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**THE OBJECTIVES, EFFECTS AND BARRIERS
OF USER-DRIVEN INNOVATION IMPLEMENTATION
IN R&D DEPARTMENTS OF SMES**

**CELE, EFEKTY I BARIERY WYKORZYSTANIA
KONCEPCJI “USER-DRIVEN INNOVATION”
W DZIAŁACH B+R PRZEDSIĘBIORSTW SEKTORA MŚP**

Abstract: One of the newest concepts of creating innovations is “user – driven innovation” (UDI) – a concept that is based on “lead user” concept by E. von Hippel. The paper introduces the results of research carried out in nineteen R&D departments in Poland functioning within companies belonging to SMEs sector. The main purpose of the research was to find the basic goals of implementing UDI to R&D departments, as well as effects and barriers of those actions. The findings may be interesting to both scientific audience, as well as companies’ management who is concentrated to develop innovations that are based in R&D.

Keywords: management, innovation, R&D, user-driven-innovation

Streszczenie: Jedną z najnowszych koncepcji tworzenia innowacji jest user-driven innovation (UDI) – bazująca na koncepcji „wiodącego użytkownika” E. von Hippela. Artykuł prezentuje wyniki studium przypadków przeprowadzonych wśród 19 działów B+R przedsiębiorstw w Polsce należących do sektora MSP. Głównymi celami badań było określenie determinant implementacji koncepcji UDI w działach B+R, a tym samym znalezienie głównych celów, efektów i barier zastosowania tej koncepcji. Wyniki badań mogą być interesujące nie tylko dla środowiska naukowego, ale także dla osób zarządzających przedsiębiorstwami, które nakierowane są na tworzenie innowacji w ramach prowadzonej działalności B+R.

Słowa kluczowe: zarządzanie, innowacje, B+R, innowacje, innowacje kreowane przez użytkownika

Introduction

One of the main areas, currently underlined in the literature, and resulting from the “lead user” theory is cooperation with users in the field of creating new or improved products. This is due to the fact that the client’s position has been gradually changing over the last 30 years - from the passive recipient to the active co-designing within the framework of value creation.

The use of external knowledge requires the integration of external resources with internal competences, especially in the field of research and development activity. However, in order to take into account strategic R&D goals, companies should pay attention to the proper integration of new ideas coming from external sources, in particular from the actual users. Cooperation with users, as part of UDI concept, in the scope of conducted research works is, in the author’s opinion, a milestone in building a new approach to the processes of managing R&D departments. Hence the importance of the research problem analyzed in this paper. The results of conducted research are the contribution to the literature gap on the subject concerning the conditions of using modern concepts of creating innovation, which is undoubtedly UDI.

The presented factors are therefore the reason for undertaking research within UDI concept in shaping R&D in enterprises in Poland. The issue of formulating recommendations regarding the activation of the R&D sector in enterprises using the UDI concept is not fully recognized and despite its importance in the theory and practice of manage-

ment, there is a lack of research and publications similar to this paper. The main purpose of the work is to identify the most important goals, effects and barriers related to the use of the user-driven innovation concept (UDI) in research and development departments in surveyed small and medium-sized enterprises in Poland.

1. User-driven innovation – theoretical background¹

The basis for the concept of user driven innovation (UDI) is the departure from closed concepts to open innovations (a concept developed by H. Chesbrough). The concept of open innovation is based on extensive cooperation with external entities and the integration of internal and external knowledge. It also gives the opportunity to use many ways to bring innovation to the market². According to this concept, all market participants are the source of knowledge in the innovation process, thanks to which it is possible to use various ideas and shorten the duration of the innovation process³.

The UDI concept has been developed parallel to the theory of open innovation, as a result of the evolution of “lead user” concept. It was based based on changes in the approach to the innovation process, i.e. focusing on users as a innovationdeterminant. The importance of close links with user needs is due to several facts:

- most of the new products are commercial errors that force enterprises to seek new sources of innovation⁴,
- users have become more active and effective in communicating, and thus working on independent and co-author projects, which is facilitated by modern technology, including the possibility of using the Internet⁵,
- services as a sector of the economy have expanded the group of entities dealing with innovation, which are created in cooperation with users⁶.

Scientists also noticed the potential of users as partners in creating new products (new product development)⁷. For example, E. von Hippel defined the involvement of users in

¹ The theoretical material used in the article comes from the author's book published in Polish: K. Szopik-Depczyńska, *Koncepcja innowacji kreowanej przez użytkownika w działalności badawczo-rozwojowej przedsiębiorstw*, Wydawnictwo Uniwersytetu Szczecińskiego, Szczecin 2018.

