

SUSTAINABLE INNOVATION OF TECHNOLOGY AND BUSINESS MODELS: STEPS TOWARD RETHINKING TECHNOLOGY AND BUSINESS STRATEGY

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Abstract

The paper deals with sustainable innovation and technology management interrelated to sustainable business development. The focus is on strategic management issues concerned with technology dynamics and innovation interwoven with business model and strategy innovation. Sustainable technology and business strategy as radical innovation is achieved by questioning and rethinking the principles of managing business. In this paper innovation of technology and business strategy are treated in an integral way as the issues are inseparable, leading to the presentation of an integral strategic model: the society and environment pull model (SEP model). The overall scene and crucial dilemmas in the environment in which business operations are performed are emphasized with special consideration and focus on the dilemmas and conflict goals of technology innovation management. It is argued that sustainable business development is based on continuous balancing and trade-offs within a holistic management approach in a long-term, strategic perspective. Innovative technology and business models are based on rethinking and redesign of the basic principles and tools. It is concluded that sustainable technological solutions represent a necessary but not complete nor sufficient condition, and need to be combined with sustainable business and consumption models in order to achieve the complex sustainable development goals.

Keywords: sustainability, innovation, business and technology models

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1. Introduction

In this paper the focus is on sustainable technology and business development as the central pillar of sustainable development of the economy and society. Sustainable business development (SBD) rests upon sustainable technology and innovation, and managing

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technological change directly influences sustainable competitiveness of business operations. (Popa, 2013; Levi Jaksic, 2012).

Research emphasis is on the combination of sustainable business models and sustainable technological innovation management in a push-pull model, closely interwoven, linked together, and led by complex sustainable development goals.

It is argued that it is at the micro, business, level of the economy, where the crucial determinants of sustainable development (SD) are established, and more specifically “it is indeed at the strategic level that sustainable development can fully uncover its value creation potential for a company” (Sempels & Hoffman, 2013, p. 3). The crucial SD determinants are concerned with the output to be offered in terms of products and/or services (what business should we be in), which inputs and resources are necessary to be engaged for the business and where should it be located, how to accomplish the business goals and what processes/operations in transforming inputs into outputs should be used. Crucial responsibility and starting point for sustainable development lies within firms representing the value-creating agents in the economy.

The sustainable development model is based on three crucial sets of goals: social, economic and environmental/ecological. In the general model presented in this paper, the economy is viewed as a process where the active, dynamic transformation is occurring – social and environmental conditions (input) are actively transformed and put in the service of the fulfillment of social and environmental goals (output).

Sustainable Business Development (SBD) is a challenging new concept balancing the external and resource-based view (Levi Jakšić, 2005), reaching for solutions in the domain of balance and right «fit» to be achieved in situations of opposed and conflicting goals and dilemmas present in managing business. “SBD is a holistic management construct that includes the entire value system from the origins of the raw materials to production processes and customer applications to end-of-life (EoL) solutions. It encompasses the full scope of relationships with supply networks, customers and stakeholders, and support service providers for providing business solutions and also handling wastes, residuals, and impacts” (Rainey, 2006, p. 2.) Sustainability is therefore defined in a broad and complex perspective, with focus on new principles, models, and tools integrating multiple dimensions and aspects of sustainable business, technology and innovation management.

2. The general model: technology and business model innovation at the core of sustainable development

Using systems and process approach, a comprehensive, general model has been developed based on the understanding that “the economy is a means, ecosystems integrity is a condition, and the social dimension is the objective of sustainable development” (Gendron, 2013, p. 55).

The complex sustainability equation is derived from a set of social, economic and environmental equations, noted in this paper as the Triple Integrated equation (TIE), corresponding to the three basic pillars of sustainable development. The new perspective and approach is emerging with the changes of the traditional business for profit strategy increasingly introducing the TIE dimensions. This leads to the conclusion that we witness a convergence of the nonprofit and business for profit sector which is primarily viewed in the more complex goals oriented at strengthening sustainability capacities leading to the “nonprofit sector gearing towards more market-based solutions, mechanisms and dynamics, ... businesses in general have assumed social responsibilities in a broad array of their activities, as well as responsibilities for the natural environment and natural resource consumption” (Bardy & Massaro, 2013, p. 139).

The general model (see Fig. 1) views the three pillars of sustainable development within a systems approach based on *input-process-output* model. In the general model (see Fig. 1) the inputs are the factors of the environment – *PESTLE* (*political, economic, social, technological, legal, natural environment*), designated as the *social and environmental conditions*, the *economy* is the *process* by which value creation and distribution is achieved, while the fulfillment of *social and environmental goals* are the *output* (based on the consumption of goods and services).

