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Dorota Korenik

Wrocław University of Economics
e-mail: dorota.korenik@ue.wroc.pl

ORCID: 0000-0002-8418-2571

THE CONCEPT OF SUSTAINABLE INNOVATION AS APPLIED TO BANKING INTERMEDIATION

KONCEPCJA INNOWACJI ZRÓWNOWAŻONEJ W POŚREDNICTWIE BANKOWYM

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Summary: The aim of this paper is to develop a framework for sustainable financial innovation, especially in banking intermediation. The author proceeds in two stages: first, tying the term of sustainable innovation to various paradigms of the role of banks in the economy in order to address that particular innovation clearly to a bank in a way that takes Responsible Research & Innovation (RRI) ideas into account. There has been no such approach to recognizing and interpreting financial innovation and sustainable financial innovation in banking intermediation in the existing theoretical achievements of banking. Secondly, examining the difference between sustainable innovation and incremental innovation. In the conclusion, the author presents the results of compiling three research perspectives (the role of banks, RRI, sustainable innovation versus incremental innovation) into an integrated approach to interpreting the term of sustainable financial innovation in banking intermediation.

Keywords: financial sustainable innovation, banking intermediation.

Streszczenie: Celem opracowania jest rozszerzenie ram poznawczych dla zrównoważonych innowacji finansowych w banku i bankowości. Uwaga jest skoncentrowana na określeniu istoty i interpretacji zrównoważonej innowacji finansowej w odniesieniu do banku i jego działalności depozytowo-kredytowej. Termin zrównoważona innowacja finansowa zostanie powiązany z różnymi paradygmatami roli banku w gospodarce, równocześnie uwzględniając postulaty „Odpowiedzialne badania i innowacje" (RRI). Następnie wykorzystana zostanie perspektywa różnicująca zrównoważoną innowację i innowację typu stopniowe ulepszenia (*incremental innovation*). Finalnie zostanie przedstawiony efekt kompilacji trzech perspektyw poznawczych (rola banku, RRI, zrównoważona innowacja *versus* innowacja typu stopniowe ulepszenia).

Słowa kluczowe: zrównoważona innowacja finansowa, pośrednictwo bankowe.

1. Introduction

Banks are expected to meet the needs of sustainable development, more so than other financial institutions or companies. This is due to the roles assigned to banks and their importance in the economy. Yet from the point of view of a bank, the point of creating and using financial innovations is to obtain or increase competitive advantage, improve its financial and economic situation, or adjust to changing conditions. This does not necessarily mean that any innovations used for this purpose meet the criteria of sustainable financial innovation.

Not every financial innovation can be seen as contributing to the benefit of all the parties involved in such a transaction or to the benefit of the economic system in general. One of the ways to safeguard such positive effects is to assess financial innovations in the context of the Responsible Research & Innovation (RRI) framework. There is a strong expectation on the banking sector to use financial innovations – be they product, organisation, process, or marketing related – that meet the criteria of RRI. This is strengthened by the fact that the global financial crisis made it obvious that, despite the regulations and supervision of the banking sector, the innovations used by banks were contrary to the ideas of responsible or sustainable development.

The aim of this paper is to develop a framework for sustainable financial innovation, especially in banking intermediation. The author proceeds in two stages: first, tying the term of sustainable innovation to various paradigms of bank functions in the economy, in order to address that particular innovation clearly to a bank in a way that takes Responsible Research & Innovation ideas into account. The postulated exposition of the concept is formulated on the basis of the most prominent paradigms, both classical (the industrial organization approach to banking, the incomplete information paradigm) and modern (the risk-sharing paradigm), typically employed to explain why banks as financial intermediaries exist. There has been no such approach to recognizing and interpreting financial innovation and sustainable financial innovation in banking intermediation in the existing theoretical achievements of banking. Secondly, examining the difference between sustainable innovation and incremental innovation. In the conclusion, the author presents the results of compiling three research perspectives into an integrated approach to interpreting the term of sustainable financial innovation in banking intermediation.

