

The benefits of IT tools in innovation process for SME sustainability

Elena Simina Lakatos, Laura Bacali, Oana Bianca Bercea, Carmen Maria Muresan, Alina Moldovan

Abstract— Innovation in its both forms – open and closed - is essential for economic growth and it is associated both with processes and organizations and likewise, with social and institutional change. Advancement in information technology (IT) has led to major transformations in the way organizations operate, forcing them to invest in IT infrastructure so as to keep pace with competition and to retain Sustainability. The present paper approaches IT benefits in innovation process of SMEs, grouping them in three major categories: strategic, tactical and operational benefits. In the last section we present the results of preliminary study on IT benefits in SME's from Romania and following research directions.

Keywords— IT, innovation, strategic benefits, tactical benefits, operational benefits.

I. Introduction

Information technology advance in the last three decades positioned it as one of most important factor of economic growth. At the individual firm level, decision making on technology investment became a complex issue, resulting from progress recorded by information technology [1]. Therefore, information technology represents an important but slightly blurred tool for facilitating innovation process of bringing new problem-solving ideas into service. Information technologies set the way information is deposited, passed on, communicated, processed and acted upon [2] and it has some important benefits to be considered.

Elena Simina Lakatos
Technical University of Cluj-Napoca
Romania

Laura Bacali
Technical University of Cluj-Napoca
Romania

Oana Bianca Bercea
Technical University of Cluj-Napoca
Romania

Carmen Maria Muresan
Technical University of Cluj-Napoca
Romania

Alina Moldovan
Technical University of Cluj-Napoca
Romania

II. The Concept of Innovation

Theories of local development and a general view position innovation alongside new processes also as social and institutional changes at the level of an industry, region and nation [3].

Innovation is seen as “a complex activity which proceeds from the conceptualization of a new idea to a solution of the problem and then to the actual utilization of economic or social value” [4]. The concept includes “the intentional introduction and application within a role, group, or organization of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, organization, or wider society” [5].

Literature on innovation identifies two major types of innovation – open innovation and closed innovation [6][7][8] assuming that firms can use resources and knowledge both from their external environment (open innovation) and their internal organization (closed innovation) in order to attain economic goals [6][8][9]. Specialized literature on organizational learning emphasizes the difference between open and closed innovation as being based on exploratory and exploitative condition of innovation search process [10]. Innovation dimensions based on previously mentioned characteristics are presented in Figure 1 below.

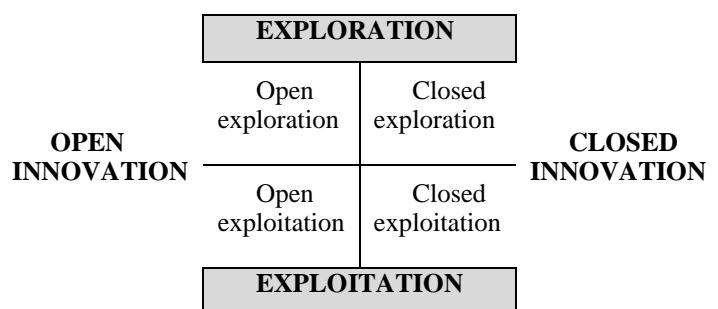


Figure 1. Open and closed innovation process research dimensions [8]

Open innovation is associated with open governance forms which enable access to a wider dimension of knowledge and which often provides a more powerful motivation for decentralized research that offers response to alternative types of problems that cannot be solved by managers. Felin and Zenger identified four major forms of open innovation governance [11]: (a) market/contracts; (b) partnership/alliances/corporate venture capital; (c) contests/platforms/tournaments and (d) user/community innovation.

Through its power and popularity, information technology – mostly hardware and communication

components - is considered the most reliable in the process of innovation as a result of its continuous advancement. Anyway, the process of innovation requires a careful consideration of both technical and human enablers [12] as the human resource is able to achieve the innovation goal even without information technology, but the information technology tools depends of human knowledge both to function and to be created.

III. SME Sustainability

Sustainability and sustainable development in the Romanian literature were considered synonyms even though in 1988 Lester Brown had written that sustainability, "the concept of support capacity, has already been used for a long while by biologists, but so far has hardly been taken into consideration by economists" [13].