This approach harmonizes the economic, social and environmental dimensions pointing out the convergence of the concepts *eco-social business* and *business in general*. “There is no clear, consensual definition of ‘social enterprise’ in the literature – much less so for eco-social business... a social enterprise is a nonprofit venture that combines the passion of a social mission with the discipline, innovation and determination commonly associated with for profit businesses, ...to generate social value” (Bardy & Massaro, 2013, p. 140). Performance of social entrepreneurship is measured economically where the social impact can be viewed in social costs concept. Field and Field (2006) argue that the social cost components include the external costs. It is a cost that appears for society and the environment caused by the activity of an enterprise. “Social entrepreneurship provides a social value from its business activities which has an impact on society or the environment” (Bagus & Manzilati, 2014, p. 14).

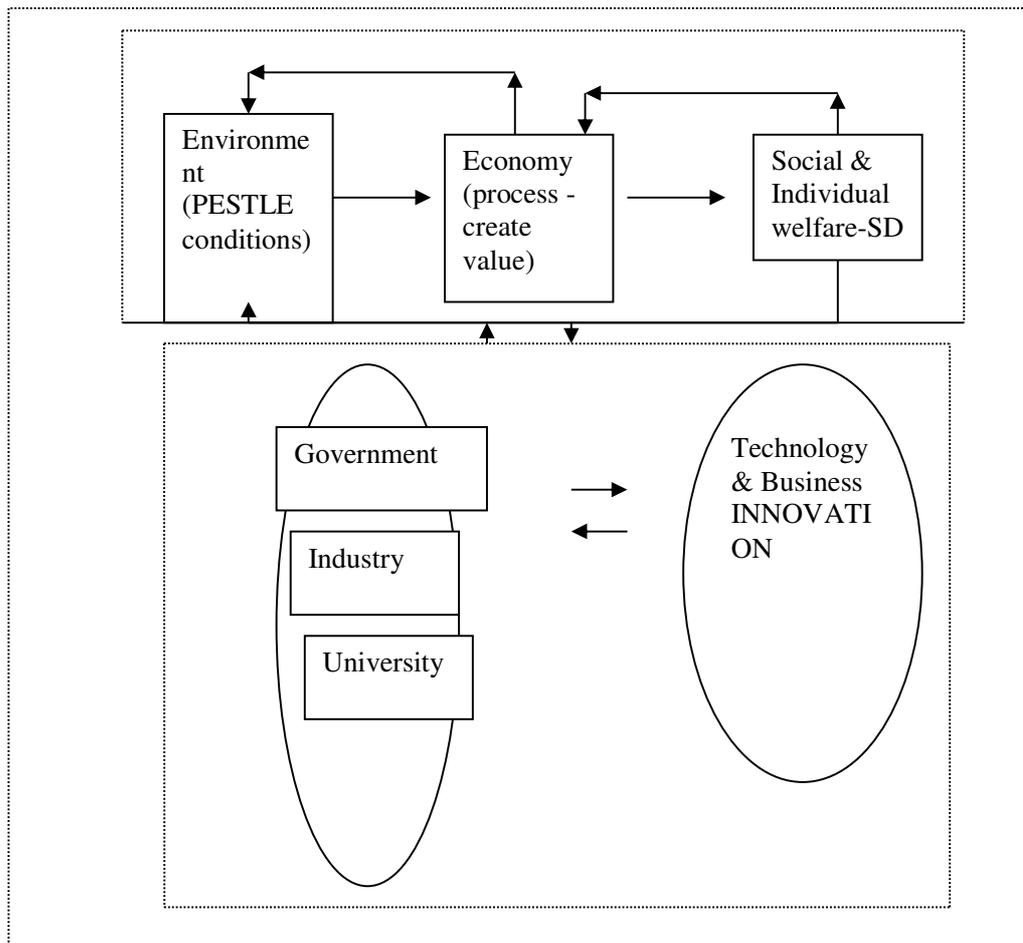


Fig. 1. Sustainable development relations: input (environment), process (economy) and output (social and environmental objectives)

Source: own work.

Social entrepreneurship is another concept emphasizing that entrepreneurship is based on innovation creating new value for economic growth, enabling the fulfillment of individual and social goals represented by a broad set of quality of life objectives.

Social entrepreneurship is utilizing resources in transactional way. Resources become tools and are used as much as possible for a particular purpose both economically and socially. Social entrepreneurship performs social activities with profit, then distributed as an effort to create social value (Kardosa, 2012).

Within the economy, the *Technology & Business Innovation Models* are at the core of competitive performance (Levi Jakšić et al, 2014). They are undergoing radical change and are the dynamic motor power of sustainable development with the mission to create social value

while simultaneously appreciating the *environment* as a condition and keeping the whole system running, vital and succesful. The triple helix actors – government, industry and university – are clearly represented as key bearers of responsibility for innovating technology & business models and strategy for sustainable development (Levi Jakšić, 2011).