From the point of view of methodology, adopting an integrated approach, combining various research perspectives, some of which come from varying research inspirations and may be considered misaligned, is an expression of methodological eclecticism, which in turn is one of the methodological approaches accepted in financial science and economics [Flejterski 2007, pp. 177-178]. By using methodological eclecticism in this work, the author hopes to contribute primarily to the scientific, but also useful in banking practice, method of recognizing sustainable financial innovations in banking intermediation. This is also a way to explain the role

of the bank in the economy more fully than before, thus making a contribution to the microeconomics of banking.

2. The nature, characteristics and specificity of responsible innovation in banking intermediation

Banking innovations are financial innovations occurring in the banking sector or, to put it differently, they are innovations in financial intermediation exercised by banks. Responsible innovations, which also include sustainable innovations, in banking intermediation represent a distinct subset of financial innovations. Not every innovation employed in the narrow context of banking intermediation can be seen as satisfying the constituent elements of responsible type innovation.

In accordance with the so-called Oslo methodology [OECD 2005, pp. 48-55], financial innovations can be defined as a set of new or significantly improved solutions employed by the banking sector in all innovation areas: product, process, organisation, and marketing. From the sectoral viewpoint, the implementation of specific innovative solutions makes sense only when their effects are seen as improving the competitive advantage of the banking industry over other sectors involved in financial intermediation (most notably the para-banking and high-tech sectors) or the financial system in general. Innovations in the banking sector are typically developed in an evolutionary manner, in response to the constantly changing environmental conditions (such as the expectations of the various banking stakeholders). In effect, the resulting changes are rarely turbulent or contesting the rules of market competition. However, in view of the strong competitive pressure from non-banking segments of the economy (most notably, the high-tech industry), and in response to excessive state restrictions, the banking sector may be forced to explore and introduce more radical solutions to impose new rules of play in banking. What remains constant, both in stakeholder expectations towards the banking industry and the innovations offered, is the focus on the economic utility of the banking sector, as expressed by its effectiveness in performing its basic functions. In this context, it may be assumed that, in order to be perceived as positive, innovations in banking should assist the banking industry in providing its fundamental systemic functions [Bank for International Settlements 1986; Merton 1992] more effectively and efficiently than before.

In light of the available literature, innovations in banking intermediation should bring positive effects in the form of cost reduction, limitation of risk and better satisfaction of demand from the banking market participants [Frame, White 2002], these in turn, can be seen as tangible proof of improved effectiveness in the realisation of the fundamental banking functions [Juhkam 2003, p. 3].

Those studies of financial innovations which include separate evaluations of banking and financial intermediation [Frame, White 2002] tend to emphasise the following areas of the benefits offered:

1. Avoidance or limitation of fiscal burden or the effects of prudency regulations.
2. Reduction of transaction cost and the increase of liquidity ratios.
3. Reduction of agency costs (i.e. internal costs incurred between principals and stakeholders or between shareholders and creditors).
4. Reduction of information asymmetry between various stakeholder groups, both internal (majority stakeholders vs. managers) and external (creditors vs. minority stakeholders).
5. Better diversification of risk (derivatives, investment funds).

From the viewpoint of the banking systems functions, the most desirable qualities of innovations are those that result in the more effective and more efficient realisation of the following:

- Cash settlement function (innovations designed to improve liquidity in both the real and financial sphere of the economy).
- Investment function (innovations designed to improve customer access to new investment opportunities, with a properly structured return/risk profile).
- Financial function (innovations designed to improve access to sources of financing, both equity and debt-based).
- Risk estimation function (innovations designed to improve both the risk estimation processes and their effects).
- Risk management function (innovations designed to improve the potential for the management and transfer of risk between various participants of the financial system).

"But there is no doubt that many financial innovations destroyed more value than they created, even as they enriched their providers, and that regulators and policymakers failed to distinguish the good from the bad, with very costly results." [Mulgan 2007, p. 1]. The problem of socially irresponsible financial innovations is considered grave, and mostly examined from the point of view of the stability and effectiveness of the financial system.