² B. Mierzejewska, *Open Innovation – nowe podejście w procesach innowacji*, „E-mentor” 2008, No. 2(24).

³ H. Chesbrough, *The era of open innovation*, „MIT Sloan Management Review” 2003, No. 3 (44), s. 35–41; B. Sieniewska, *Otwarty model innowacji – nowe podejście do działalności badawczo-rozwojowej*, [in:] *Komputerowo zintegrowane zarządzanie*, t. 2, R. Knosala (ed.), Oficyna Wydawnicza Polskiego Towarzystwa Zarządzania Produkcją, Opole 2010, p. 448–455.

⁴ R. Balachandra, J. Friar, *Factors for success in R&D projects and new product innovation*, „IEEE Transactions on Engineering Management” 1997, No. 44 (3), p. 276–287.

⁵ J. Howe, *Crowdsourcing: Why the Power of the Crowd Is Driving the Future of Business*, Crown Publishing Group New York 2008, p. 22.

⁶ A. Kuusisto, J. Kuusisto, *Customers and users as drivers and resources of new service development: Three approaches towards user needs driven service innovations*, Proceedings of the 11th International CINet Conference 2010, vol. 9 (1), p. 5–7.

⁷ F.T. Piller, D. Walcher, *Toolkits for idea competitions: a novel method to integrate users in new product development*, „R & D Management” 2006, vol. 36, z. 3.

the innovation process as a customer-active paradigm, later developing this theory to be more focused on the impact of the “lead user” on the innovation activity of enterprises⁸.

Starting from 2005, when the UDI concept began to take shape, no single, universally binding definition of UDI was developed. One definition, well reflecting the idea of UDI, defines it as “a phenomenon in which new products, concepts, processes, distribution systems, marketing methods, etc. are inspired or are the result of the needs, ideas and opinions of users; UDI includes existing and / or potential users, and processes are based on systematic actions that search, recognize, select and understand explicit as well as implicit knowledge and ideas of users”⁹. The subject of innovations coming from users is still widely discussed in the subject literature in the context of the leading user paradigm¹⁰. The leading user was the object of interest of E. von Hippel, already in the late 1970s, who formulated the terms – “active customer paradigm” or “lead user”. He developed a very different view on innovations, arguing that users are just as important or even more important than producers, and sources of innovation should be seen in modern societies. The concept of “user-driven innovation” (UDI), which offers a systematic approach to customer-oriented open research and development, as previously mentioned, is an extension of “lead user” concept von E. von Hippel¹¹. Currently, broad competences are being used as part of an extended network, which includes in particular the competence of users¹². In this context, the ability to integrate users into the R&D activity may be a decisive factor of R&D project success, although due to the increasing complexity, it may pose a challenge for the organization. Focusing on the product functions mostly preferred by the target customer, the duration and costs of the product development process as part of R&D, through cooperation with users, can be lowered¹³. Thus, responding to users needs in an optimal way can positively affect the effects of research and development activity and product development in enterprises, ultimately leading to diffusion of innovation¹⁴.

2. Methodology

Empirical research was carried out from November 2017 to April 2018. The first database covered 678 enterprises. The next step was separating enterprises that use the

⁸ E. von Hippel's research at the time concerned the operation of industrial enterprises: E. von Hippel, *Lead users: A source of novel product concepts*, „Management Science” 1986, vol. 32 (7), p. 791-805.

⁹ A.M. Hjalager, S. Nordin, *User-driven innovation in tourism: A review of methodologies*, „Journal of Quality Assurance in Hospitality & Tourism” 2011, vol. 12 (4), p. 290.

¹⁰ G.L. Urban, E. von Hippel, *Lead users analyses for the development of new industrial products*, „Management Science” 1988, vol. 34 (5), p. 569-582.

¹¹ F. Steinhoff, H. Breuer, *Customer-centric open R & D and innovation in the telecommunication industry*, Proceedings of the 16th International Product Development Management Conference on Managing Dualities in the Innovation Journey, Twente, Netherlands 2009.

¹² C.K. Prahalad, V. Ramaswamy, *The future of competition: co-creating unique value with customers*, Harvard Business Press 2004.

¹³ G.L. Urban, E. von Hippel, *Lead users analyses...*, p. 569-582.

¹⁴ E.M. Rogers, *Diffusion of innovations*, Free Press, New York 2003.