Technology and business innovation drives the economy towards acheiving the sustainable development goals, hence the emphasis is on technology and business innovation, where sustainable business strategy is approached through sustainable business, technology and innovation model. “If the business model cannot align economic, environmental and social issues, the only credible solution is to change it... the business model should be innovated by integrating sustainability in order to build or keep a competitive advantage in an ever changing economy” (Sempels & Hoffman, p. 20).

In the society and environment pull (SEP) business model (see Fig. 2) social and environmental objectives are built into a sustainable strategy, leading to technology and business innovation, creating and delivering new value consumed by customers and society and environment are influenced by all these actions, they are the consequence and at the same time initial stage for a new business cycle in the economy and society.

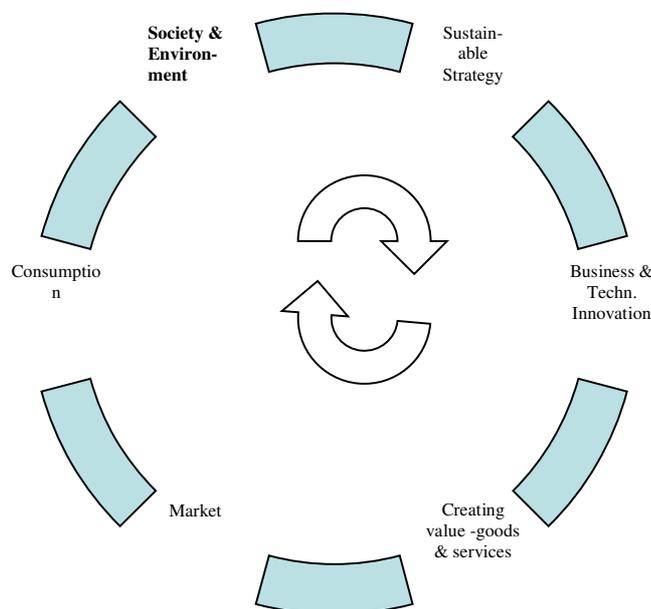


Fig. 2. SEP Business Model

Source: own work.

The SEP comprehensive model combines macro and micro dimensions emphasizing basic relations of achieving sustainability in the macroperspective, while focusing on technology & business innovation as the core factor affecting sustainable development.

3. Sustainable technology and business innovation model

Sustainable business competitiveness means the achievement of a set of different goals – economic and non-economic – of the firm. It is a concept based on quantitative and qualitative performance indicators, namely, the integration of traditional business performance goals measured by traditional economic indicators (e.g. profitability) and a set of new non-economic performance criteria that emphasize the satisfaction of needs of the customers, employees and all other stakeholders. SBD approach is based on the efforts to build sustainable competitiveness taking into account multiple factors (Meyer, 2002, p. 42).

Business model innovation is increasingly becoming a priority for managers in terms of creating competitive advantage and achieving superior performance (Velu, 2015)

The triple integrated equation (TIE) comprising social, ecological (environmental) and economic functions within the sustainable business development (SBD) concept has added the dimensions of ecology and society to the already established economic equation.

The focus of some studies on green technology have led to the assumptions that our efforts are to be directed towards safe, green technology and that by achieving the goals of environmentally safe technology we have automatically solved the problems of sustainable business. As a result, focus on green technology and pushing it to the businesses became the dominant concern (Boons & Ludeke-Freund, 2013).

The definitions of SBD that are focussing on ecological equation, leaving behind economic and social aspects, could be understood as a consequence of neglecting the natural environment for a long period of time and facing the very urgent need to act in an alarming situation of deteriorating soil, water and air by our business activities. The priority of sustainable business strategy is given to preserving the ‘essential’ or ‘critical’ natural capital and «sustainable development is achieved if actions of producers and consumers do not harm air, biodiversity, climate, soil and water, and thus maintain the earth's ecosystem services (Bardy & Massaro, 2013). Some authors even postulate that the economic and the ecological equation are confronted, opposing and contradictory, so the solutions should be looked for in the domain of coercion, legal acts and regulations limiting, forbidding and constrainig damaging actions to the environment.

This could be understood as the reaction to urgent needs in a short time span only. In this paper we argue the significance of dealing with the complete TIE of SBD for the long term, sustainable future. This means innovation of business models, strategy and solutions with a radical change in the overall business philosophy simultaneously striving for solutions by developing new, innovative, safe technologies as the long term, strategic sustainable dimension of the businesses of tomorrow.