In view of the fact that the innovation processes have the power to generate both positive solutions (positive innovations) and those that serve to the detriment of the industry's stability and add to the systemic risk, some authors [Anderloni, Bongini 2009; Lumpkin 2010] postulate to increase control over financial innovations with the view of anticipating and eliminating those that produce a negative outcome, based on the use of the standard regulatory and financial supervision instruments available to the financial system. The authors also emphasize the accelerated trend of problems related to financial innovations and their effects upon the cost and financial stability of the banking system (or the financial system in general). The postulated approach is to stimulate the development of responsible innovations, i.e. those that contribute to the financial stability of the system, improve (or, at the very least, maintain) the cost effectiveness of the system's fundamental functions, increase the utility of banking products/services and make them more responsive to customer needs, assist in combating the problems of information asymmetry, high transaction

cost, and the high risk of banking borne both by suppliers and purchasers of banking products or services [Llewellyn 2009, p. 23].

However, the public expectations for creating and using sustainable or responsible innovations by banking institutions, articulated through the needs of an effective and stable banking (financial) system, may not be seen by the bank as being addressed directly to the bank. For the bank as a microeconomic entity, the RRI concept (but at the same time in close connection with specific bank roles) may be more useful. Meanwhile the banking achievements lack studies focusing on the RRI concept relation to each bank's specific role.

To safeguard the positive outcomes, a responsible financial innovation must be created and disseminated in accordance with the recommendations of the RRI (Responsible Research & Innovation), a concept developed in the first decade of the 21st century in Europe and the United States. The RRI concept has been developed since 2003 in parallel by many authors, following the pioneering work of Hellstrom, Guston, Owen, and Robinson, to name but a few. The RRI concept is defined [Von Schomberg 2013] as "a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products in order to allow a proper embedding of scientific and technological advances in our society." Some authors [Sutcliffe 2011] point out that RRI may be used to similar effect in the regulation of innovations in financial instruments, public/social policies and instruments, distribution, services, and systemic innovations. In accordance with the recommendations of the European Commission, innovations and new technologies should meet global challenges such as climate change and global warming, the efficient use of natural resources, demographic change, global health and development, social cohesion and the maintenance of economic prosperity [Owen 2013]. RRI sets the procedures for the better integration of social needs into the research and innovation framework, and the associated methodology helps to maintain a proper focus on role equality and the social responsibility of both innovators and other actors in the social system.

A more direct appeal to the bank, more effective in establishing whether the innovations used are responsible or sustainable, may be achieved by correlating these innovations with the role of a bank in the economy (as defined by the banking microeconomics theory) while still taking RRI ideas into account. In the case of banks, tying sustainable financial innovation to the established role of banks in the economy is especially important, because it relates to the question of the future of banking: will banks concentrate on banking per se (its core being credit and deposit activities) or on post-banking (its core being unknown, and credit and deposit activities might be side-lined). Credit and deposit activities are considered crucial for the development of the real economy, a fact which is expressed in banking theory and through special public care for banks which perform these activities.

3. Interpretation of sustainable financial innovation using the paradigms of the bank's role in the economy and RRI assumptions

The concept of sustainable financial innovation as defined in the RRI can be performed on the grounds of various paradigmatic constructs commonly used for the purpose of explaining why banks as financial intermediaries exist. The various paradigms explain the role of banks in the economy differently, since they come from varying research perspectives, but they all accept credit and deposit activities as the core actions of a bank. In this author's approach, these include the following: the industrial organization approach to banking, the incomplete information paradigm, the risk-sharing paradigm (or the paradigm of banks' special importance in risk management in the national economy). This line of reasoning focuses not so much on analyses of potential and real effects of innovations in the context of their economic or financial impact on individual institutions, but rather on the impact of individual institutions on the real economy. The study of such an impact must be based on evaluations of specific innovations from the viewpoint of the equal (fair) distribution of benefits between both parties, namely the provider and the recipient of the banking products or services.

In light of the industrial organization approach to banking [Freixas, Rochet 1999, pp. 15-90; Degryse, Kim, Ongena 2009, pp. 26-56], innovations should assist banks in better serving their roles as providers of specific services, i.e. those associated with the cash settlement function. This function is realised through a properly balanced correlation of savings from, and loans granted to, the economy. The existence of banking intermediation can only be justified if such a form of organisation offers a line of products (savings and loans) which are more suited to the needs than those immediately available on the financial market at a given time. Consequently, the system should support those products (both loans and savings) which are generated on the basis of detailed information on the needs and financial capabilities of specific target segments. This type of information should be gathered at the source and properly interpreted. In this approach, a responsible innovation is an innovation based on the proper identification and interpretation of information, designed to provide products and services better suited to the specific needs and capabilities of specific targets. This type of innovation serves to improve the accuracy and effectiveness of the asset transformation function of banks.

