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Responsible Research and Innovation in the Context of University Technology Transfer

Abstract: The term „Responsible Research and Innovation (RRI)" has been increasingly used for over a decade. The RRI concept is not currently well defined. The theory of RRI is not developed enough and there are still conceptual divergences. This paper introduces the issue of Responsible Research and Innovation and addresses the following key questions: How do we define RRI? Where do we stand in terms of understanding the RRI dimensions presented in literature? What is the role of RRI in the university technology transfer activity? The study is based on literature search on the Scopus (www.scopus.com), EBSCO (www.ebsco.com), Google Scholar (scholar.google.com) and Google Books (books.google.com) databases to obtain articles published in peer reviewed journals, related to the concept of RRI and technology transfer. The search terms (for title and topic) were: responsible innovation, responsible research and innovation, RRI, technology transfer. Critical analysis of the state of knowledge allowed to propose a set of seven conceptual dimensions (inclusion, anticipation, responsiveness, reflexivity, sustainability, care and economic) of the Responsible Research and Innovation concept that may be implemented in technology transfer processes executed at universities. RRI concept is still under development. A discussion around the conceptual dimensions of RRI will be followed by the strategic challenges of universities. The study resulted in two conclusions. Firstly, the RRI concept may shift the focus of TTOs (Technology Transfer Offices) from outcomes (revenues, cash flow, rate of return, patents, license fee, etc.) to processes, which further leads to the second conclusion, that all seven presented conceptual dimensions should indicate particular types of processes in university TTO. Fulfillment of these two conclusions makes possible to implement RRI on university in a wider perspective, than just fulfill the requirements of administrative funders.

Keywords: Responsible Research and Innovation, RRI, Responsible innovation, Research policy, Technology transfer

JEL: A13, E60, O30

1. Introduction

The terms „Responsible Research", „Responsible Innovation" or „Responsible Research and Innovation (RRI)" have been increasingly used for over a decade (Hellstrom, 2003; Guston, 2004; Fisher, Rip, 2007; Owen et al., 2009; Owen, Goldberg, 2010; von Schomberg, 2011; Armstrong et al., 2012; Lee, 2012; Owen et al., 2012; Bensaude-Vincent, 2014; Burget et al., 2016; Ribeiro et al., 2016). The theory of RRI is not developed enough and there are still conceptual divergences (Stahl et al., 2014).

History contains some examples of scientists who demonstrated a strong commitment to social responsibility. In 1939, Albert Einstein, at the instigation of Hungarian physicist Leo Szilard, wrote a letter to President Roosevelt informing him about Germany's intent to develop atomic bombs from enriched uranium. Scientist could not ignore the threat to world peace posed by the Nazi regime (Einstein, 1939). After the war, Einstein and other physicists advocated using atomic energy only for peaceful purposes (Shamoo, Resnik, 2014). In 1962, wildlife biologist Rachel Carson published Silent Spring, a book that warned scientists and the public about the dangers posed by overuse of dichlorodiphenyltrichloroethane (DDT) and other pesticides. Carson's book helped to launch the modern environmental movement and led to new pesticide regulations (Carson, 1962). During the 1970s, pediatrician and child psychiatrist Herbert Needleman conducted important research demonstrating the adverse impacts of lead on human development. Needleman informed the public about health hazards of lead and advocated for regulations to ban it as an ingredient in gasoline and household paints (Shamoo, Resnik, 2014; Resnik, Elliot, 2016). Those are only a few examples of the attitude of scientists towards society.

Both research and innovation can be generated by universities. An organizational unit of the university responsible for this process is Technology Transfer Office (TTO). Responsible Research and Innovation concept applies to TTOs in two aspects. First in an administrative aspect, when researchers apply for EU funding (e.g. under the Horizon 2020 program). Second in strategic and mission aspect, where RRI is recognized from a wider perspective than in the definitions of European Council reports and documents.

While knowledge creation and dissemination – embodied within research – have long been the responsibilities of universities, technology transfer is generally considered part of what has emerged in policy lexicon as the so-called "fourth mission" of higher education: economic development (Hayter, 2016). In relation to the part of university's mission specifying the support of economic development, an "economic dimension" of RRI was proposed during the study as an addition to the dimensions already identified in the literature. This corresponds well with the recognition of universities as promoters of regional and national economic prosperity.

This paper introduces the issue of Responsible Research and Innovation and addresses the following key questions: How do we define RRI? Where do we stand in terms of understanding the RRI dimensions presented in literature? What is the role of RRI in the university technology transfer activity? Methodology used in this research was the critical analysis of the state of knowledge. The study consisted of literature search on the Scopus (www.scopus.com), EBSCO (www.ebsco.com), Google Scholar (scholar.google.com) and Google Books (books.google.com) databases to obtain articles published in peer reviewed journals, related to the concept of RRI and technology transfer. The search terms (for title and topic) were: responsible innovation, responsible research and innovation, RRI, technology transfer. Initially 89 publications were collected. After screening for relevance 59 papers were analyzed.

2. Theoretical background of responsible research and innovation concept

Social implications of scientific research is treated as a responsibility of researchers by numerous scientists and philosophers (Popper, 1959; Edsall, 1975; Longino, 1990; Shrader-Frechette, 1994; Reiser, Bulger, 1997; Kitcher, 2001; Wing, 2002; Beckwith, Huang, 2005; Forge, 2008; Committee on Science, Engineering, and Public Policy, 2009; Douglas, 2009; Elliott, 2011; Frankel, 2012; Owen et. al., 2013; Shamoo, Resnik, 2014, Koops et al., 2015; Iatridis, Schroeder, 2016). Nowadays there are multiple possibilities in which science and scientists can proceed in socially responsible ways. For example, they can impute rigorous levels of research conduct. They can also provide solutions to societal problems and can deliver (socially) useful outcomes. Finally, scientists can reflect on their motivations and methods or initiate knowledge acquisition, through supervision and assessment, to a broad range of societal stakeholders (Glerup, Horst, 2014; Boucher, 2015).

Discussions on responsibilities within the fields of science and innovation have been widespread throughout the developments in the fields of ethics (Resnik, 1998), environmental governance (Pellizzoni, 2004), and through extensive philosophical and sociological analysis of the concept (Jonas, 1984; Glerup, Horst, 2014). Presently in publications there are two types of RRI definitions functioning: administrative and academic.

