018) and number of views of the submitted content (Bangani, 2018), increased professional recognition or academic awards (Gul, et al., 2021; Serano-Vicente, 2016) as well as promotion of the achievements of research institutions (Dawson and Young, 2016).

The demotivating factors seem to remain the same over time. Thus, fear to violate copyright and embargo periods is registered by Creaser et al. (2010), Kim (2010), but also by Naryan and Luca (2017). The lack of knowledge about and low awareness of institutional repositories and increased workload or additional effort and time in submitting publications have been discovered as barriers to uploading publications in institutional repositories at different times and in different places by Kim (2010), Nicholas et al. (2011), Singeh et al. (2013), Macevičiūtė and Wilson (2013), Hyan and Wyatt (2014), Yang and Li (2015) and Shajitha and Abdul Majeed (2019). The limited usefulness of the repositories was expressed in terms of discrepancy between required effort and impact on academic careers (Han and Wyatt, 2014), fear that publications in open access can be plagiarised (Singeh, et al., 2013), the opinion that content in repositories is unreliable as not peer-reviewed content is accepted (Creaser, et al., 2010; Yang and Li, 2015), which may even harm the reputation of a researcher (Narayan and Luca, 2017). Kim (2010) has also identified the age of researchers as a negative factor: older researchers are less inclined to submit publications to repositories.

Thus, despite the expressed support to open access ideas found in previous study, the actual activity of publishing through open access repositories or uploading content published elsewhere is diminished by a number of negative factors influencing the attitudes, intentions and actions of researchers.

Research exploring factors affecting open access publishing behaviour of Lithuanian researchers has not been conducted so far, and the aim of our paper is to establish which factors affect the intention of Lithuanian researchers to use open access repositories as a publication channel, and to what extent. We also may point out that representative studies of researchers throughout a whole country and multiple research areas are not very common.

## **Repositories of research information in Lithuania**

The OpenDOAR international catalogue of research repositories (<https://v2.sherpa.ac.uk/opensoar/about.html>) lists nineteen repositories that function in Lithuania. Fourteen of those are institutional repositories, two are subject based, one accepts research data and one is the largest interinstitutional repository of research information eLABa, which receives publications from forty-eight Lithuanian institutions of higher education and research (eLABa, (1), n.d.). The latter is defined as ‘*a national Lithuanian academic digital library, storing for public access submitted research and educational documents and/or their metadata*’ (eLABa, (2)2, n.d.). According to the data from January 23, 2022, 111,263 open access documents were available through eLABa,

76% of which were digital theses and dissertations (84,266 documents) and only 24% (26,997 documents) research publications, submitted by authors or other actors (eLABa, (3), n.d.).

The capacity of researchers to provide publications to eLABa repository can be illustrated by the registration level of research publications in it: the system contains 543,222 bibliographic descriptions, 447,204 of those are descriptions of research publications and only 96,018 relate to theses, dissertations and dissertation summaries. Thus, researchers register their publications in eLABa, but upload only a small part of their research production.

The guide to the open access produced by Lithuanian universities requests researchers to submit a published version (post-print), that is peer-reviewed and approved, to the repository at once or even before the publication (pre-print) (Kepalienė, 2020). All publications published by a researcher at the university should be available in the repository. The embargo period should not be longer than twelve months for social science and humanities, and six months for biomedical, physics, technology and agriculture publications.

### **Theoretical framework**

To achieve our research aim we employ the theory of planned behaviour that is based on a rational understanding of human behaviour and presumes that an individual behaves in a concrete situation in accordance with their behavioural intention. An intention is defined as a certain commitment to act accordingly in anticipation of a certain outcome. It is the most important prognostic dimension of behaviour (Taylor, et al., 2007). According to the theory of planned behaviour, the open access publishing behaviour of researchers can be defined as follows: the intensity of the researcher's intention to use open access as a channel for publishing research publications under certain conditions (the more intense the intention, the more likely the individual is to behave accordingly) (Ajzen, 1991). This can be expressed by a mathematical function:  $BI = AB + SN + PBC$  (where BI – behavioural intention, AB – attitude about behaviour, SN – perceived subjective norm, PBC – perceived behaviour control) (Ajzen, 1991).