UDI concept (December 2017 and January 2018). On the basis of preliminary telephone conversations with representatives of all selected enterprises to be examined (contact was made primarily with employees of R&D departments), enterprises were identified that confirmed active participation of users as part of R&D activities and creation of innovations on that basis. Such participation was confirmed only by 20% of respondents, which means that only 137 enterprises were qualified for the next stage of the study. The study was conducted using an electronic questionnaire (Google Forms). The CATI data collection technique was used¹⁵. As a rating scale - the Lickert scale was used. In the end, the survey was completed by representatives of research and development departments of 57 enterprises of which the small and medium enterprises (SMEs) group is 19 companies. The research findings are therefore based on those 19 cases. Considering this, as well as the innovative nature of the work and hence the inability to refer to the results obtained by other researchers, according to quantitative and qualitative criteria, the results can be treated only as a form of expanded case study.

3. Empirical research

Table 1. Percentage of solutions created using UDI in R&D departments in surveyed SMEs in Poland in 2015-2017

Tabela 1. Odsetek rozwiązań utworzonych przy użyciu UDI w działach B+R badanych MŚP w Polsce w latach 2015-2017

Percentage of solutions created using UDI in R&D departments in surveyed SMEs in 2015-2017	Frequency	%
11-30	7	36,8
31-40	6	31,6
41 and more	6	31,6

Source: own study based on the conducted research.

The research results show that in the case of the SME sector, in the largest number of surveyed enterprises, 11-30% of solutions created in R&D departments come from the use of UDI concept. This response was indicated by 36.8% of the surveyed SMEs. The survey also asked whether in the next three years a change in this parity is planned. It turned out that 58% of surveyed R&D departments plan to increase the use of UDI in the next three years, and 89% plan to remain at this level, which is an additional, important conclusion resulting from the conducted research.

¹⁵ *Computer-assisted telephone interviewing* – a method of gathering information in quantitative market and public opinion research, an interview with a respondent conducted by telephone, in which the interviewer reads the questions and then notes the answers obtained, using a special computer script.

4. Main objectives of using UDI in R&D departments in surveyed enterprises representing SMEs sector

Regarding the frequency of responses regarding the purpose of using UDI in the R&D departments, the results are presented in Table 2.

Table 2. Purpose of using UDI in R&D departments in surveyed SMEs in Poland in the years 2015-2017

Tabela 2. Cel wykorzystania UDI w działach B+R w badanych przedsiębiorstwach MŚP w Polsce w latach 2015-2017

Purpose of using UDI in R&D departments in surveyed SMEs	Definitely yes	Rather yes	Hard to say	Rather no	Definitely no
	frequency	frequency	frequency	frequency	frequency
Increase of sales	8	3	3	3	2
Reducing dissatisfaction with the product	2	0	0	3	14
Creating closer relationships with users	16	2	0	0	1
Reducing the costs of research and development	14	1	2	1	1
User help in solving problems related to the product	0	0	0	2	17
Positive impact on the brand image	16	3	0	0	0
Acquiring ready solutions	0	0	0	6	13
Improving existing products	17	2	0	0	0
Evaluation of the implemented products	17	2	0	0	0
Personalization of the offer	4	5	0	6	4
Better matching of the offer to the needs of users	15	3	0	0	0
Following the trends visible among users	14	5	0	0	0
Gaining knowledge about current users	18	1	0	0	0
Gaining knowledge about potential users	3	4	0	7	5
Lowering the costs of acquiring customers	5	8	0	2	4

Source: own study based on the conducted research.

From the data presented in the table regarding the purpose of using UDI in R&D departments of surveyed SMEs, the basic result is that the main objectives of cooperation with users in R&D departments are:

- positive impact on the brand image,
- improving existing products,
- evaluation of the implemented products,
- following the trends visible among users,
- gaining knowledge about current users.

The results of research concerning studied enterprises from SMEs sector are slightly different than for all analyzed group of enterprises (including the largest group - large enterprises). For small and medium-sized enterprises slightly less important turned out to be the goal “better matching the offer to users needs”, not matching the group of the most important goals for all surveyed enterprises, with the maximum number of responses.

The next places (apart from the most important ones) were: better matching the offer to users needs, creating closer relationships with users, reducing the costs of research and development activity. These results do not differ significantly from the results for all surveyed enterprises (including large ones).

In addition it can be seen that all respondents representing the surveyed enterprises from SMEs sector did not agree that users help in solving problems related to the product. Moreover, acquiring ready solutions were as well not the main goal for UDI usage in R&D departments of surveyed SMEs. It is also a confirmation that regardless of whether the analyzes concern the SMEs sector or the total number of surveyed enterprises, these goals are not important from the point of view of undertaking UDI activities in enterprises' R&D departments.

5. The effects of using UDI in R&D departments in surveyed enterprises representing SMEs sector

The frequency of responses regarding the effects of UDI usage in R&D departments in surveyed SMEs is presented in Table 3.