One of the latest "administrative" definition of RRI, created by European Commission (von Schomberg, 2011: 9) states: "Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view on the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketa-

ble products (in order to allow a proper embedding of scientific and technological advances in our society)."

RRI is closely related to "Research and Innovation" idea which is a key pillar in the strategy of the European Union. It was developed to create sustainable, inclusive growth and prosperity and to address the societal challenges of Europe and the world. The need for the development of the innovation process in relation to societal needs is reflected in many high-level policies, such as Horizon 2020, related to responsibility of research and innovation. According to European Commission (EC) RRI refers to the comprehensive approach of proceeding in research and innovation in ways that allow all stakeholders (societal actors such as: researchers, citizens, policy makers, businesses, third sector organizations, etc.) that are involved in the processes of research and innovation at an early stage:

a) to obtain relevant knowledge on the consequences of the outcomes of their actions and on the range of options open to them,
b) to effectively evaluate both outcomes and options in terms of societal needs and moral values,
c) to use these considerations (under a and b) as functional requirements for design and development of new research, products and services.

According to EC, the RRI approach has to be a key part of the research and innovation process and should be established as a collective, inclusive and system-wide approach. In practice, RRI is implemented (by EC) as a package that includes multi-actor and public engagement in research and innovation, enabling easier access to scientific results, the take up of gender and ethics in the research and innovation content and process, and formal and informal science education (European Commission, 2013: 3).

In 2011, in a document titled "A Report on Responsible Research and Innovation" Hilary Sutcliffe summarized the main points characterizing RRI (Sutcliffe, 2011: 3):

1) the deliberate focus of research and the products of innovation to achieve a social or environmental benefit;
2) the consistent, ongoing involvement of society, from beginning to end of the innovation process, including the public and non-governmental groups, who are themselves mindful of the public good;
3) assessing and effectively prioritizing social, ethical and environmental impacts, risks and opportunities, both now and in the future, alongside the technical and commercial impact;
4) where supervision mechanisms are better able to anticipate and manage problems and opportunities and to adapt and respond quickly to changing knowledge and circumstances;
5) where openness and transparency are an integral component of the research and innovation process.

Furthermore Sutcliffe in 2011 proposed a definition for research and for innovation. Research is defined as the systematic investigation in order to establish facts as well as to reach new conclusions. Innovation is "a superior process or product", but also "effective commercialization of an invention". It is worth noting that, Sutcliffe's "administrative" definition of innovation is partially convergent with the most synthetic and clear innovation definition proposed by MIT (Massachusetts Institute of Technology) which is as follows: innovation equals invention multiplied by commercialization.

The administrative definitions emphasize primarily inclusiveness, participatory governance, anticipation, adaption and the importance of prioritizing societal, ethical and environmental impacts along with the technical and commercial ones (Burget et al., 2016). Some definitions describe RRI as a process or design strategy that ends in "marketable products" (von Schomberg, 2011), others are describing the concept as a comprehensive approach which will result in ''research, product and service'' (European Commission, 2013).

The administrative RRI definitions come from science policy makers and European funding agencies. And probably that is the reason for the increased citation of EC publications about RRI. However the issues concerning research, responsibility and innovation have been considered by researchers for a few decades now. Stahl (2013: 5) defined RRI as "higher-level responsibility or meta-responsibility that aims to shape, maintain, develop, coordinate and align existing and novel research and innovation-related processes, actors and responsibilities with a view to ensuring desirable and acceptable research outcomes". While Stilgoe et al. (2013: 1570) developed the definition of responsible innovation as follows: "Responsible innovation means taking care of the future through collective stewardship of science and innovation in the present". Pidgeon et al. (2013: 451) states that: "responsible innovation aims to embed an explicit evaluation of the wider worth, impacts, unanticipated risks and ethical implications, into research and development process for a new technology".

Therefore, RRI can be seen to operate as an "umbrella term" in the academic literature, which comprises a series of theoretical approaches and methods, and cuts across different sectors. As such, a wide range of stakeholders are involved in RRI governance, which can be characterised as a patchwork of different and sometimes shared responsibilities. Most of the analyzed studies aim to contribute to the development of RRI from a point of view of a specific discipline or area of research, drawing attention to the sedimented nature of the concept (Ribeiro, 2016). During literature review besides discussions on the definition of RRI concept, the term "RRI dimension" occurred. The focus on dimension of RRI seems to be an important issue, transferring considerations to a higher level. The European Commission described six distinct RRI dimensions: engagement, gender equality, science education, ethics, open access and governance (Regulation EU

No. 1291/2013, 2013). Descriptions of dimensions such as: actors, norms and activities Stahl (2013); liability, accountability, care and responsiveness Pellizzoni (2004); and anticipation, inclusion, reflexivity and responsiveness Stilgoe et al. (2013) also appear in literature. What is significant, is the fact that dimensions proposed by EC are radically different from those proposed by researchers.

One of the aims of this study was to answer the question: Where do we stand in terms of understanding the RRI dimensions presented in literature? The summary of results of the analysis of literature in the field of RRI dimensions is presented in Table 1. Conceptual dimensions of Responsible Research and Innovation concept are presented with description and assigned authorship. Therefore, the following dimensions are devided into the following groups: inclusion, anticipation, responsiveness, reflexivity, sustainability, care and economic.

Table 1. Conceptual dimensions of Responsible Research and Innovation

Dimension	Description	Authors/Research
Inclusion	Inclusion is a conceptual dimension which can be considered as fundamental for most of the discussions within the RRI area. Inclusion is also associated with all other conceptual dimensions, it engages different stakeholders in the early stages of research and innovation process. When it comes to the discussion of technology transfer and technological issues, it is important not to forget about societal, economic, political and human aspects. Engaging the public stakeholders in early stages of R&D is supposed to positively influence technological development. The example of inclusion in the view of RRI is the Code of Conduct (CoC), which leads various actors to follow the principles of a safe, ethical and effective framework. Many followers of RRI concept see inclusion as the ‘‘ongoing involvement of society’’ in various stages of the research and innovation process, without wasting taxpayers’ money or time at the same time. Inclusion is the conceptual dimension that characterizes RRI the most.	– D. Barben, E. Fisher, C. Celin and D.H. Guston (2008) – R. Owen, P. Macnaghten and J. Stilgoe (2012) – N. Mejlgaard, C. Bloch, L. Degn, M.W. Nielsen and T. Ravn (2012) – B.C. Stahl (2013) – M. Kearnes (2013) – K. Asante, R. Owen and G. Williamson (2014) – L. Levidow and C. Neubauer (2014) – B.C. Stahl, N. McBride, K. Wakunuma and C. Flick (2014) – S. de Saille (2015) – B. Bozeman, H. Rimes and J. Youtie (2015) – M. Burget, E. Bardone, M. Pedaste (2016)