The model based on the theory of planned behaviour is widely used in analysing the relation between attitude and behaviour and in establishing the factors encouraging certain behaviour (Conner and Armitage, 1998). The theory was used in research on health behaviour (Pourmand, et. al., 2020), risky behaviour (Cristea and Gheorghiu, 2016), users' behaviour and shopping habits (Teixeira, et. al., 2022), engagement in social welfare activities (Ghaffari, et. al., 2019), use of new technologies (Teo and Beng Lee, 2010) and other activities. This theory is one of the most frequently used and cited in exploring future behaviour (Ajzen, 2011).

This theory was also successfully applied in research on the open access publishing behaviour of researchers. Moksness and Olsen (2017) have applied the theory of planned behaviour for a study of open access publishing intentions of a Norwegian university researchers. Park (2007) has defended a dissertation and publicised its results in an article (2009) showing that the theory of planned behaviour has helped to establish which factors influence researchers' acceptance of open access and how each of them affect their open access behaviour. The survey of 1,104 researchers conducted in this study has revealed eleven such factors and has identified that the strongest of them are the job position of a researcher and earlier experience in publishing through diverse publishing channels as well as the knowledge about open access and expected benefits from using this channel.

The model of the theory of planned behaviour is based on the interaction of certain components, where attitudes, norms and control affect the behavioural intention, and the latter influences behaviour itself (Madden, et al., 1992; Taylor, et al., 2007). This interdependence of components allows for a better understanding of the internal (related to attitudes and some control) and external (related to norms and also some control too) forces that can affect behaviour by assessing the strength of the relationship between these forces and behaviour.

In the model of planned behaviour, the most important role is played by *the intention to behave*, which, according to the author of the theory, has a direct effect on behaviour and is therefore one of the most important components of behavioural research (Zarzuela and Anton, 2015). Intention is the mediator between an individual's attitudes and/or imaginary norms, perceived control and behaviour. The intention dimension shows how motivated an individual is and how willing to take certain actions. In general, the stronger the intention, the more likely a person is to behave accordingly (Ajzen, 1991). Intention, defined as a certain commitment, a willingness to act appropriately in anticipation of a particular outcome, is shaped by an attitude, an imaginary norm (Taylor, et al., 2007) and perceived control.

*Attitudes* are an individual approach to a particular behaviour. Researchers may have positive or negative attitudes towards the submission of scientific publications in repositories. They influence the decision to use or not to use this channel for publishing research publications. The model of planned behaviour allows us to assess how strongly the attitudes are related to the researchers' intention to publish their work through an open access channel.

*Perceived norms* are an individual's perception of social pressure to engage in certain activities (Field, et al., 1993). Although Lithuanian researchers are obliged to place scientific publications in repositories, they are still involved in this activity with less intensity than expected. The publishing tradition that has developed in certain fields of research (or communities) is also important and can be understood as environmental pressure. For example, if it is accepted in a particular research community to submit publications to open access repositories, the researcher is likely to feel pressured to do so, and conversely, if there is no tradition of publishing in repositories, the researcher is likely to feel less pressure to do this.

*Perceived control*. In the context of the theory of planned behaviour, the question arises as to how to assess what behaviour is to be regarded as voluntary (under individual free will) and what is wholly or partly unavoidable under certain conditions. Often, certain behaviour is associated with the need to have a variety of resources (time, knowledge, skills, collaboration, etc.) or potential difficulties. Ajzen (2012) introduced the variable of *perceived control*, which allows to assess the extent to which an individual can control his/her behaviour under certain conditions (with certain possibilities and resources). Both internal and external factors can be relevant in choosing how to behave in a particular situation. Individual act in accordance with the intention to behave to the extent that various internal possibilities (abilities, skills, knowledge, etc.) allow and to the extent that they are able to overcome external obstacles and barriers that make it difficult to perform certain activities (Ajzen, 2012). It can be said, therefore, that the dimension of perceived control can correct behaviour not only directly but also through intent. The indirect effect of perceived control on behaviour (through intent) is based on the assumption that the more resources and opportunities a person has to behave appropriately, the more conducive it will be to behaviour and vice versa, when an individual does not have the necessary resources and capabilities, his or her intention to perform a particular action will be small. Thus, the relationship between perceived control and intention is based on the influence of motivation on behaviour control through intention (Madden, et al., 2007; Ajzen, 2012):

- If individuals realise that they have *complete control* over a situation, their behaviour is directly affected only by the intention to behave. It is a situation where individual have all the necessary conditions to perform an action, and whether or not they choose to perform that action depends solely on his intention with respect to the action.
- If individuals perceive that they have *limited control* over a situation because their behaviour is affected by certain internal and/or external circumstances, it is important to include a perceived control criterion in the behaviour study to assess the impact of various circumstances on intent.
- If individuals realise that they have *no control* over the behaviour at all and no choice in how to behave in a particular situation, then that perception directly affects their behaviour because there is no basis for the intention to occur.