In addition, the conceptual framework of the above paradigm accentuates the postulate for savers to have easy access to accumulated liquidity, in the form of deposit contracts, and for borrowers to have access to credit extensions, in line with their personal preferences (either in terms of credit duration or value). Innovations that fulfil the above postulates will warrant the proper and effective realisation of the liquidity provision function of the banking system. The generation of responsible

innovations is a sequential process, in the sense that it follows the natural progression of: mutual informing, advising on the best strategy or solution to a specific financial problem, providing the most suitable banking product. As such, this type of innovations can be seen as representative of the group of demand-stimulated innovations. This does not mean, however, that the final user of the product is the 'winning party' of this exchange. The banking provider will also benefit by ensuring proper continuance and uninterrupted course of their future dealings (due to the lessened risk of service agreement defaults or withdrawals). Any disruption in the sequential course of actions, for instance in the informing phase (presentation of the standard package of services, without due information on individualised products) or the advising phase (resorting to own products and withholding information on any third-party products or services available on the market which could be employed in tandem with own services to provide the best solution package to suit the customer needs and financial capabilities), shall only have the effect of 'palming off' products which are at most only half-way solutions (if not less than that) or even products that generate additional cost for the customer or are otherwise restricted by the steep prices of alternative products. Product innovations generated in such a flawed manner are also detrimental to the providing party, as exemplified by the growing number of customers unable to meet their contractual obligations or waive their agreements despite the apparent unfairness or breach of standards on the part of the providing institution. Such defaults may also affect banks' capabilities to form and maintain appropriate and long-term relations with their customers (as opposed to long-term customers 'doomed' to maintain their relations due to steep withdrawal restrictions). In line with the relationship banking strategy, long-term relations with customers constitute the very fundament of the banking advantage over other financial intermediaries and markets and the very basis for the realisation of the term, the transformation function of the banking sector.

From the viewpoint of the incomplete information paradigm (the incomplete contract approach), banks – through their services – are responsible for reducing the imperfections of the market. This would mean that they are somehow better equipped to deal with the problems generated by the information asymmetry and opportunistic behaviour in the economy, thus improving the allocation of resources. There are three recognized approaches to the justification of the banks' beneficial role in the economy: (1) banks as information producers [Freixas, Rochet 1999, pp. 23-28], (2) banks as delegated monitors [Freixas, Rochet 1999, pp. 29-31; Diamond 1996, pp. 51-66], (3) banks as delegated re-negotiators [Freixas, Rochet 1999, pp. 111-117; Joonmo, Scott, Ashraf 1997, pp. 163-179]. Innovations in banking, mainly those of the process and organisation type, can be seen as responsible if they assist the bank in serving any of the above three roles.

As the information producers, banks make their crediting (investment) decisions on the basis of acquired and internally processed information. The banking benefit is represented here by the profit margin included in the product price (with higher loan

values producing more profit). In this approach, the most desirable innovations should present a reliable signal to the financial market, generated by the information producer. Specifically this involves innovations designed to generate reliable information required for making apt crediting (investment) decisions in terms of the proper selection of projects for financing or the volumes of financial support granted, with due consideration for the development needs of the bank's home economy. In the context of reliability of such signals in communicating the real economic and financial standing of actors seeking financial support from banks, the key factor is the adequate recognition of the development needs of the bank's immediate environment. With respect to certain groups and segments, particularly those considered of great importance to the national economy (including innovative and emerging segments), signals generated in this way may become distorted or unreliable due to the steep barriers to access or strenuous requirements – this will result in no signal, a rejection signal or a signal of decreased banking involvement (inadequate to the reported financial needs of the final product user). Signal distortion is the effect of banks' strong aversion to risk, an attitude strongly enhanced by their inability to produce an objective risk assessment, as well as by their excessive demands in terms of product price or collaterals. It should be noted that innovations in banking are of fundamental importance for the development of modern innovative economies, particularly those with a strong dependence on the SME sector (as in Poland), where banking support is the preferred approach.

The above types of process or organisational innovations also play a dominant role under the framework of two other approaches to the justification of the banks' beneficial role in the economy, namely the paradigm of banks as delegated monitors, and that of banks as delegated re-negotiators.