Dimension	Description	Authors/Research
Anticipation	Anticipation is a dimension that aims at envisioning the future of research and innovation. It takes into account understanding how current dynamics help design the future. In research, RRI is also linked to "Real-Time Technology Assessment" or "anticipatory governance". Anticipatory governance includes those technologies which provide value added advantage and, at the same time, avoid the emergence of potentially negative consequences. Successful anticipation means understanding the dynamics of economy that help shape the technological futures. Anticipation of potential impacts of technology serves the purpose of: – reflecting on the motivations and implications of a research project, – being clearer about uncertainties and dilemmas, – opening the visions to broader public, – using the outcomes for shaping the research and innovation trajectory. Anticipation plays an important role at the beginning of research and development and in indicating the direction to take in order to achieve better and more desirable results.	– D.K. Robinson (2009) – A. Stirling (2010) – C. Selin (2011) – M.C. Roco, B. Harthorn, D. Guston and P. Shapira (2011) – S. van den Hove, J. McGlade, P. Mottet and M.H. Depledge (2012) – R. Owen, P. Macnaghten and J. Stilgoe (2012) – J. Stilgoe, R. Owen and P. Macnaghten (2013) – B.C. Stahl (2013) – B.C. Stahl, N. McBride, K. Wakunuma and C. Flick (2014) – N. Rose (2014) – M. Burget, E. Bardone, M. Pedaste, (2016)
Responsiveness	Responsiveness is linked to risk, which is the probability of an occurrence of an event multiplied by the amount of the cost of that event, which new technologies may bring about. The risks involved in new technologies can be medium or long term, economic, environmental, security or societal. In this case, identification and analysis of risks as part of responsiveness is linked to the anticipation dimension. In the research, discussions involving responsiveness were also primarily linked to ethics, risks, transparency and accessibility.	– L. Pellizzoni (2004) – R. Owen, P. Macnaghten and J. Stilgoe (2012) – J. Stilgoe, R. Owen and P. Macnaghten (2013) – H. Torgersen and M. Schmidt (2013) – P. Schaper-Rinkel (2013) – L. Levidow and C. Neubauer (2014) – A.D. Maynard (2015) – M. Burget, E. Bardone, M. Pedaste (2016)

Dimension	Description	Authors/Research
Reflexivity	Reflexivity is linked to public dialogue, science and public collaboration, and anticipation. It can be defined as "holding a mirror up to one's activities commitments and assumptions, being aware of the limits of knowledge and being mindful that a particular framing of an issue may not be universally held". Responsibility turns reflexivity into a public matter. Involving the public in the research may help researchers reflect on the ethical and social dimensions of their work. Science and public collaboration is a key component of reflexivity. Connection between reflexivity and anticipation allows to avoid the risk of making wrong predictions, especially in the early stages of technological development.	– B. Wynne (1993) – E. Fisher and R.L. Mahajan (2006) – S. van der Burg (2009) – D. Schuurbiers (2011) – J. Stilgoe, R. Owen and P. Macnaghten (2013) – E. Forsberg, G. Quaglio, H. O'Kane, T. Karapiperis, L. van Woensel and S. Arnaldi (2015) – M. Burget, E. Bardone, M. Pedaste (2016)
Sustainability	Although the sustainability issues can be found in the majority of the research, it is not clearly referred to as a dimension. In the recent research sustainability is identified as a key driver of innovation, research and development. Sustainability is already starting to convert the competitiveness concept, which will force organizations and business to change their strategy. Research focused on science, technology and innovation for sustainable development is also conducted in the field of economy. Sustainability often refers to the so-called resource-efficiency of new products. Research and innovation are closely connected to social responsibility, because they can implement more sustainable innovations (products) in economy. In general therefore it can be concluded that sustainability as a conceptual dimension can be a part of Responsible Research and Innovation.	– D. Wright, R. Gellert, S. Gutwirth and M. Friedewald (2011) – S. Flipse, M. Sanden and P. Osseweijer (2013) – M. de Martino, L. Errichiello, A. Marasco and A. Morvillo (2013) – B.C. Stahl, N. McBride, K. Wakunuma and C. Flick (2014) – L. Levidow and C. Neubauer (2014) – B. Bozeman, H. Rimes and J. Youtie (2015) – S. Bremer, K. Millar, N. Wright and M. Kaiser (2015) – E. Forsberg, G. Quaglio, H. O'Kane, T. Karapiperis, L. van Woensel and S. Arnaldi (2015) – M. Burget, E. Bardone, M. Pedaste (2016)

Dimension	Description	Authors/Research
Care	The main challenge of future-oriented ethics is to answer the question of how to deal with uncertainties derived from social practices like technology and innovation. Care is a "public domain" dimension so that society is responsible for the decisions and actions carried out on its behalf. Care is also explained as a process through which people develop abilities to perceive, act and judge together. What is important, as far as care as a conceptual dimension of RRI is concerned, is the fact that it is crucial in order not to see inclusion just as a means to meet the "grand challenges" but as a way to bring together people's high objectives and day-to-day practices.	– C. Groves (2009) – J. Stilgoe, R. Owen and P. Macnaghten (2013) – M. Burget, E. Bardone, M. Pedaste (2016)
Economic	Concerns about the impact of new technologies on economy and society explain growing calls for the responsible innovation concept, the sustainable transition of social and technical arrangements, and stronger engagement between science-driven innovation and society. Such issues as those related to RRI are better understood as "aspirations" which may never be absolutely achieved, suggesting their instantiation could only be imagined through observation of the practice of science-driven innovation. Innovations are not created only for the creation process. Innovations are implemented in the economy and comply with the requirements of meeting needs in terms of value creation for the company, the public and other stakeholders in the process of economic development.	– J.A. Schumpeter (1934) – E.M. Rogers (1962) – R.R. Nelson and S.G. Winter (2002) – F.W. Geels (2010) – R. Owen, N. Goldberg (2010) – R. Garud, J. Gehman (2012) – M. Armstrong, G. Cornut, S. Delacôte, M. Lenglet (2012) – R. Owen, J. Bessant, M. Heinz (2013) – K. Pandza and, P. Ellwood (2013) – S. de Saille (2015)

Source: own preparation based on literature review

RRI is a set of ideas essentially concerning and trying to make sense of a general framework for the governance of research and innovation. One of the most significant steps taken in this direction is the shifting the attention from outcomes to processes. In this sense, RRI is fundamentally a cluster of ideas for promoting an idea of science governance, which is essentially about responsible processes as opposed to processes that are not supervised responsibly (Burget et al., 2016). All dimensions presented in Table 1, in fact, indicate a particular type of processes. Those processes can be implemented in different entities in the economy. One of the entities whose task it is to carry out research and generate innovation is a university. The university unit responsible for such processes is Technology Transfer Office (TTO). Taking into account that the universities are public entities, it is natural for TTOs to implement the RRI in every-day processes.