The submission of publications to open access repositories requires certain resources (knowledge about the submission of research publications to repositories, ability to use information and communication technologies, knowledge of licensing agreements and copyright). The component of perceived control in the context of researchers' open access publishing behaviour can be understood as a certain belief of a researcher about the resources at his or her disposal that, in his or her perception, allow or, conversely, become a barrier to open access publishing. Acting under certain conditions, researchers may have some perception of their abilities to use open access as a channel for publishing research publications. For example, one of the prerequisites for a researcher to receive funding may be the submission of his research to an open access repository. In carrying out such projects and in order to meet the requirements of the funding authority, the researchers have limited control over the situation. In this case, there is no reason to find intent and perceived control directly affects behaviour.

*Critique and limitations of the theory of planned behaviour.* The theory of planned behaviour is essentially based on the analysis of cognitive processes and suggests that an individual makes decisions as a rationally thinking and individually acting being (Taylor, et al., 2007), excluding influence of subconscious, emotions or group pressure (Sniehotta, et al., 2014). It has also been noticed that it does not pay enough attention to the impact of individual characteristics (age or sex, education or experience) and can lead to differences between subjective self-assessment and objectively measured impact of the influences (Armitage and Conner, 2001).

It is worth remembering that essentially this theory explores only individually perceived aspects of behaviour. In our study we analyse only researchers' own perceptions of publishing in open access and how this perception influences their intentions to publish themselves. That is we investigate the 'micro' level of perception and individual psychological factors, but not the impact of more global external influences related to, for example, research policy and management or publishers strategies. On the other hand, we can concentrate on individual attitudes that affect how a certain social group (researchers in this case) behave under certain conditions.

Taking into account the aim of the research - what factors and with what intensity determine the intention of Lithuanian researchers to use open access repositories as a publishing channel, the following research questions are formulated:

1. To what extent do attitudes, norms and controls affect the intention of Lithuanian researchers to submit publications to open access repositories of research information?
2. How are the past publishing behaviour and professional demographic characteristics related to the intention of Lithuanian researchers to submit publications to open access repositories?
3. Which factors (attitudes, norms, control, past publishing behaviour or professional demographic characteristics) have the strongest influence on the intention of Lithuanian researchers to submit publications to open access repositories?

Five hypotheses are formulated on the basis of research questions:

- H1. Attitudes have a statistically significant positive or negative effect on the intention of Lithuanian researchers to submit publications to open access repositories.
- H2. The imagined norm has a statistically significant positive or negative effect on the intention of Lithuanian researchers to submit publications to open access repositories.
- H3. Perceived control has a statistically significant positive or negative effect on the intention of Lithuanian researchers to submit publications to open access repositories.
- H4. The past open access publishing behaviour is related to the intention of Lithuanian researchers to submit publications to open access repositories.
- H5. Professional characteristics are related to the intention of Lithuanian to submit publications to open access repositories.

## Survey

The study was carried out using the research method of the questionnaire survey. The obtained data were analysed using the research methods of statistical analysis (correlation). The respondents were the Lithuanian researchers who have a doctoral degree and work in one of the twelve Lithuanian state universities or one of the thirteen state research institutes. The questionnaire has included the presentation of the study and explanations of the concepts. It was distributed to the respondents by e-mail.

An invitation to participate in the survey was sent to 6,944 respondents, of whom 545 answered all the questions in the questionnaire. 50.7% of researchers working in natural science and technology, and 47.4% of from social science and humanities answered the survey questionnaire. The distribution of study participants by sex was fairly even (56.1% of women, 43.9% of men). The largest share of respondents by age is researchers aged 40-49. Respondents indicated working in universities (77.1%), research institutes (30.1%) and other workplaces (1.3%). The period of the survey (dissemination of the questionnaire) is April-July of 2020.