As a consequence of the increasing importance of sustainable development, in 2000, in Friibergh (Sweden) the declaration on the promotion of sustainability science (Statement on Sustainability Science), was adopted which aims at improving substantially in terms of "the interactions between nature and society", taking also into account that during the last decades the development direction of mankind has not been sustainable and the need to reconcile social development goals with the environmental limits of the planet in the long-term require particular attention to the ways in which environmental changes affect society.

"The Sustainability science differs totally from other current fields of science, with regard to structure, method and content. It deals with new approaches connected to non-linearity, complexity, large gaps of time between economic and social actions and their consequences, the development of specific theories and semi quantitative models. Addressing the challenges of sustainability science requires a clearer delimitation of the responsibilities of the government, an improvement of democracy, a stronger awareness to citizens, new styles of institutional organization to strengthen and support interdisciplinary research, in the long-term, inclusively in developing countries, involving scientists, practitioners and citizens in setting priorities, creating new scientific knowledge, assessment of possible consequences and testing them in practice" [14].

"Business sustainability, defined as the ability to thrive without a foreseeable timeframe is treated as equivalent to the sustainable development concept implemented in the business world" [15]. In the long-term, the economic and societal interests converge; this term is often used in conjunction with and in some cases as a synonym for other terms such as "sustainable development" and "corporate social responsibility".

Enterprise sustainability admits that corporate growth and profitability are important; profit is also needed to pursue social objectives, especially those related to sustainable development - environmental protection, social justice and equity and economic development.

A review of the literature suggests that the concept of company sustainability borrows elements from four concepts: 1) sustainable development, 2) corporate social responsibility, 3) stakeholder theory and 4) the theory of corporate responsibility [30]. The contributions of these four

concepts and their relation with sustainable enterprise are illustrated in Figure 2.

To identify and use this convergence, managers need a strategic vision to ensure, on the one hand, the matching of internal factors determining success and, on the other hand, their alignment to societal determinants. The engagement of corporate societal responsibility is the contribution that the business can make to sustainable development and at the same time, an important factor for business sustainability.

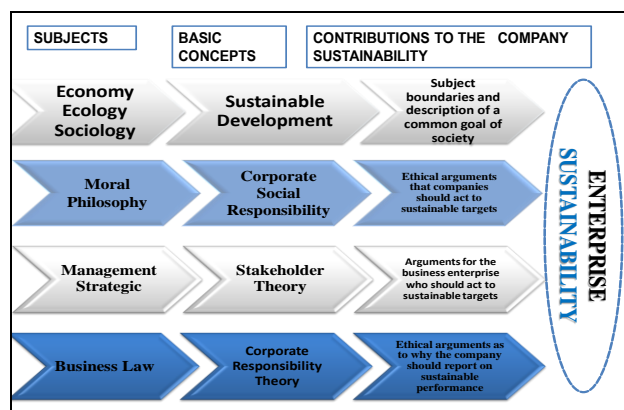


Figure 2. Evolution of enterprise sustainability (adapted from Wilson, [16])

The interdependence between business prosperity on the one hand, and social prosperity and integrity of the natural environment on the other hand, shows that any discussion on business sustainability loses its meaning if there is no reference to the conditions of sustainable development. In pursuing the sustainability of the business they run, managers need to incorporate into the business strategy objectives related to the social and natural environment, because, in the long-term the business, social and environmental concerns must converge.

The sustainable development implies the adoption of strategies to enable the company to meet the current demands of shareholders and other stakeholders and, at the same time, protect and improve human and natural resources that will depend on its future activities.

IV. Benefits of IT Use

Potential benefits of IT used in firms are depicted by Love and Irani in their empirical study in three major groups [17]: strategic benefits, tactical benefits and operational benefits, adapted to our context and operationalized in Table 1.

