proceedings

MDPI

Proceedings

Customization Model for Assessing the Commercial Potential of Technologies to Different Technology Manufacturing Branches: Development a Set of Factors †

Vaida Zemlickienė

Institute of Sustainable Construction, Vilnius Gediminas Technical University, Saulėtekio av. 11, 10223 Vilnius, Lithuania; vaida.zemlickiene@vgtu.lt

* Correspondence: vaida.zemlickiene@vgtu.lt; Tel.: +370-699-52163

† Presented at the 2th Entrepreneurship and Family Enterprise Research International Conference (EFERIC2018), Edinburgh, United Kingdom, 27–29 June 2018.

Published: 14 November 2018

Abstract: previously developed model for assessing the commercial potential of technologies is universal—dedicated for assessment technologies in all manufacturing branches. However, in the course of research has been established, that specifics of different technology manufacturing branches (DTMB) are important for assessing the commercial potential. Historically, several technology manufacturing branches had already positive results in Lithuania, they cover the most promising part of the national economy and are in line with EU priorities. For these reasons a decision was taken to customize the model for assessing the commercial potential of technologies to biotechnology, mechatronics, laser technology, information technology, nano electronics. The article presents development a sets of factors for assessment commercial potential for different technology manufacturing branches based on multiple criteria decision making (MCDM) methods. Afterwards sets of factors will be used as the research tool for determination meanings of factors values and the significance of factors for every manufacturing branche.

Keywords: assessment of the commercial potential; biotechnology (BT); mechatronics (MT); laser technology (LT); information technology (IT); nano electronics (NET)

1. Introduction

Most of the attempts to commercialize technologies ends in failure, and thus the ability to timely and objectively assess the expedience of technology commercialization, in order to avoid non-productive investments is a crucial step for the institutions engaged in scientific research and R&D. When the owner of technology, the potential investor must make a decision on the future of technology and to answer questions such as if it is worth developing the technology, investing in it or buying it? In order to answer these questions and to make the right decision, tools for assessing the commercial potential of technologies are in use.

In dissertation developed model [1] for assessing the commercial potential of technologies is universal—dedicated for assessment of technologies in all manufacturing branches. However, in the course of research it has been established, that specifics of DTMB are important for assessing the commercial potential. Both the dissertation and the scientific literature of the last year did not take into account the specifics of DTMB. Customization model for assessing the commercial potential of technologies for DTMB would allow achieving a more objective assessment of the commercial potential and a more rational use of resources.

The article presents development a sets of factors for assessment commercial potential of technologies in DTMB based on MCDM methods. Afterwards sets of factors will be reviewed by expert and will be used as the research tool for determination meanings of factors value and the significance of factors for every manufacturing branch.

2. Methodology for Development of a Sets of Factors for Assessing the Commercial Potential of Technologies for DTMB

Previously developed set of factors (Figute 1) [1] have been developed referring to the analysis of scientific literature [2–6], information sources provided by different organizations [7–10] expert survey and the principles suggested by V. Belton and T. J. Stewart [11]. A set of factors for the assessment of commercial potential of technologies is universal for all technology manufacturing branches. This complex of factors will be used as a guidelines in the analysis of the specifics of DTMB.

Analysing the expediency of existing factors and the need to add additional factors that will be used to develop tools for measuring the commercial potential of technology in DTMB it is important to take into account the specifics of the intended use method and the prospects for using the complex of factors. In recent years MCDM techniques have been suggested to choosing the optimal probable options. The main idea of the MCDM methods is to combine the values and significance of factors into a single criterion of multi criteria evaluation [12,13].

3. The Specifics of Different Technology Manufacturing Branches

With the help of the aforementioned literature, the author seeks to find out challenges and problems are faced representatives of DTMB in the process commercialization and realization of technologies.

It can be stated that the factors most relevant to the commercialization of BT are: financial environment (C) factor financing potential (C1) and predicted period of product development (C6) and evaluation of the durability of product and its importance for creating a recrudescent flow of income (C5). It is important to consider the factor ability to copy technology (D2) which belongs to the group of factors competitive environment (D) and the factor benevolence of national legislation for commercialization (G1) which belongs to the group of factors legal environment (G). It is important to emphasize that the factors which reflect a need of infrastructures, need of specialized staff and the consequences of patenting for the development of technology was not included in the complex of factors, therefore this possibility should be considered [14,15].