To achieve research aims we use the methods of non-parametrical statistical analysis. These methods are used in cases when data can be ranked but does not have a clear numerical interpretation, e.g., in preference assessment. These methods are quite straightforward, but more robust than parametric methods, when we cannot make many assumptions about relations between variables (Corder and Foreman, 2014). Thus, we will determine them from the data testing hypotheses and build the model from it as is usual in non-parametric statistics analysis. Non-parametric measures of association make no distributional assumptions. This avoids distorting the distribution if there is reason to believe these characteristics are representative of the underlying population (Norman and Streiner, 2008). Non-parametrical analysis was used in the studies seeking to identify what factors and to what extent affect intents of researchers to publish in open access by, for example Moksness and Olsen (2017) and Park (2009).

## Results

*Connections between attitudes and intention to submit publications to open access repositories.* Calculation of Spearman's correlation coefficient shows that a statistical relation exists among all eight components of the attitude about publishing through open access repositories. Assessing the strength of the relationship on a scale from -1 to +1, the statistical relationship found is *very weak positive and weak positive* (see Table 1).

Table 1: Connection between attitudes and future intentions to provide publications to repositories (N = 545, p <0.001)

<b><i>Attitudes about providing full-text publications to a repository</i></b>	<b><i>Correlation coefficient</i></b>	
1. Increases my options to get a promotion during research evaluation	0.263	Intention to upload a full-text research publication to a repository of research information or to take care that it is uploaded within coming 18 months (1,5 years)
2. Ensures higher reading and citation numbers of a publication	0.186	
3. It is prestigious	0.158	
4. Ensures long-term preservation of a publication	0.266	
5. Does not create tension because of possible violation of copyright	0.225	
6. Increases possibility to get funding for research	0.183	
7. Helps to establish oneself in the academic community	0.197	
8. Shows that a researcher is socially aware and responsible as publications become freely available to all internet users	0.270	
<b>Average positivity rating of attitudes</b>	<b>0.279</b>	

*Connections between perceived norm and intention to submit publications to open access repositories.* The calculation of the correlation coefficients shows that there is a positive relationship *of the average*

*strength* between the perceived norm to submit to repositories and the intention to do so in the next 18 months (scale average  $r = 0.574$ ,  $p < 0.001$ ) (see Table 2).

Table 2: Connections between the perceived norm and future intentions to submit publications to open access repositories (N = 545,  $p < 0.001$ )

<b>Statements related to a perceived norm of submitting publications to repositories</b>	<b>Correlation coefficient</b>	Intention to upload a full-text research publication to a repository of research information or to take care that it is uploaded within coming 18 months (1.5 years)
1. I am expected to take care that my research publications were uploaded to an open access repository(ies)	0.552	
2. The publications by most researchers who I know are submitted to open access repositories(y)	0.491	
<b>3. Perceived norms in relation to submitting research publications to open access repositories (scale average)</b>	0.574	

*The links between perceived control and the intention to publish through open access channels.* Table 3 shows that there was a positive relationship of average strength between respondents' ability to submit research publications to the repositories and their intention to do so in the future (mean score  $r = 0.441$ ;  $p < 0.001$ ). The strongest correlation exists between intent and the extent to which researchers believe they can submit publications without major barriers ( $r = 0.484$ ;  $p < 0.001$ ).

Table 3: Connections between perceived control and future intentions to submit research publications to open access repositories (N = 545,  $p < 0.001$ )

<b>Statements related to a perceived control of submitting publications to open access repositories</b>	<b>Correlation coefficient</b>	Intention to upload a full-text research publication to a repository of research information or to take care that it is uploaded within coming 18 months (1,5 years)
1. I can decide myself if my full-text research publications will be submitted to open access repositories(y)	0.196	
2. I can easily upload a research publication to an open access repository(ies)	0.484	
3. I trust my own capabilities to upload a research publication to an open access repository(ies)	0.463	
<b>4. Perceived control by researchers in planning submission of publications to open access repositories (average estimate)</b>	0.441	

*Connections between past open access publishing behaviour of researchers and future intention to publish through open access channels.* According to the calculated Mann and Whitney average ranks, those researchers who have uploaded at least one scientific publication to the repository in the last three years have shown a stronger intention to do so over the next 1.5 years (Mann and Whitney average ranks 374,79) as compared to those who have not uploaded any publication (Mann and Whitney average ranks 170,02). Researchers who did not upload publications to the scientific information repository themselves, but it was done by the scientific institution or publisher (or they uploaded themselves only part of their publications), are also less interested in doing so in the future than those who have submitted their publications in the past three years by themselves (see Table 4).