3. Social responsibility of research and innovation and the university technology transfer

Research universities are increasingly recognized for their role in society and economy. While knowledge creation and dissemination – embodied in research and teaching – have long been the responsibilities of colleges and universities, the technology transfer is generally considered a part of what has emerged in policy lexicon as the so-called "fourth mission" of higher education: economic development (Hayter, 2016). Policymakers broadly use the term "technology transfer" to describe specific economic development contributions, including the establishment of university spinoff companies, the development of new technologies, know-how commercialization, innovation generation, employment, and attraction of talented individuals to work in the surrounding region (Phan, Siegiel, 2006; Rothaermel et al., 2007). The sanctioning of this approach in US was the adoption of the Bayh-Dole Act (in 1980) in an effort to accelerate the dissemination and commercialization of new knowledge produced in universities. In the assumptions of this document universities should operate in the field of intellectual property (IP) on the basis of a model concentrated on generating and managing patents. Crucial to this interpretation was the creation of university technology transfer offices ("TTOs"). Nearly all major research universities – more than 200 – have established TTOs (Hayter, 2016). Of course, it doesn't mean that before Bayh-Dole Act universities did not use the technology transfer and have not managed their IP. However after Bayh-Dole Act we can easily identify the university's organizational unit responsible for managing processes such as: IP management, commercialization of know-how, Research and Development activity, generation of innovations and technology transfer. The focus on the relationship between technology transfer and knowledge and intellectual property disseminations is motivated by several interrelated factors (Hayter, 2016):

1) in the wake of the 2008 financial crisis, higher education has garnered significant attention among policymakers for its potential and realized contributions to economic development;
2) recent cutting – edge economics research has not only provided an understanding of the economic and social value of new knowledge, it has created awareness of the barriers and enablers to its flow and, thus, its impact;
3) a robust and rapidly growing empirical literature examines the structure, operation, and impact of the current technology transfer system.

The "social value of new knowledge", mentioned in the second point, is crucial for further discussion in the TTO's perspective. This assumption corresponds to RRI concept in the activity of universities. According to Blumberg, universities are obliged to implement the social mission in their strategy. Society expects

specific benefits from the economic system, which result from the public support for universities. The fundamental assumption for the consideration of this is the fact that universities are not-for-profit organizations. In the scientific mission of research universities the need to organize and operate in public interest is emphasized. This includes the carrying on of the scientific research in the public interest. Blumberg also suggests that formal technology transfer practices (arising from the procedures), especially the exclusive licensing of university technologies to single companies (in the process of establishment of company spin-offs), seem to serve little purpose other than to generate revenues for research universities. While revenues are not inherently negative, revenue – driven activities present an operational risk, especially when they may impede other public benefits (such as open publication) (Blumberg, 1996).

Higher education institutions were established hundreds of years ago to contribute to the public good of society. Surprisingly, a recent review of the extant higher education literature finds that discussions of how social responsibility is defined and, more importantly, how responsibility manifests in the decisions, management practices, and the impact of colleges and universities is significantly underdeveloped. This is in contrast to the expansive and rapidly growing body of scholarship relating to Corporate Social Responsibility (CSR). In basic assumptions RRI is similar to CSR. Social performance model embraces legal and discretionary obligations but replaces profit generation with the responsibility to fulfill the university's "fourth mission". Thus, social responsibility of universities depends on their ability to fulfill their mission, while also fulfilling their legal and discretionary requirements to society. This is not to say that revenues are not important. Quite the opposite – financial resources are needed to support the scale and the impact of universities. However, revenue generation must necessarily follow other responsibilities for a number of reasons (Hayter, 2016).

At this point major questions occur: Should universities focus on revenues through TTOs activity? Or maybe, as non-profit public organizations, they should pursue a mission with and for society? Or maybe both. Adoption of a strategy typical for a business setting in a higher education setting is doomed to failure. This does not result only from the fact that we are dealing with a public entity whose budget is composed of public money but also whose research is mostly financed with public money. The use of science to generate profit rather than social values may lead to serious risks.

University's "formal" responsibility to society is congruent with the traditional ideals of academic science that favor open unfettered investigation, open publication, and the wide dissemination of new knowledge (Merton, 1973). Unfortunately little, if any, research explores empirically how faculty, students, or administrators define social responsibility in higher education, not to mention policymakers, community leaders, or the general public. Furthermore, there are few systematic anal-

yses of how, beyond the ubiquitous three-pronged mission of teaching, research, and service, the social responsibilities are specifically defined (Hayter, 2016).

Social responsibility is an essential part of the responsible conduct of research that presents difficult ethical questions for scientists. Recognizing one's social responsibilities as a scientist is an important first step toward exercising social responsibility, but it is only the beginning. Scientists who exercise social responsibility often face ethical dilemmas concerning their obligations to society. These dilemmas typically arise in three different areas:

1) problem selection,
2) publication and data sharing, and
3) public engagement.

Exercising social responsibility sometimes presents hazards for researchers, since they may face public reaction and investigation, and may risk compromising their own objectivity or their reputation for objectivity (Resnik, Elliot, 2016).

The contributions of universities have been framed in terms of economic development and thus, are seen as a distinct function. While the commercialization of knowledge proceeded by TTOs may be a relatively new formalized objective for universities, knowledge dissemination is not. Therefore economic development related to technology transfer seems to be more of an adequate public relations vehicle, allowing universities to differentiate between the "unique role" of the TTO and their other (related to RRI) core missions (Hayter, 2016). RRI creates unreasonable expectations of universities, beyond their missions as non-profit education and research organizations focused on fulfilling the social needs. Furthermore, RRI approach does not neglect the opportunity to explore other innovative ideas creating value added to society.