In light of the approach of banks as delegated monitors, the desirable innovations should assist banks in gaining advantage in their role of agents responsible for monitoring the course of financial transactions. This applies not only to the customer segments and sectors regularly serviced by banks, but also to new and potentially favourable segments deemed to be of importance for the development of innovative economies (budding companies from innovative and high-tech industries), and even to companies of the SME segment. The task of monitoring financial transactions carried out by innovative, start-up and high-tech companies requires process and product innovations in banking (possibly also organisational) which are quite distinct from the instruments normally used in credit risk analyses and assessments. These may include solutions to such problems as:

1. Steep and often unrealistic credit collateral requirements and other precautionary conditions – this problem affects companies whose main assets are largely immaterial (knowledge or know-how) as well as start-up companies in the SME segment [Bierut et al. 2016, p. 181]; in this context, desired innovations should concentrate on securing the timely repayment of loans.

2. Other types of knowledge and skills of banking personnel, related to risk assessment of innovative projects, including project feasibility evaluations [Kerr,

Nanda 2015, p. 181] – the desired innovations in this context should focus on technologies and methodologies of risk assessment of innovative projects.

3. Greater uncertainty of returns from investments in innovative projects (compared to the more traditional forms of investment) and high volatility of cash transfers typically associated with innovative projects undermines the utility of classical credit line products based on fixed repayment schedules [Brown, Martinsson, Petersen 2012, pp. 1512-1529]; in this area the most desirable innovations are product innovations that offer floating or variable repayment schedules.

By addressing these problems, banks may benefit from important modifications and new solutions to assist them in the effective financial monitoring of projects and other investments in the sphere of innovation, knowledge and learning, particularly those in the SME segment of the economy. Innovations of this type will be deemed positive if they serve to answer additional challenges such as the high cost of monitoring, high risk of innovation financing, or multiplication of monitoring cost. Some authors [Herrera, Minetti 2007, pp. 223-269; Cosci, Meliciani, Sabato 2015] note that certain economies (e.g. Germany or Italy) have managed to largely alleviate the wealth of the problems associated with the financing of innovation by placing great emphasis on relational banking which, again, seems to confirm the need for banking innovations based on the proper management of customer relations.

From the viewpoint of the approach defining the role of banks as delegated renegotiators, the industry needs innovations which are more capable of assisting banks in the enforcement of appropriate restructuring measures (financial, organisational, fundamental) upon borrowers, compared with third-party financial intermediation and other instruments of the financial market. However, innovative solutions may also prove detrimental and effectively hamper the development of innovation and the SME sector due to excessive banking circumspection which may result from the lack of skill in the effective assessment of risk associated with innovative and start-up projects.

Dealing with risk in the modern socio-economic setting characterised by growing uncertainty seems to present the greatest challenge for banks and their customers. In light of the most recent paradigm, i.e. the risk-sharing paradigm [Freixas, Rochet 1999, pp. 94-128; Abdullah 2013, pp. 279-294; Onyriuba 2016, pp. 1-668], it is assumed that banks have a cost advantage over other actors with respect to the management and redistribution of risk in the economy. "Risk sharing ensures an efficient allocation of resources and a reduction of waste by providing investors with a powerful incentive – the risk of losses – to exercise due diligence" [Abdullah 2013, p. 279]. Therefore risk sharing is perceived to be the most fundamental element of banking operations. To maintain this advantage, banks are forced to seek solutions offering integrated risk management, e.g. by reducing the cost of delegating parts of risk management to the customer (both in loans and savings). The industry needs innovations that offer assistance to customers in the effective limitation of their risk (financial, economic). Another important challenge for innovations in this approach