Table 4: Connections between past open access publishing behaviour of researchers and future intentions to submit publications to open access repositories

	<b>Have you uploaded at least one full-text research publication to an open access repository in the last three years (e.g., eLABa, arXiv, PubMed Central)?</b>	<b>Frequencies</b>	<b>Mann and Whitney mean ranks</b>	<b>p-value</b>
I plan to upload myself my full-text research publication to an open access repository (eLABa, arXiv, PubMed Central or other) or to take care that it is uploaded within coming 18 months (1,5 years)	Yes	156	374,79	< 0.001
	I have not uploaded myself, but my research publications are in a repository (repositories) through the initiative of a research institution or a publisher	208	242,58	
	Part of research publications I have uploaded myself, parts were submitted to a repository (repositories) through the initiative of a research institution or a publisher	80	283,61	
	No	101	170.02	

*Connections between occupational and demographic characteristics and the intention to publish in an open access channel. Represented area of science.* A statistical comparison using the Mann and Whitney test showed that the intention of researchers to publish differs depending on the field in which they work. i.e., in the natural sciences or in the social sciences and humanities ( $p < 0.05$ ). Representatives of the social sciences and humanities have a greater intention to place a publication in the repository of scientific information (see Table 5).

Table 5: Future intentions to provide research publications to open access repositories by research area

	<b>Research area</b>	<b>Frequency</b>	<b>Mann and Whitney mean ranks</b>	<b>p-value</b>
I plan to upload myself my <b>full-text research publication to an open access repository or to take care that it is uploaded</b> within coming 18 months (1,5 years)	Natural and technology sciences	280	258,36	0.033
	Social science and humanities	263	286,53	

*Research experience.* The intention to upload research publications to the repository(ies) is more pronounced in the group of respondents with 5-14 years of experience (Kruskal and Wallis average rank 305.71), and the lowest in the group with 25 years or more of research experience (average rank by Kruskal and Wallis 239.67) (see Table 6).

Table 6: Connections between the length of research work and future intentions to submit research publications to open access repositories (1)

	<b>How many years do you work as a researcher?</b>	<b>Frequencies</b>	<b>Kruskal and Wallis mean ranks</b>	<b>p-value</b>
I plan to upload myself a full-text research publication to <b>an open access repository</b> or to take care that it is uploaded within coming 18 months (1,5 years)	Less than five years	30	274,08	0.001
	5–14 years	191	305,71	
	15–24 years	178	265,05	
	25 and more years	146	239,67	

Comparing the two groups of respondents with different research experience (up to 25 and more than 25 years), it can be seen that respondents with up to 25 years of experience expressed a stronger intention to upload their publications to open access repositories (see Table 7).

Table 7: Connections between the length of research work and future intentions to submit research publications to open access repositories (2)

	<b>How many years do you work as a researcher?</b>	<b>Frequencies</b>	<b>Mann and Whitney mean ranks</b>	<b>p-value</b>
I plan to upload myself a full-text research publication to an open access repository or to take care that it is uploaded within coming 18 months (1,5 years)	Up to 25 years	399	285,20	0.002
	25 and more years	146	239,67	

*Age.* The results of the correlation analysis revealed that the older the researcher, the less likely one is to upload full-text publications to the repository (s) ( $r = -0.202$ ,  $p < 0.001$ ) (see Table 8). These results can be related to the data presented in Table 7, as the seniority of researchers is inevitably related to their age.

Table 8: Connections between the age of researchers and future intentions to submit research publications to open access repositories

	Age	
I plan to upload myself a full-text research publication to an open access repository or to take care that it is uploaded within coming 18 months (1,5 years)	Correlation coefficient	-0.202
	p-value	< 0.001
	Frequencies	545

## Hypotheses testing

*H1. Attitudes have a statistically significant positive or negative effect on the intention of Lithuanian researchers to submit publications to open access repositories.* On the basis of the established link between the attitudes and the intention, it can be argued that this hypothesis has been *partially confirmed*. The positive effect of the attitude on the intention has been found, but it is weak (see Figure 1). Dulle and Minishi-Majanja (2011) found that attitudes are one of the strongest determinants of researchers' intention to use open access as a publishing channel for research publications, both through open access journals and open access repositories. A study by Park (2009) revealed that researchers' attitudes are significant depending on the academic work experience of the researchers. Studies by other researchers show that significant impact is made by such attitudes as understanding whether making a publication available in a repository can lead to wider dissemination of the publication, (Creaser, et. al., 2010; Singeh, et al., 2013; Hahn and Wyatt, 2014), the desire to support the idea of open access by providing all Internet users access to publications (Kim, 2010), perception of the extent, to which open access publications in repositories can have a positive or at least neutral impact on one's career (Kim, 2010), and the assessment of the repository as a reliable research distribution channel (Yang and Li, 2015; Narayan and Luca, 2017). Our research though showing some connection between attitudes and intention to publish through open access repositories is not as strong.