It can be stated that the most relevant factor in the commercialization of MT is the factors in the technology features (E) group of factors: complexity of technology (E1) as well as the problems that arise from it, are the relevant factors belonging to the competence of technology developers (F) group of factors: competence of scientific personnel in the technology commercialization (F1); competence of the personnel of the production department in the technology commercialization (F5). However, in assessing the competencies of MT developers, it is necessary to take into account the competence of mechanics, electronics and informatics specialists and the experience of the project manager [16,17].

The factors reflecting the specifics of LT and included in the complex of factors are: level of experiencing difficulty in use of the potential product (B4) in factor group value for the consumer (B); predicted period of product development (C6) in factor group financial environment (C). During the survey—process developing a flexible set of factors, factor dependence of technology functioning on geographical/climatic circumstances (E2) was emphasized. Also, a very important specific aspects only to the laser manufacturing industry is very high added-value products produced in a small quantity. This specificity may be reflected in these factors: predicted contribution of technology to the profit of the company (C3) and predicted share of the target market at the moment when a product is prepared for launching (A2). It is important to emphasize that the factor reflecting the infrastructure needs and the possibility to find the necessary specialists in the complex of factors has not been included, therefore this possibility should be considered [18–22].

Factors reflecting the specifics of IT and included in the complex of factors are: predicted period of product development (C6) in factor group financial environment (C); factor belonging to the legal environment; (G) group of factors benevolence of national legislation for commercialization (G1). The consequences of patenting for the development of technology factor would be expedient to include in the leagal environment (G) group [18,23].

Factors that reflect the specifics of NET and included into complex of factors are: predicted period of product development (C6) in factor group financial environment (C); complexity of technology (E1) in factors group technology features (E). The factor the consequences of patenting for the development of technology (G6) it is expedient to include in factors group legal environment (G) for legally not protected technologies and factor accessibility of specialized staff (F6) include in factors group competences of technology developers and related opportunities (F) [12,24].

4. Conclusions

Summarizing the issues of research, it is safe to say that the commercialization of branches is unique; therefore, in assessing the commercial potential of technology, it is necessary to take into account the specific of each of them.

Based on previously discussed specifics of BT, MT, LT, IT, NET, relevant factors for these branches was detected. Some of them are already included in the set of factors, others are proposed to be included. In many cases the same factors are relevant to DTMB which means that the set of factors to different branches will change slightly. Factors in the universal factor complex correspond to the common trends in the evaluation of the commercial potential of technology. It is possible to expect that the significance of the factors and the meanings of the factors values will be markedly different, for example because of different duration of time for technology development, scale of the meanings of factor values will be completely different due to time differences in technology development. A similar situation are with other factors: costs, legal regulation and other differences existing in branches and etc.

Author Contributions: V.Z. analyzed the data and independently wrote the paper.

Acknowledgments: This research is/was funded by the European Social Fund under the No. 09.3.3-LMT-K-712 "Development of Competences of Scientists, other Researchers and Students through Practical Research Activities" measure.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Zemlickienė, V. *Doctoral Dissertation: Assessment of the Commercial Potential of Technologies*; Vilnius Gediminas Technical University: Vilnius, Lithuania, 2015.
2. Cho, J.; Lee, J. Development of a new technology product evaluation model for assessing commercialization opportunities using Delphi method and fuzzy AHP approach. *Expert Syst. Appl.* **2013**, *40*, 5314–5330, doi:10.1016/j.eswa.2013.03.038.
3. Cooper, R.G. How companies are reinventing their idea-to-launch methodologies. *Res. Technol. Manag.* **2009**, *52*, 47–57, doi:10.1080/08956308.2009.11657558.
4. Dereli, T.; Altun, K. A novel approach for assessment of candidate technologies with respect to their innovation potentials: Quick innovation intelligence process. *Expert Syst. Appl.* **2013**, *40*, 881–891, doi:10.1016/j.eswa.2012.05.044.
5. Galbraith, C.S.; DeNoble, A.F.; Sanford, B.E. Predicting the commercialization progress of early-stage technologies: An ex-ante analysis. *IEEE Trans. Eng. Manag.* **2012**, *59*, 213–225, doi:10.1109/TEM.2010.2068050.
6. Hsu Ch, W.; Chang, P.L. Innovative evaluation model of emerging energy technology commercialization. *Innov. Manag. Policy Pract.* **2013**, *15*, 476–483, doi:10.5172/impp.2013.15.4.476.