is to assist banks in better dealing with their banking risk. Banking innovations will be deemed responsible if they help the bank provide risk management products and services which are better suited to customer needs and requirements, as well as investment/financing products with measures to safeguard customers against the effects of highly volatile market parameters. However, the effective provision of such product innovations is closely related to the bank's 'innovative potential', i.e. their involvement in the search for better solutions (process, organisational or even marketing innovations) in the sphere of banking risk management. In response to the effects of the recent global financial crisis, banks seem to have elevated the status of risk management processes in their day-to-day activities, but it may be useful to note that risk management is also one of the most important factors behind financial innovations [Anderloni, Bongini 2009, p. 42; Llewellyn 2009, p. 7]. Innovations designed to improve the effectiveness and cost efficiency of the risk management processes in banking are, without doubt, much needed. However, some of them may ultimately prove detrimental to the industry, particularly when their effectiveness is obtained at the cost of certain stakeholder groups. For instance, banking employees may find it difficult to yield to the pressure of the aggressive sale of products which are obviously detrimental to the final user, or suffer from the extra pressure of meeting their sales targets. Customers may also suffer, as they will be forced to bear the excessive burden of the real banking risk (as a force outside the influence of either party).

4. Characteristics of sustainable financial innovation in light of the comparison with incremental innovations

There is no precise or established definition for sustainable innovation, and therefore a definition for sustainable financial innovation, which reflects the more general difficulty in defining the concepts of sustainability and sustainable development. There is an emerging recognition that sustainable innovation ("sustainability-driven" innovation, sustainability innovation) is about new concepts but also the commercialization of technologies, products and services and about entrepreneurship; innovation can also be about the adoption of new processes and systems at societal level. Like sustainable innovation, sustainable financial innovation is also part of the Responsible Research & Innovation framework, which is in turn part of a larger set of ideas and initiatives addressing socially responsible innovation.

If the innovations used by a bank do not follow the ideas of RRI, then even if they are valid from the point of view of the bank's various roles and paradigms, they will not be sustainable financial innovations. A sustainable innovation or a sustainable financial innovation is not a singular act, it is a process. It is believed that: "Sustainable innovation is a process where sustainability considerations (environmental, social, financial) are integrated into company systems from idea generation through to research and development (R&D) and commercialization.

This applies to products, services and technologies, as well as new business and organization models.” [Katerva 2018]. This view coincides with the RRI concept, with the difference that RRI stresses more clearly that innovation should meet the global challenges. Necessary for sustainable innovation, including sustainable financial innovation, is the inclusion of sustainability considerations within it (environmental, social, financial) and integration into company systems (in-house bank systems). This property of sustainable financial innovation, as well as more properties, can be shown by distinguishing it from regular (incremental) innovation. Appropriate to the proposal of the expert group Lavery Pennell [LaveryPennell.com 2015], sustainable financial innovation can be defined in comparison to regular (incremental) innovation as financial innovation that leads to greater profits, better social outcomes and less environmental damage. It differs from regular financial innovation in three substantial ways:

1. Sustainable financial innovation is more disruptive (sustainable financial innovation as a disruptive innovation, within the meaning of the theory of disruptive innovation).

New models of the banking business are a challenge for many aspects of the incumbent banking companies (production, operations, brand, marketing and sales). At the same time, this challenge introduces new, non-traditional risks. A bank defending itself against non-traditional risks develops “corporate antibodies” within its existing culture. A space forms that allows only regular innovation, which does not entail lasting change in employee behaviour (such as energy saving or a change in their approach to analysing and evaluating innovative client projects). Innovations offering so-called fast winnings, such as using more effective devices or IT systems, may lead to new gains, both financial and environmental, but they will remain regular innovations if they do not result in an important change in every aspect of the bank’s business model and its interior integration.

2. There is a stronger rationale behind sustainable financial innovation.

Sustainable financial innovation has a greater chance of a significant change than regular innovation. The drivers for change include [see: LaveryPennell.com 2015]: changing consumer aspirations and behaviour; customers and consumers expecting companies to look after the environment and community; increasing staff expectations of their employers (and managers) to share their personal values, ethics and purpose; environmental and social externalities being included into banking business cases either through real pricing in the process of analysing and evaluating the profitability of a client’s investment project or through “shadow pricing” (e.g. an internal price for coal); cleaner technologies (especially when the state creates permanent conditions for their development in order to ensure the cost-effectiveness of their use by the bank and the profitability of client projects related to cleaner technologies) and enabling technologies (like remote monitoring) becoming less expensive; obtaining by the owners of enterprises (financial institutions) good

results in terms of sustainable development with good management; communities increasingly challenging companies' licence to operate (and licence to grow).

These drivers can provide a solid business foundation for sustainable financial innovation that can convince management and overcome the problem of the occurrence of "corporate antibodies".