*H2. The imagined norm has a statistically significant positive or negative effect on the intention of Lithuanian researchers to submit publications to open access repositories.* The hypothesis was confirmed. The imaginary norm has a positive average effect on the intention to publish publications through the open access channel (see Figure 1). The results of studies conducted by Park (2009) and Dulle and Minishi-Majanja (2011) did not show a significant effect of the norm on the intention to use open access as a publishing channel for scientific publications. The results of Kim's (2010) study showed that researchers' understanding of the established norms in their area of research or institution is an important motivating factor to submit publications to open access repositories, and our study supports these findings.

*H3. Perceived control has a statistically significant positive or negative effect on the intention of Lithuanian researchers to submit publications to open access repositories.*

This hypothesis was confirmed by a positive mean correlation between perceived control and future intent (see Figure 1). As this link is positive, it can be suggested that Lithuanian researchers do not face insurmountable obstacles when placing scientific publications in repositories. A study by Dulle and Minishi-Majanja (2011) found that perceived control influences the intention to publish publications through open access channels in general (both to publish articles in open access research journals and to submit publications in repositories). A study by Park (2009) revealed that the control perceived by researchers as well as attitudes is significant depending on the academic experience of the researchers. The main obstacles faced by researchers in submitting publications to repositories are identified in the following studies: lack of knowledge about repositories (Singeh, et al., 2013; Hahn and Wyatt, 2014; Yang and Li, 2015), high time costs (Kim, 2010; Hahn and Wyatt, 2013) and fears of possible copyright infringement (Creaser, et al., 2010; Kim, 2010; Narayan and Luca, 2017). A separate study is needed to determine whether these barriers are also affecting Lithuanian researchers.

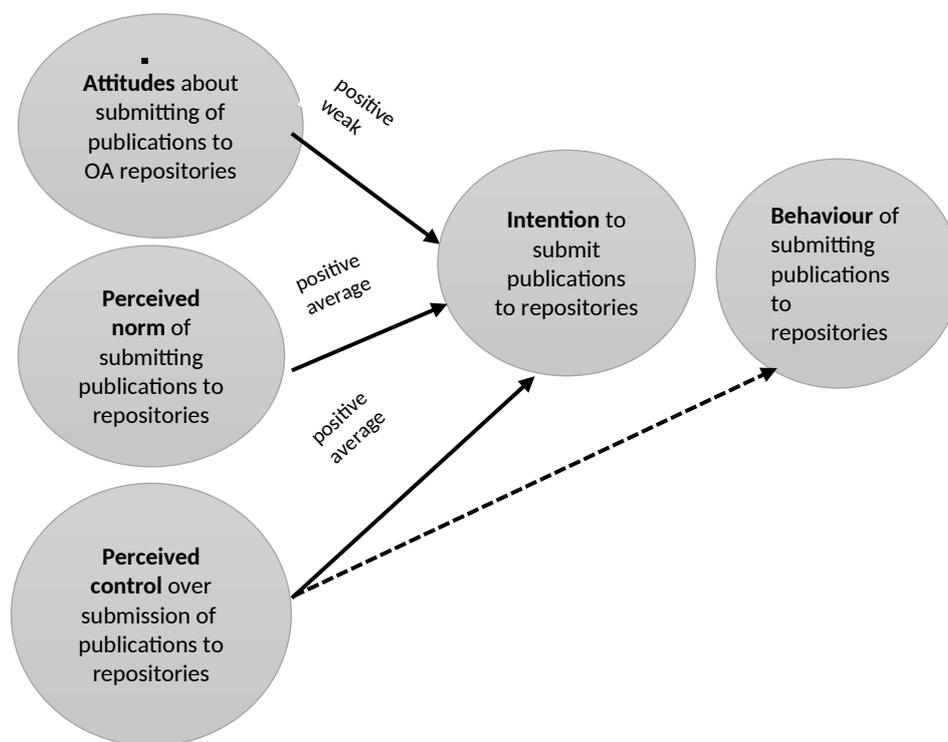


Figure 1: Connection between the attitudes, an imaginary norm, perceived control and future intention to submit publications to open access repositories by Lithuanian researchers.