On the other hand, research on successful commercialization shows that university scientists who have strong ties to industry, receive industry funding, or possess industry experience are more likely to have commercially – relevant technology and they are more likely to patent, license, and establish a university spin-off (Gulbrandsen, Smeby, 2005; O'Gorman et al., 2008). Similarly, faculty and students exposed to a wide range of commercialization and entrepreneurship activities are more likely to be successful in the development of university spin-offs. Formal courses, workshops, product/technology development seminars, mentoring, funding, and networking services, designed to promote and support academic entrepreneurship, not only provide knowledge important for commercialization, but are also mechanisms for engaging contacts important for obtaining resources, commercialization, and spinoff success (Hayter, 2015b). University and TTO cannot prohibit researchers' closer relations with business. It is however important, to obtain compromise between generating tangible benefits from the process of commercialization of knowledge and social mission of the university. Critics have long argued for "academic exceptionalism" as it relates to intellectual property protection. Academic exceptionalism is the idea that universities should be treated dif-

ferently, especially in relation to the "experimental" or "fair use" of IP to further their research mission and unique role in society (Lee, 2013).

Considering RRI concept one cannot fail to mention the theoretical achievements in the area of innovation and entrepreneurship which were developed by J.A. Schumpeter. The definition of innovation proposed over 80 years ago still applies to the concrete essence of the concept in the face of the multitude of definitions and "interpretative buzz". According to Schumpeter innovation is (Schumpeter, 1934):

1) a launch of a new product or a new species of already known product;
2) an application of new methods of production or sales of a product (not yet proven in the industry);
3) an opening of a new market (the market for which a branch of the industry was not yet represented);
4) an acquisition of new sources of supply of raw material or semi-finished goods;
5) a new industry structure such as the creation or destruction of a monopoly position.

Taking into account the above definitional assumptions, the transition from the interpretation of the essence of innovation (at the level of the assessment of its use) in terms of responsibility can be achieved through the recognition of processes arising from the dimensions point of view. Assuming that TTO focuses on issues related to RRI, in view of current knowledge, it might be noted, that one of the ways to achieve the RRI objectives is to concentrate on RRI dimensions (presented in Tab. 1).

University TTO can implement RRI concepts in two ways. First – it can include scientific approach taking into account the inclusion, anticipation, responsiveness, sustainability, care and economic as conceptual dimensions in the executed process. Second – it can include administrative approach, taking into account the: engagement, gender equality, science education, ethics, open access and governance.

What seems to be still unclear, though, is how the idea of responsible processes as the very basis of RRI should or could be interpreted practically. In other words, it is not clear whether RRI with its emphasis on the processes rather than on the outcomes of research and innovation is actually a formalisable procedure (Burget et al., 2016). This is crucial for TTO's approach to dealing with research process carried out at the university. One way of achieving the objectives of the RRI concept may be to use the TTO educational opportunities in the field of entrepreneurship and technology transfer, another may be to attempt to enter the appropriate details in procedures.

According to the presented RRI dimensions, which should be inclusive in TTO processes, all people should be allowed to participate in research, at least in principle. TTO and researchers have to decide what different actors (stakeholders) should participate in the process. The RRI dimensions function in parallel. Considering stakeholders inclusion, TTO will probably evaluate engagement of those actors

in the RRI process. Similarly, responsiveness and sustainability are related to the ability to exhibit a forward-looking attitude within the TTO strategy. All the dimensions would not make sense, unless they are linked to moral nature. The "care" dimension is important due to the fact that the governance of the RRI approach realized by TTO, within the areas of science and technology, does not necessarily need to concentrate on revenues but rather on attitudes. In the end innovation and responsible research are closely related to economic development.

4. Conclusions

Responsible research and innovation are issues of economic, political and scientific debate. "Administrative" definition of the RRI concept has recently displaced the "scientific" one in citations. The debate on responsible innovation and research in economy, society, and the laboratories of the universities is difficult to resolve. It has something in common with the debates on climate change. Those policies have been difficult to resolve, in part, because opposing stakeholders have disputed the scientific facts (Pielke, 2007).

The aim of this paper was to answer the following questions: How do we define RRI? Where do we stand in terms of understanding the RRI dimensions presented in literature? What is the role of RRI in the university technology transfer activity? After defining RRI from the "administrative" and the "scientific" point of view, the development of different concepts was summarized. RRI has gained a broader significance in the European Union research policy in recent years, but in "administrative" approach there is still an ambiguity concerning its definition and dimensions. Critical analysis of the state of knowledge allowed to propose a set of seven conceptual dimensions of RRI: inclusion, anticipation, responsiveness, reflexivity, sustainability, care and economic. Transition from research to innovation may be completed at universities. The RRI concept is still under development but may be implemented in technology transfer processes executed at universities.

A discussion of the conceptual dimensions of RRI will coincide with the challenges of university's TTOs. The study resulted in two conclusions. First, that the RRI concept may shift the focus of TTOs from outcomes (revenues, cash flow, rate of return, license fee etc.) to processes, which relates to the second conclusion, that all seven presented conceptual dimensions should indicate particular types of processes within a university's TTOs. The fulfillment of these two conclusions makes it possible to implement RRI at universities in a wider perspective than just for the fulfillment of the requirements of administrative funders.

References

Armstrong M., Cornut G., Delacôte S., Lenglet M. (2012), *Towards a practical approach to responsible innovation in finance: New product committees revisited*, "Journal of Financial Regulation and Compliance", no. 20, pp. 147–168.

Asante K., Owen R., Williamson G. (2014), *Governance of new product development and perceptions of responsible innovation in the financial sector: insights from an ethnographic case study*, "Journal of Responsible Innovation", no. 1(1), pp. 9–30. doi:10.1080/23299460.2014.882552.

Barben D., Fisher E., Celin C., Guston D.H. (2008), *Anticipatory governance of nanotechnology: Foresight, engagement, and integration*, [in:] E.J. Hackett, O. Amsterdamska, M. Lynch, J. Wajcman (eds.), *The handbook of science and technology studies*, 3rd ed., MIT Press, Cambridge, pp. 979–1000, http://cspo.org/legacy/library/090501F5DQ_lib_STSHandbookBarbe.pdf [accessed: 13.05.2016].