As result of research, we come to the conclusion that the concepts of sustainable innovation and sustainable business are converging. It is difficult to draw a line as innovation is understood as commercialization of invention (idea), referring to its market introduction and transfer. “Research and experimental development (R&D), when appropriately valorized, lead to technological innovation in the form of new products and processes, which contribute to growth, competitiveness and job creation, and which produce other societal benefits. Because of market failures, the private sector, left to its own devices, invests in R&D in sectors not always fully aligned with, and at levels below, the socially desirable, and is unable to fully valorize its research output” (Delanghe & Muldur, 2014). The necessity to develop sustainable technological innovation and sustainable business models based on the TIE (triple integrated equation) involves the idea to idea concept starting from research and development of sustainable technological innovation, its implementation in a sustainable business environment considering the complete life cycle – idea, innovation, market, exploitation and end of life.

Viewing literature on the definitions of business model it is evident that the concepts of technology and business innovation are closely linked: a business model is used as a plan which specifies how a new venture can become profitable (Boons & Ludeke-Freund, 2013, p. 10). Business model is a “market device” (Callon et al, 2007), an intermediary between different innovation actors such as companies, financiers, research institutions, etc., i.e. actors who shape innovation networks. Business model describes the principles according to which an organization creates, distributes and captures value.(Sempels & Hoffman, 2013, p. 35.) Business model is a means by which company strategy is established (Sempels & Hoffman, 2013, p. 3).

The two core questions concerning the relations between sustainable technology and sustainable business innovation considered are:

1. Could there be a sustainable business based on non-sustainable technology?

2. Is it possible to have sustainable technology innovation embedded in a non-sustainable business?

In this paper it is argued that sustainable technology innovation is inseparable from sustainable business.

In literature business model consists of different blocks: value proposition, value architecture and economic equation (Sempels & Hoffman, 2013); value proposition, supply chain, customer interface, financial model (Boons & Ludeke-Freund, 2013).

The above models clearly show absence of social and environmental objectives and they need rethinking.

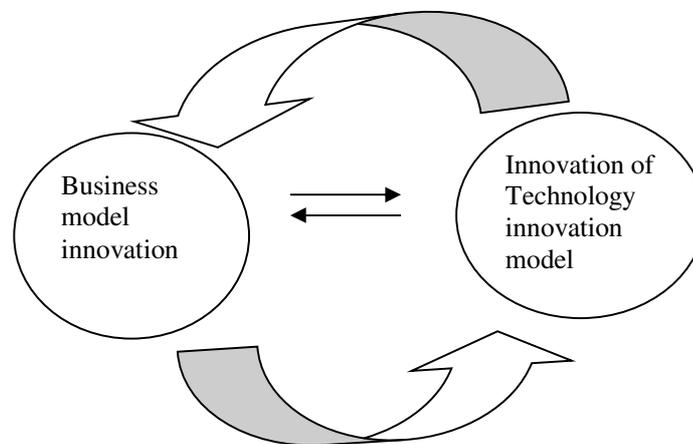


Fig. 3. The sustainable model of PUSH-PULL relations between SB and and STI models.

Sustainable competitive strategy is based on interrelatedness between the two spheres (see Fig. 3). Sustainable technology pushes the sustainable business (SB) and sustainable business pulls sustainable technology innovation (STI). Both business and technology model rethinking will lead to overall innovation of their relations integrated in a sustainable business development strategy.

4. Conclusion

The input-process-output model of SD focuses on the economy as a dynamic process by which new value is created to increase the overall welfare, satisfaction and benefits to the society. The driving force of economy dynamics are the businesses implementing technology to develop operations leading to the creation of new value in the form of goods and services to be consumed and used in further increasing social benefits and welfare.

The broad concept of technology management indicates the complex involvement of technological issues in all the aspects of business development and the technology-push model insists on business trying to adapt and create an ambience for introducing technological innovation efficiently and effectively. We develop the SEP model that starts and ends with the societal and environmental conditions, objectives and goals.

Rethinking strategy means posing the sustainability TIE and deriving means for its fulfillment through innovative sustainable business and technology. Although sustainability encompasses the complex TIE, in practice it is often understood that by implementing green technology we are safe from unsustainable business models. In this paper it is argued that the full capacity of SD can be reached in the comprehensive approach focussing on the three crucial dimensions of TIE in relation to technology innovation, but also business model innovation as it should be noted that “while creating and delivering customer value, the business model itself can become a source of competitive advantage by means of business model innovation” (Boons & Ludeke-Freund, 2013, p. 10).

The conclusion we come to is that the concepts of sustainable technology innovation and sustainable business model are close concepts but differentiation is found in the push-pull dynamics: sustainable technology innovation pushes to the market in a business environment, and sustainable business model innovation seeks for sustainable technology. Future research in the complex nature of the relations will show more distinction in the potential situations occurring in practice.

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