**Note:** dashed line represents the situation when an individual has no control over the behaviour and this perception directly affects his or her behaviour as there is no basis for the intention to occur.

*H4. The past open access publishing behaviour is related to the intention of Lithuanian researchers to submit publications to open access repositories.* The Mann and Whitney test showed that there is a significant difference between the two groups of respondents – those who have submitted at least one research publication to a repository in the last three years and those who have not. Based on these results, it can be stated that *the hypothesis has been confirmed*: the experience of publishing publications through the open access channel has a significant positive impact on the intention to do so in the future. This shows that respondents have had a positive experience in providing publications to the repositories and therefore intend to select this channel for publication again. The other researchers have not explored the impact of past open access publishing behaviour on the intention to use open access as a publishing channel in the future.

*H5. Professional characteristics are related to the intention of Lithuanian to submit publications to open access repositories.* This hypothesis has been partially confirmed: the area of research, to which researchers belong, has a negligible effect on the intention to submit publications to open access repositories. The intention of the scholars in social sciences and humanities to publish through open access is a little stronger. Older and senior researchers were also less likely to submit publications to open access repositories. The age of researchers as a factor negatively affecting researchers' willingness to provide publications to the repository was also singled out by Kim (2010).

## **Discussion and conclusions**

Authors of Lithuanian research publications are obliged to publish them through the open access channels and this requirement is established in normative documents. Most of them formulate obligations to submit publications to repositories but do not include any incentives. Therefore, although Lithuania has favourable conditions for open access due to the infrastructure of the repositories, there is a lack of a motivational system for publishing through open access channels, such as clearer links of open access publishing with research evaluation and career.

Increasingly, the funders of research projects and the administration of research institutions impose requirements on researchers to increase availability and visibility of research publications, and these are changing the established publishing habits of researchers as well as the choice of publishing channels. Despite the above-mentioned barriers to the use of open access, the study shows a favourable attitude of Lithuanian researchers towards the submission of publications to repositories. Lithuanian researchers have gained experience in using open access repositories as a publishing channel. It is the existing experience of publishing through the repositories that is a factor affecting strongly the intention of researchers to publish in repositories again. Given this motivating factor for publishing through an open access channel, it can be argued that the submission of publications to repositories often meets authors' expectations and produces the desired results, and researchers who have already submitted publications to the repository are more interested in using them in the future than those who have not done so in the past.

As we can see from the reflections on the hypothesis, perceived control has the strongest influence on the intent of researchers in Lithuania to upload their publications to open access repositories and also affects the reported behaviour, which also confirms findings by Zenk-Möltgen et al. (2018). This implies that Lithuanian researchers see themselves as competent users of information technology and other resources of open access that has been proved to be an important factor when engaging in sharing information online (Kim, et al., 2015). The imagined norm also has some influence on the intention to publish through the repositories. Apart from the previous experience that has not figured in previous research, the findings are corresponding with earlier results.

However, Lithuanian researchers differ from the general context of open access publishing behaviour in that the influence of norms (social pressure) on the intention to submit publications to open access repositories is greater than that of researchers in other countries, and the attitudes, although positive, are less significant. This result, knowing that the open access movement was initiated by the researchers themselves, is unexpected.

In terms of information exchange, it is interesting that researchers in Lithuania internally believe that making their research available free of charge to all Internet users enhances their image as aware and responsible researchers. They are also setting more weight on possibilities to preserve their publications, receive promotion and comply with legal norms, than on actual numbers of readers and citations or getting further funding for research.

The study showed that Lithuanian researchers representing social sciences and humanities are slightly more likely to submit publications to the repositories than researchers representing the natural science, medicine and technology, which contradicts some earlier findings showing that the former prefer gold open access in journals rather than green open access in repositories (Rowley, et al., 2017). The age and seniority of researchers are also significant: the older researchers are and the longer their research

experience, the less likely they are to submit publications to open access repositories preferring more established forms of sharing their research results.

Thus, all in all we can see those positive attitudes, perceived social pressure, positive experience and belief in their competence to publish through open access, Lithuanian researchers demonstrate strong intention to engage in such publishing. However, this intention does not transfer into action due to uncertainty about the right to make necessary decision themselves an ambiguity about academic benefits of such an action regardless of research area.

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