Beckwith J., Huang F. (2005), *Should we make a fuss? A case for social responsibility in science*, "Nature Biotechnology", no. 23(12), pp. 1479–1480.

Bensaude-Vincent B. (2014), *The politics of buzzwords at the interface of technoscience, market and society: The case of "public engagement in science"*, "Public Understanding of Science", no. 23(3), pp. 238–253.

Blumberg P.D. (1996), *From "Publish or Perish" to "Profit or Perish": Revenues from University Technology Transfer and the § 501(C)(3) Tax Exemption*, "University of Pennsylvania Law Review", no. 89, p. 105.

Borup M., Brown N., Konrad K., van Lente H. (2006), *The sociology of expectations in science and technology*, "Technology Analysis and Strategic Management", no. 18, pp. 285–298, doi:10.1080/09537320600777002.

Boucher P. (2015), *'You wouldn't have your granny using them': Drawing boundaries between acceptable and unacceptable applications of civil drones*, "Science and Engineering Ethics", doi:10.1007/s11948-015-9720-7.

Bozeman B., Rimes H., Youtie J. (2015), *The evolving state-of-the-art in technology transfer research: Revisiting the contingent effectiveness model*, "Research Policy", no. 44, pp. 34–49. doi:10.1016/j.respol.2014.06.008.

Bremer S., Millar K., Wright N., Kaiser M. (2015), *Responsible techno-innovation in aquaculture: Employing ethical engagement to explore attitudes to GM salmon in Northern Europe*, "Aquaculture", no. 437, pp. 370–381, doi:10.1016/j.aquaculture.2014.12.031.

Burg S. van der (2009), *Imagining the future of photo acoustic mammography*, "Science and Engineering Ethics", no. 15(1), pp. 97–110, doi:10.1007/s11948-008-9079-0.

Burget M., Bardone E., Pedaste M. (2016), *Definitions and Conceptual Dimensions of Responsible Research and Innovation: A literature Review*, "Science and Engineering Ethics", doi:10.1007/s11948-016-9782-1.

Carson R. (1962), *Silent Spring*, Houghton-Mifflin, New York.

Committee on Science, Engineering, and Public Policy, National Academy of Sciences, National Academy of Engineering, and Institute of Medicine (2009), *On Being a Scientist: A Guide to Responsible Conduct in Research*, 3rd ed., National Academies Press, Washington.

De Martino M., Errichiello L., Marasco A., Morvillo A. (2013), *Logistics innovation in Seaports: An inter-organizational perspective*, "Research in Transportation Business and Management", no. 8, pp. 123–133, doi:10.1016/j.rtbm.2013.05.001.

Douglas H. (2009), *Science, Policy, and the Value-Neutral Ideal*, University of Pittsburgh Press, Pittsburgh.

Edsall J.T. (1975), *Scientific freedom and responsibility*, "Science", no. 188(4189), pp. 687–693.

Einstein A. (1939), *Letter to Franklin D. Roosevelt*, August 2, http://www.atomicarchive.com/Docs/Begin/Einstein.shtml [accessed: 13.05.2016].

Elliott K.C. (2011), *Is a Little Pollution Good for You? Incorporating Societal Values in Environmental Research*, Oxford University Press, New York.

European Commission (2013), *Options for Strengthening Responsible Research and Innovation. Report of the Expert Group on the State of Art in European Responsible Research and Innovation*, Brussels, doi:10.2777/46253.

Fisher E., Mahajan R.L. (2006), *Midstream modulation of nanotechnology research in an academic laboratory*, Proceedings of ASME International Mechanical Engineering Congress & Exposition (IMECE), Chicago, pp. 1–7, doi:10.1115/IMECE2006-14790.

Fisher E., Rip A. (2007), *Responsible innovation: multi-level dynamics and soft intervention practices*, [in:] Owen R., Heintz M., Bessant J. (eds.), *Responsible Innovation*, Wiley, Chichester.

Flipse S., Sanden M., Osseweijer P. (2013), *The why and how of enabling the integration of social and ethical aspects in research and development*, "Science and Engineering Ethics", no. 19(3), pp. 703–725, doi:10.1007/s11948-012-9423-2.

Forge J. (2008), *The Responsible Scientist: A Philosophical Inquiry*, University of Pittsburgh Press, Pittsburgh.

Forsberg E., Quaglio G., O'Kane H., Karapiperis T., van Woensel L., Arnaldi S. (2015), *Issues and opinions: Assessment of science and technologies: Advising for and with responsibility*, "Technology in Society", no. 42, pp. 21–27, doi:10.1016/j.techsoc.2014.12.004.

Frankel M.S. (2012), *Regulating the boundaries of dual-use research*, "Science", no. 336(6088), pp. 1523–1525.

Garud R., Gehman J. (2012), *Metatheoretical perspectives on sustainability journeys: evolutionary, relations and durational*, "Research Policy", no. 41(6), pp. 980–995.

Geels F.W. (2010), *Ontologies, socio-technical transitions (to sustainability) and the multi-level perspective*, "Research Policy", no. 39(4), pp. 495–510.

Glerup C., Horst M. (2014), *Mapping "social responsibility" in science*, "Journal of Responsible Innovation", no. 1(1), pp. 31–50.

Groves C. (2009), *Future ethics: Risk, care and non-reciprocal responsibility*, "Journal of Global Ethics", no. 5(1), pp. 17–31, doi:10.1080/17449620902765286.

Gulbrandsen M., Smeby J.-C. (2005), *Industry Funding and University Professors' Research Performance*, "Research Policy", vol. 34, pp. 932–936.

Guston D.H. (2004), *Responsible innovation in the commercialised university*, [in:] D.G. Stein (ed.), *Buying in or Selling Out: The Commercialisation of the American Research University*, Rutgers University Press, New Brunswick.

Hayter C.S. (2015a), *Social Responsibility and the Knowledge Production Function of Higher Education*, [in:] C. Antonelli, A.N. Link (eds.), *Routledge Handbook of The Economics of Knowledge*, Routledge, New York.

Hayter C.S. (2015b), *A trajectory of early-stage spinoff success: the role of knowledge intermediaries within an entrepreneurial university ecosystem*, "Small Business Economics", pp. 1–24, doi:10.1007/s11187-016-9756-3.

Hayter C.S. (2016), *A social responsibility view of the "patent-centric linear model" of University Technology Transfer*, "Duquesne Law Review", vol. 54, pp. 7–52.