3. Sustainable innovation involves greater collaboration.

For sustainable financial innovation, it is not so much the cooperation based on Michael Porter's linear value chain, more so on the "value network" or the web. This requirement is fully in line with the RRI concept, reflecting the essence of RRI.

For a bank to implement sustainable financial innovations, it must be able to be innovative at least. A bank establishes its own means of defining and transferring knowledge that is the basis for innovation. For this purpose, science offers two models of innovation creation [Jensen et al. 2007]: the STI mode (Science, Technology, Innovation), based on R+D expenditures, and the DUI mode (Doing, Using, Interacting), based on learning through interaction and relations with research facilities, clients, contractors and employees. In practice, innovations can be created in processes that form a highly individualised mixed mode. Logically speaking, the mode of innovation creation influences the capacity of creating a sustainable financial innovation. In order to meet the needs of an innovative economy and build a relationship banking model, a bank must gather and use the knowledge of its local context and conditions. Such knowledge is built on individual and team experiences, data transfer within the bank, building cooperation nets that facilitate learning, and staying close to clients. The STI mode, typically used in global banks, where knowledge is codified and global (not local) and general, does not offer such possibilities. A bank will hardly be able to create innovations that meet the needs of clients from the innovative economy sector (such as floating or variable repayment schedules) if it does not strive for innovation based on networking, unique employee skills, or extending those skills to employee teams, within its own system.

5. Conclusion

I. In the synthetic approach, innovation responsible in banking intermediation is a financial innovation (financial innovation) and having a positive impact on the cost effectiveness and stability of the financial system, in particular the banking system (i.e. positive financial innovation), and at the same time it is the responsible innovation in the RRI context. It is also a specific type (variety) of the financial innovation included, in two respects:

- it is directed at better fulfilling a specific role (among those presented in this paper) as a financial intermediary;
- it is distinguished from other types of responsible innovation which is regular financial innovation.

II. Recent times have brought an increased interest in the role and impact of financial innovations upon cost effectiveness and the stability of the banking (financial) sector. Innovations with a positive influence, that is positive innovations, are desirable. The previous partial attempts to answer this problem are:

- on the one hand – postulate to increase control over the financial market;
- on the other hand – the concept of RRI.

A promising way to tackle this problem can be found in the relatively new and maturing concept of RRI, defined in line with the recommendations of the European Commission of 2013 on responsible innovations and their effects upon the socio-economic system and its parts, such as the financial system or banking system. With reference to the banking industry, a responsible innovation is one that assists in the effective realisation of the fundamental banking functions, as emphasised in professional literature. The realisation of the banking functions is inherently and closely related to banking intermediation. However, the multitude of roles assumed by banks acting in an intermediary capacity has not yet been properly exposed and analysed in the context of responsible innovations, also defined in accordance with the RRI concept. This paper represents a partial attempt at filling this gap, at least in the theoretical dimension of the problem at hand.

III. The integrated approach used in this paper, which uses and combines several research perspectives such as: the role of banks in the economy as defined by banking microeconomics, the RRI ideas, and distinguishing sustainable innovation from regular innovation, allows to establish the core and to interpret the characteristic traits (criteria) of sustainable financial innovation in banking intermediation.

A sustainable financial innovation in banking intermediation is a wholly new or significantly modified solution created by or for the bank and implemented in the bank, that allows it to perform its allotted role in the modern economy better than before. This applies to products, services and technologies, as well as new business and organisation models. For a financial innovation to be considered sustainable, it must meet both these conditions:

1. It attempts to demonstrate the point of the bank's existence in the economy through meeting one or more paradigms of a bank's role in economy, such as: banks as information producers, banks as delegated monitors, banks as delegated re-negotiators, or banks as delegated service providers for financial risk management for customers.

2. It meets one or more of the global challenges, as indicated by the European Commission and the ideas of RRI, and integrates the sustainability considerations (environmental, social, financial) into company systems, from idea generation through research and development (R&D) to commercialisation.

The characteristics of sustainable financial innovation are that:

- it is more disruptive than regular (incremental) innovation,
- there is a stronger rationale behind sustainable financial innovation than regular innovation,

- it is based on greater collaboration than regular innovation, it is based on the "value network" or the web.

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