Table 3. Effects of using UDI in R&D departments in surveyed SMEs in Poland in the years 2015-2017

Tabela 3. Efekty zastosowania koncepcji UDI w działach B+R w badanych przedsiębiorstwach MŚP w Polsce w latach 2015-2017

The effects of using UDI in R&D departments in SMEs	Definitely yes	Rather yes	Hard to say	Rather no	Definitely no
	frequency	frequency	frequency	frequency	frequency
For the needs of the company (eg. process optimization, costs)	13	3	0	0	3
To create (refine) products offered on the market	13	3	0	3	0
Obtaining feedback from the user about the implemented product	14	5	0	0	0
User's participation in the R&D process	8	10	0	0	0
Product testing	11	8	0	0	0
Product prototyping	6	3	0	4	6
Product exploration	5	5	0	5	4
Getting to know the ideas of users	15	4	0	0	0

Source: own study based on the conducted research.

The results of the study showed that in terms of the effects of UDI usage in R&D departments of the surveyed enterprises representing SMEs sector, the most important were:

- obtaining feedback from the user about the implemented product,
- user's participation in the R&D process,
- product testing,
- getting to know the ideas of users.

Therefore, it can be concluded that in terms of the effects of using UDI in R&D departments in surveyed SMEs, the results are not different from that of large enterprises. These are, therefore, the most important effects from the point of view of managing R&D departments' activity in all enterprises, not only representing the SMEs sector, but generally – the whole range of surveyed enterprises and their R&D departments.

6. Barriers of using UDI in R&D departments in surveyed enterprises representing SMEs sector

The results of the research in terms of barriers to the use of UDI in R&D departments of surveyed SMEs are presented in Table 4.

Table 4. Barriers to UDI usage in R&D departments in surveyed SMEs in Poland in 2015-2017
Tabela 4. Bariery w stosowaniu koncepcji UDI w działach B+R w badanych przedsiębiorstwach MŚP w Polsce w latach 2015-2017

Barriers to the use of UDI usage in R&D departments in surveyed SMEs	Definitely yes	Rather yes	Hard to say	Rather no	Definitely no
	frequency	frequency	frequency	frequency	frequency
No financial resources	0	4	1	10	5
No external sources of financing	0	0	5	4	10
Lack of qualifications and skills of employees in the field of R & D support by UDI	8	0	3	5	3
No information about the needs of users	0	0	2	11	6
Difficulties in cooperation within UDI	9	0	3	4	3
High risk of misinterpretation of knowledge coming from users	15	0	2	1	1
Difficulty in choosing the best among many ideas of users	10	0	5	3	1
No infrastructure for proper communication with the user within UDI	0	0	2	1	16
Lack of system tools (state policy) to stimulate the use of UDI as part of enterprises' activities	8	0	5	2	4

Source: own study based on the conducted research.

The research results showed that the main barriers to the UDI usage in R&D departments in surveyed SMEs are:

- high risk of misinterpretation of knowledge coming from users,
- difficulty in choosing the best among many ideas of users,
- difficulties in cooperation within UDI.

Thus, the results of research show that for SMEs, the barrier – difficulty in choosing the best among many ideas of users, turned out to be more important than for all 57 surveyed R&D departments, where this answer was in third place. In turn, the answers: lack of qualifications and skills of employees in the field of R&D support by UDI as well as the lack of system tools (state policy) to stimulate the use of UDI as part of enterprises' activities, found themselves in the last places (*ex aequo*). It therefore follows that for all surveyed enterprises and their R&D departments in which large enterprises predominate, state policy's tools to stimulate the use of UDI and staff qualifications are more important factors determining R&D departments' activities than for small and medium-sized enterprises.

Conclusions

Based on the conducted research, it can be concluded that in relation to the objectives of implemented UDI activities in the surveyed enterprises representing SMEs sector, the expectations associated with the use of this concept, it is primarily to direct product development in terms of users' needs.

In turn, in terms of the effects of using UDI in R&D departments in surveyed enterprises representing SMEs sector, the most important is the direct impact of consumers on product development and implementation.

Taking into account the barriers to this type of activity of the surveyed R&D departments of enterprises representing SMEs sector, it can be concluded that the most important is the risk associated with incorrect interpretation of solutions suggested by users or the risk associated with incorrect sampling. Research and development activity is expensive, and many investments in this area often do not bring the expected benefits. In particular, for small and medium enterprises, high risk and financial investments are the main obstacles to the activation of R&D.

The application of "user-driven innovation" concept can be a way to stimulate research and development activity in enterprises. It can also allow to acquire necessary knowledge from users that can be used while designing products in R&D departments. Eventually, the usage of UDI can lead to implementation of products that will meet the needs of current and potential users. This is favored by modern technology - the Internet and social media, enabling communication and cooperation between increasingly numerous users.

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