Hellstrom T. (2003), *Systemic innovation and risk: technology assessment and the challenge of responsible innovation*, "Technology in Society", no. 25, pp. 369–384.

Hove S. van den, McGlade J., Mottet P., Depledge M.H. (2012), *The innovation union: A perfect means to confused ends?*, "Environmental Science and Policy", no. 16, pp. 73–80, doi:10.1016/j.envsci.2011.11.006.

Iatridis K., Schroeder D. (2016), *Responsible Research and Innovation in Industry, The Case for Corporate Responsibility Tools*, Springer, Cham–Heidelberg–New York–Dordrecht–London.

Jonas H. (1984), *The imperative of responsibility: In search of an ethics for the technological age*, University of Chicago Press, Chicago.

Kearnes M. (2013), *Performing synthetic worlds: Situating the bioeconomy*, "Science and Public Policy", no. 40(4), pp. 453–465, doi:10.1093/scipol/sct052.
Kitcher P. (2001), *Science, Truth, and Democracy*, Oxford University Press, New York.
Koops B.-J., Oosterlaken I., Romijn H., Swierstra T., van den Hoven J. (2015), *Responsible innovation. Concepts, Approaches, and Applications*, Springer, Cham–Heidelberg–New York–Dordrecht–London.
Lee P. (2013), *Patents and the University*, "Duke Law Journal", vol. 63, no. 1, pp. 25–26.
Lee R.G. (2012), *Look at Mother Nature on the run in the 21st Century: Responsibility, research and innovation*, "Transnational Environmental Law", no. 1, pp. 105–117.
Levidow L., Neubauer C. (2014), *EU research agendas: Embedding what future?*, "Science as Culture", no. 23(3), pp. 397–412, doi:10.1080/09505431.2014.926149.
Longino H. (1990), *Science as Social Knowledge*, Princeton University Press, Princeton.
Maynard A.D. (2015), *The (nano) entrepreneur's dilemma*, "Nature Nanotechnology", no. 10(3), pp. 199–200, doi:10.1038/nnano.2015.35.
Mejlgaard N., Bloch C., Degn L., Nielsen M.W., Ravn T. (2012), *Locating science in society across Europe: Clusters and consequences*, "Science and Public Policy", no. 39, pp. 741–750.
Merton R.K. (1973), *The sociology of science: Theoretical and empirical investigations*, University of Chicago Press, Chicago.
Nelson R.R., Winter S.G. (2002), *Evolutionary theorizing in economics*, "Journal of Economic Perspectives", no. 16(2), pp. 23–46.
O'Gorman C., Byrne O., Pandya D. (2008), *How Scientists Commercialise New Knowledge Via Entrepreneurship*, "Journal of Technology Transfer", vol. 33, p. 23.
Owen R., Baxter D., Maynard T., Depledge M.H. (2009), *Beyond regulation: Risk pricing and responsible innovation*, "Environmental Science and Technology", no. 43, pp. 5171–5175.
Owen R., Bessant J., Heinz M. (2013), *Responsible Innovation, Managing the responsible emergence of science and innovation in society*, Wiley & Sons Ltd., New York.
Owen R., Goldberg N. (2010), *Responsible innovation: A pilot study with the U.K. Engineering and Physical Sciences Research Council*, "Risk Analysis", no. 30, pp. 1699–1707.
Owen R., Macnaghten P., Stilgoe J. (2012), *Responsible research and innovation: From science in society to science for society, with society*, "Science and Public Policy", no. 39(6), pp. 751–760.
Pandza K., Ellwood P. (2013), *Strategic and ethical foundations for responsible innovation*, "Research Policy", no. 42(2013), pp. 1112–1125.
Pellizzoni L. (2004), *Responsibility and environmental governance*, "Environmental Politics", no. 13(3), pp. 541–565.
Phan P.H., Siegel D.S. (2006), *The Effectiveness of University Technology Transfer: Lessons Learned, Managerial and Policy Implications, and the Road Forward*, "Found Trends Entrepreneurship", no. 77, pp. 77–144.
Pidgeon N., Parkhill K., Corner A., Vaughan N. (2013), *Deliberating stratospheric aerosols for climate geoengineering and the SPICE project*, "Nature Climate Change", no. 3(5), pp. 451–457.
Pielke R. (2007), *The Honest Broker: Making Sense of Science in Policy and Politics*, Cambridge University Press, Cambridge.
Popper K. (1959), *The Logic of Scientific Discovery*, Hutchinson, London.
Regulation EU No. 1291/2013 of the European Parliament and of the Council of 11.12.2013 establishing Horizon 2020-the Framework Programme for Research and Innovation (2014e2020) and repealing Decision No 1982/2006/EC. Off J Eur Union.
Reiser J.M., Bulger R.E. (1997), *The social responsibilities of biological scientists*, "Science and Engineering Ethics", no. 3(2), pp. 137–143.
Resnik D.B. (1998), *The ethics of science: An introduction*, Routledge, London.
Resnik D.B., Elliot K.C. (2016), *The ethical challenges of socially responsible science*, "Accountability in Research", no. 23(1), pp. 31–46, doi:10.1080/08989621.2014.1002608.

Ribeiro E.B., Smith R.D.J., Millar K. (2016), *A mobilizing Concept? Unpacking Academic Representations of Responsible Research and Innovation*, "Science and Engineering Ethics", pp. 1159–1180, doi:10.1007/s11948-016-9761-6.

Robinson D.K. (2009), *Co-evolutionary scenarios: An application to prospecting futures of the responsible development of nanotechnology*, "Technological Forecasting and Social Change", no. 76, pp. 1222–1239, doi:10.1016/j.techfore.2009.07.015.

Roco M.C., Harthorn B., Guston D., Shapira P. (2011), *Innovative and responsible governance of nanotechnology for societal development*, "Journal of Nanoparticle Research", no. 13(9), pp. 3557–3590, doi:10.1007/s11051-011-0454-4.

Rogers E.M. (1962), *Diffusion of Innovation*, Free Press, New York.

Rose N. (2014), *NeuroView: The human brain project: social and ethical challenges*, "Neuron", no. 82, pp. 1212–1215, doi:10.1016/j.neuron.2014.06.001.