7. European Patent Office. Available online: https://www.epo.org/searching-for-patents/business/ipscore.html#tab-1 (accessed on 11 July 2015).
8. International Islamic University Malaysia. Evaluation Criteria for Commercial Potential Award. Available online: http://www.iium.edu.my/irie/13/index.php/evaluation-criteria/8-iriie/15-commercial-potentialaward (accessed on 9 July 2015).
9. NASA (The National Aeronautics and Space Administration). Method of Selection and Evaluation Criteria. Available online: https://sbir.nasa.gov/solicit/58007/detail?l1=58014 (accessed on 15 December 2015).
10. WIPO. Exchanging Value: Negotiating. Technology. Licensing Agreements. Available online: http://www.wipo.int/edocs/pubdocs/en/licensing/906/wipo_pub_906.pdf (accessed on 1 March 2015).
11. Belton, V.; Stewart, T. *Multiple Criteria Decision Analysis: An Integrated Approach*; Kluwer Academic Publishers: Dordrecht, The Netherlands; Springer Science and Business Media: New York, NY, USA, 2002.
12. Hwang, C.L.; Yoon, K. *Multiple Attribute Decision Making Methods and Applications*; Springer: Berlin, Germany, 1981.
13. Ustinovičius, L.; Zavadskas, E.K.; Podvezko, V. Application of a quantitative multiple criteria decision making (MCDM-1) approach to the analysis of investments in construction. *Control Cybern.* **2007**, *36*, 251–268.
14. Volpatti, L.R.; Yetisen, A.K. Commercialization of microfluidic devices. *Trends Biotechnol.* **2014**, *32*, 347–350, doi:10.1016/j.tibtech.2014.04.010.
15. Vu, C.H.T.; Lee, H.G.; Chan, Y.K.; Oh, H.M. Axenic cultures for microalgal biotechnology: Establishment, assessment, maintenance, and applications. *Biotechnol. Adv.* **2018**, *36*, 380–396, doi:10.1016/j.biotechadv.2017.12.01.
16. Neumann, F. Chapter 2: Mechatronic Product Development. In *Book Analyzing and Modeling Interdisciplinary Product Development*; Springer Fachmedien: Wiesbaden, Germany, 2015; pp. 23–32, doi:10.1007/978-3-658-11092-5_2.
17. Stetter, R.; Pulm, U. Problems and chances in industrial mechatronic product development. In Proceedings of the International Conference on Engineering Desing, Stanford, CA, USA, 24–27 August 2009.
18. Kiškis, M.; Limba, T. *Monografija: Biotechnologijų MVĮ Intelektinės Nuosavybės Strategijos*; Mykolo Romerio Universitetas: Vilnius, Lithuania, 2016; ISBN 978-9955-19-842-0.
19. Lithuanian Laser Association. Laser Technologies in Lithuania. Available online: http://www.ltoptics.org/uploads/documents/Laser%20Technologies%20in%20Lithuania.%202017.pdf (accessed on 29 May 2018).
20. Soo, C.; Tian, A.W.; Teo, S.T.; Cordery, J. Intellectual capital–enhancing HR, absorptive capacity, and innovation. *Hum. Resour. Manag.* **2017**, *56*, 431–454, doi:10.1002/hrm.21783.
21. Tsai, C.H.; Wu, H.W.; Chen, I.S.; Chen, J.K.; Ye, R.W. Exploring benchmark corporations in the semiconductor industry based on efficiency. *J. High Technol. Manag. Res.* **2017**, *28*, 188–207, doi:10.1016/j.hitech.2017.10.007.
22. Vasantha, G.; Roy, R.; Corney, J. Challenges and Opportunities in Transforming Laser System Industry to Deliver Integrated Product and Service Offers. In *Working Conference on Virtual Enterprises*; Springer: Berlin/Heidelberg, Germany, 2014; pp. 127–134, doi:10.1007/978-3-662-44745-1_12.
23. Park, J.H.; Kim, Y.B.; Kim, M.K. Investigating factors influencing the market success or failure of IT services in Korea. *Int. J. Inf. Manag.* **2017**, *37*, 1418–1427, doi:10.1016/j.ijinfomgt.2016.10.004.
24. Ferreira, A.; Franco, M. The mediating effect of intellectual capital in the relationship between strategic alliances and organizational performance in Portuguese technology-based SMEs. *Eur. Manag. Rev.* **2017**, *14*, 303–318, doi:10.1111/emre.12107.

© 2018 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (http://creativecommons.org/licenses/by/4.0/).