TABLE I. IT use benefits operationalization for innovation [17]

Strategic benefits	Tactical benefits	Operational benefits
<input type="checkbox"/> Reduced marketing costs;	<input type="checkbox"/> Improved response to changes;	<input type="checkbox"/> Improved data management;
<input type="checkbox"/> Improved market share;	<input type="checkbox"/> Improved teamwork;	<input type="checkbox"/> Improved communication;
<input type="checkbox"/> Improved	<input type="checkbox"/> Reduced time to	<input type="checkbox"/> Improved decision-

customer relations;	compile tenders;	making;
<input type="checkbox"/> Enhanced competitive advantage;	<input type="checkbox"/> Reduced time to prepare cost plans;	<input type="checkbox"/> Reduced bottlenecks;
<input type="checkbox"/> Improved organizational and process flexibility.	<input type="checkbox"/> Improved contract administration.	<input type="checkbox"/> Reduced labor costs;
		<input type="checkbox"/> Improved quality of output;
		<input type="checkbox"/> Improved ability to exchange data;
		<input type="checkbox"/> Improved forecasting and control.

assessed benefit of IT can be found in the following three tables (Table 2, Table 3 and Table 4).

TABLE II. Strategic benefits of IT use in innovation process

Strategic benefits	Average
Reduced marketing costs;	3.318
Improved market share;	3.590
Improved customer relations;	4.090
Enhanced competitive advantage;	3.954
Improved organizational and process flexibility.	3.909

Bruque and Moyano argue that the tensions provoked by the growth of firms are the main drivers of information technology adoption. They linked the growth of the firm with proactive change strategies (innovation) as a response to stakeholder's pressure (competitors, suppliers and customers) [18].

Debrell et al. address the issue of developing the capacity for sustained capacity and the need for incorporating innovation in the business strategy [19]. The strategy should refer to resource allocation for new products and collaborative structures options and processes of problem solving and connecting innovations with existing businesses [20]. King and Burgess regard IT as vital for this kind of capacity building [21].

v. A Pilot Study on Benefits of IT Use in SMEs' Innovation Process

A. Methodology

Following the framework provided by Love and Irani regarding benefits of use of IT for firms [17] and the firm activities indicators, depicted in Measurement framework of the Innovation Union Scoreboard [22], we have conducted a pilot survey of Romanian SMEs regarding IT benefits in their innovation process. Due to the narrow sample, only some descriptive statistics can be presented based on responses received, as more complex statistical analyses will not be representative for our population. Therefore, the following preliminary results are based on the responses extracted from 40 questionnaires applied to representatives of companies located in North-West Region of Romania. The questionnaire was applied via e-mail in May and June 2015 and 40 valid responses were obtained for a total of 43 questionnaires.

B. Preliminary Results

As our concern is about benefits the use of IT in the innovation process of SMEs we questioned our subjects about some of the benefits mentioned in Love and Irani paper [17] using a Likert scale from 1 to 5 where 1 = not at all, and 5 = to a great extent. The average results for each

One of the most appreciated strategic benefits from the use of IT in the innovation process is represented by improving relationship with customers, with an average score of 4.090 out of 5, followed by enhanced competitive advantage with 3.954 and improved organizational and process flexibility with 3.909.

TABLE III. Tactical benefits of IT use in innovation process

Tactical benefits	Average
Improved response to changes;	3.818
Improved teamwork;	3.727
Reduced time to compile tenders;	3.818
Reduced time to prepare cost plans;	3.681
Improved contract administration	3.954

Within the potential tactical benefits from the use of IT the respondents had pointed at the improved administration of contract with an average score of 3.954, followed by reduced time to compile tenders and improved response to changes, each one with an average of 3.818.

TABLE IV. Operational benefits of IT use in innovation process

Operational benefits	Average
Improved data management;	4.090
Improved communication;	3.954
Improved decision-making;	3.681
Reduced bottlenecks;	3.818
Reduced labor costs;	3.5
Improved quality of output;	4
Improved ability to exchange data;	4
Improved forecasting and control;	3.863

Regarding operational benefits from the use of IT in the innovation process, subjects emphasized the improved data management with an average score of 4.090, followed by improved communication (3.954) and improved forecasting and control (3.863).



Figure 3. Intellectual asset status

The most frequent intellectual asset within the questioned firms is the publications in specialized journals (36%), followed by community designs and community trademarks, each of them with 31% of the respondent firms. Patent applications and patent applications in societal challenges were at 63% and 72% respectively, of the questioned firms from Figure 3.