Rothaermel F.T., Agung S.D., Jiang L. (2007), *University Entrepreneurship: A Taxonomy of the Literature*, "Industrial and Corporate Change", vol. 16, no. 4, pp. 691–791, doi:10.1093/icc/dtm023.

Saille S. de (2015), *Innovating innovation policy: The emergence of 'responsible research and innovation'*, "Journal of Responsible Innovation", no. 2(2), pp. 152–168, doi:10.1080/23299460.2015.1045280.

Schaper-Rinkel P. (2013), *The role of future-oriented technology analysis in the governance of emerging technologies: The example of nanotechnology*, "Technological Forecasting and Social Change", no. 80, pp. 444–452, doi:10.1016/j.techfore.2012.10.007.

Schomberg R. von (2007), *From the ethics of technology towards and ethics of knowledge policy and knowledge*, A working document from the European Commission Services.

Schomberg R. von (2011), *Towards responsible research and innovation in the information and communication technologies and security technologies fields*, European Commission, Brussels.

Schumpeter J.A. (1934), *The theory of economic development: an inquiry into profits, capital, credit, interest and the business cycle*, "Harvard Economic Studies", vol. 46, Harvard College, Cambridge.

Schuurbiers D. (2011), *What happens in the lab does not stay in the lab: Applying midstream modulation to enhance critical reflection in the laboratory*, "Science and Engineering Ethics", no. 17(4), pp. 769–788, doi:10.1007/s11948-011-9317-8.

Selin C. (2011), *Negotiating plausibility: Intervening in the future of nanotechnology*, "Science and Engineering Ethics", no. 17, pp. 723–737, doi:10.1007/s11948-011-9315-x.

Shamoo A.E., Resnik D.B. (2014), *Responsible Conduct of Research*, 3rd ed., Oxford University Press, New York.

Shrader-Frechette K.S. (1994), *Ethics of Scientific Research*, Rowman and Littlefield, Boston.

Stahl B.C. (2013), *Responsible research and innovation: The role of privacy in an emerging framework*, "Science and Public Policy", no. 40(6), pp. 708–716, doi:10.1093/scipol/sct067.

Stahl B.C., McBride N., Wakunuma K., Flick C. (2014), *The empathic care robot: A prototype of responsible research and innovation*, "Technological Forecasting and Social Change", no. 84, pp. 74–85, doi:10.1016/j.techfore.2013.08.001.

Stilgoe J., Owen R., Macnaghten P. (2013), *Developing a framework for responsible innovation*, "Research Policy", no. 42, pp. 1568–1580, doi:10.1016/j.respol.2013.05.008.

Stirling A. (2010), *Keep it complex*, "Nature", no. 468, pp. 1029–1031, doi:10.1038/4681029a.

Sutcliffe H. (2011), *A report on responsible research and innovation*, http://ec.europa.eu/research/science-society/document_library/pdf_06/rri-report-hilary-sutcliffe_en.pdf [accessed: 14.05.2016].

Torgersen H., Schmidt M. (2013), *Frames and comparators: How might a debate on synthetic biology evolve?*, "Futures", no. 48, pp. 44–54, doi:10.1016/j.futures.2013.02.002.

Wing S. (2002), *Social responsibility and research ethics in community-driven studies of industrialized hog production*, "Environmental Health Perspectives", no. 110(5), pp. 437–444.

Wright D., Gellert R., Gutwirth S., Friedewald M. (2011), *Minimizing Technology Risks with PIAs, Precaution, and Participation*, "IEEE Technology and Society Magazine", pp. 47–54.
Wynne B. (1993), *Public uptake of science: A case for institutional reflexivity*, "Public Understanding of Science", no. 2, pp. 321–337, doi:10.1088/0963-6625/2/4/003.

Odpowiedzialność badań i innowacji z punktu widzenia uniwersyteckiego transferu technologii

Streszczenie: Pojęcie „odpowiedzialne badania i innowacje" (RRI – ***Responsible Research and Innovation***) jest coraz częściej wykorzystywane już od ponad dekady. Koncepcja ta nie jest obecnie dobrze opisana. Teoria RRI nie jest wystarczająco rozwinięta i nadal istnieją znaczące różnice koncepcyjne. Celem niniejszego opracowania jest odpowiedź na następujące pytania: „Jak może być zdefiniowane RRI?", „Na jakim etapie jest proces wyłaniania wymiarów koncepcyjnych RRI?", „Jaka może być rola RRI w procesie uniwersyteckiego transferu technologii?". Metodyka zastosowana w badaniu to krytyczna analiza stanu wiedzy. Badanie polegało na zgromadzeniu publikacji z takich baz danych, jak: Scopus (www.scopus.com), EBSCO (www.ebsco.com), Google Scholar (scholar.google.com) i Google Books (books.google.com). Analizie poddano publikacje tylko z recenzowanych czasopism. Sformułowania użyte w trackie przeszukiwania baz danych to: odpowiedzialne innowacje, odpowiedzialne badania i innowacje, RRI oraz transfer technologii. Analiza krytyczna stanu wiedzy doprowadziła do wniosków skutkujących propozycją siedmiu wymiarów pojęciowych RRI (inkluzja, antycypacja, reakcja, refleksja, troska i wymiar ekonomiczny). Zaprezentowane wymiary RRI mogą być realizowane w procesach transferu technologii procedowanych na uniwersytecie. Koncepcja RRI jest wciąż w fazie rozwoju. Dyskusja wokół koncepcyjnych wymiarów RRI będzie prawdopodobnie zmierzać w tym samym kierunku co wyzwania strategiczne uczelni. W wyniku przeprowadzonego badania wyłoniły się dwa kluczowe wnioski. Po pierwsze, wykorzystanie koncepcji RRI może doprowadzić do przesunięcia punktu ciężkości celów działalności Centrów Transferu Technologii (CTT) od wartości finansowo-księgowych (przychody, przepływy pieniężne, stopy zwrotu, patenty, opłaty licencyjne etc.) do procesów, które są związane z drugim kluczowym wnioskiem, iż siedem zaprezentowanych wymiarów koncepcyjnych RRI powinny być realizowane w ramach procedur CTT. Uwzględnienie tych dwóch wniosków umożliwia wdrożenie RRI na uniwersytecie w szerszej perspektywie niż tylko spełnienie administracyjnych wymogów instytucji finansujących badania naukowe.

Słowa kluczowe: odpowiedzialność badań i innowacji, odpowiedzialne innowacje, polityka badań naukowych, transfer technologii

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