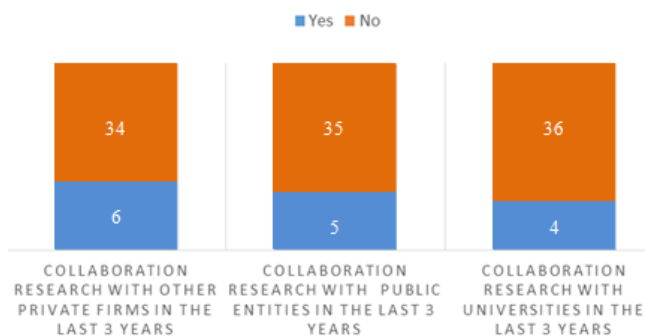


Figure 4. Intellectual asset status

Collaboration research activity in the respondent firm is weak as can be seen in the Figure 4. The most frequent research collaboration partners, as arising from this sample, are other private firms. Collaboration is known as a driver of innovation as it enables knowledge exchange between partners. A weak interaction between public-private sector is apparent.

VI. Conclusions and Following Research Direction

Information technology is known as innovation enabler due to its power to simplify work and although it requires consistent investment both in equipment as well in training of human resource, it provides strategic, tactical and operational benefits for the innovation process of SMEs that must be considered. Despite the small number of questioned subjects in our pilot study there are some trends that should be emphasized: 1) all the potential benefits of IT use were assessed with scores above 3 out of a 5 on Likert scale, 2) publications in journals are the most frequent intellectual property form used by SMEs and 3) collaboration research with other sectors beside the private one is rather weak.

The following step of the study implies a bigger sample that will allow us to establish relationships between individual characteristics of firms (e.g., size, operation region, legal status, activity sector) and other variables regarding the use of IT and innovation (types of IT benefits, financial allocation for R&D and innovation, collaboration research activity, etc.). Relationships between collaboration research activity and innovation, product destination market and innovation, financial allocation for innovation and innovation using statistical analysis methods will be our primary focus for the follow-up research.

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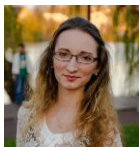
About Authors:



Dr. Elena Simina Lakatos is Adjunct Professor at the Department of Management and Economical Engineering as well as Financing Administrative Director at the Faculty of Machine Building, Technical University of Cluj-Napoca, Romania. Her main research interests is in the study of the innovation process of technology management, business and management, NGOs, entrepreneurship, sustainability companies, sustainable development, diffusion of innovations, applied economics and artificial intelligence. She is also the President of Center for Innovation and Sustainability of Organization.



Dr. Laura Bacali is a Professor and Vice-Dean at the Faculty of Machine Building, Technical University of Cluj-Napoca, Romania. She has a long experience in management, marketing, financial analysis and statistics. Moreover, she has published 6 books and over 140 papers, and has been involved in 51 grants and/or research contracts (out of which 15 are research grants within different programs with organisations such as the World Bank, Leonardo da Vinci, Tempus and other EU funded programs). Furthermore, Professor Bacali is member of several scientific research committees and scientific journals' editorial boards and in 2001 she gets the Romanian Academy Award "Victor Slavescu" for his book "Promoting Romanian Marketing Management".



Oana Bianca Bercea is a Phd. Student since 2014 at the Department of Management and Economical Engineering within Faculty of Machine Building, Technical University of Cluj-Napoca, Romania. Her main research interest is the study of local and regional socio-economic development, social economy and project management. Moreover, she holds a project manager position within a local private company dealing with the writing and implementation of national and european funded projects for public and private entities.



Carmen Maria Mureşan is a lecturer at the Department of Management and Economic Engineering inside the Faculty of Machine Manufacturing, Technical University of Cluj-Napoca. Her Ph. D was carried out in the field of Engineering and Management. The title of the thesis is "The role of marketing research for substantiating decision making processes in organizations". Her main scientific results are: 2 books, 1 lab guide, 20 indexed papers (ISI Proceedings, BDI or published in periodicals or unindexed volumes of conferences), 14 projects within the economic environment. Her areas of interest/ expertise are: modular mathematics, marketing research and entrepreneurship. She has skills in using the statistical software SPSS and Matlab.



Alina Moldovan is a Phd. Student since 2012 at the Department of Management and Economical Engineering within Faculty of Machine Building, Technical University of Cluj-Napoca, Romania. Her main research interest is marketing, neuromarketing, consumer behaviour, rsc and so on She holds a programs coordinator position at Center for Innovation and Sustainability of Organization.