The Absorptive Capacity of a Finance Company as an Efficiency Factor of Its Pro-technology Innovation Activities

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Abstract In today's turbulent and challenging world it is not an organization's internal research and development activity that is the leading source of innovation, but the organizational environment. As a consequence, transfer of innovative technologies is a tool commonly used to enhance a company's development. The effectiveness of this undertaking is determined primarily by the technology recipient's absorptive capacity which is responsible for acquiring strategically valuable technology, its effective assimilation, and using it with desired results in mind. Thus, a company should guarantee the realization of goals it sets for itself when deciding to engage in technology transfer by maintaining a proper perfection level of these specialized abilities.

In this paper, the authors make an attempt to gauge the absorptive potential of finance companies operating in Poland in terms of their efficiency in transferring innovative technologies; all based on a survey. As it turns out, realization of this potential confirmed the assumptions made by the authors, hence it has been concluded that how well developed financial companies' absorptive capacities are has an actual influence both on direct and indirect effects of innovative pro-technology activities based on external sources, which economically justifies making investments in further development of those absorptive abilities.

Keywords Absorptive capacity • Innovation • Technology transfer • Efficiency • Finance company

1 Introduction

A company's efficiency defines its actual capability to carry out a strategy and accomplish planned objectives, and in consequence improve its market position and financial outcomes (Skrzypek 2012). Thus its increase is highly desirable in all

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T. Dudycz et al. (eds.), *Efficiency in Business and Economics*, Springer Proceedings in Business and Economics, https://doi.org/10.1007/978-3-319-68285-3_5

fields of company activity, both operational and strategic, ongoing and developmental, which also includes fields of innovation.

Innovation is an extremely important factor in the ability of any company to compete effectively, which is why every company should aim at reaching a high level of innovation. A serious obstacle in this respect turns out to be a company's limited potential, resulting from limited access to assets, especially intellectual and organizational ones. In such conditions, it seems more than reasonable to use external sources of innovation, which translates into searching the environment for knowledge and ready-made solutions, and supporting other specialized business entities. According to learning organization theory, the factor responsible for the effectiveness and efficiency of these actions is the company's absorptive capacity, which is meant to acquire, transform and utilize all assets necessary for innovation activity (Zahra and George 2002). Assuming the existence of the presented connection, companies should be extremely interested in the development of their absorptive capacities. What is more, the stronger the dependence, the more effort should be made to develop their capacities in order to ensure long-term success.

Taking into account the significance of the abovementioned assumption, the main goal of this paper is to assess the actual influence of the absorptive capacity of finance companies operating in Poland on their efficiency in the field of innovative technology transfer. The realization of this goal, based on the results of a survey conducted in the Polish finance-company sector is aimed at answering the question of whether how well developed the absorptive capacity of any finance company is, has an actual influence on direct and indirect results of pro-technology undertakings based on external sources. The question arises whether it is thus worth investing in the development of absorptive capacity expecting concrete gains in terms of assets, market position and finances, both in an operational and strategic sense.

2 The Role of Absorptive Capacity in Pro-technology Innovation Activities

Every company—regardless of its size, value or market position—is in possession of strictly defined, and at the same time limited assets, which determine its potential. The value of this potential, resulting from the structure, volume and quality of its constituents, determines the company's capacity, both in terms of its ongoing operations and developmental prospects. However, this capacity can be significantly boosted by the potential of various external entities from the company's environment.

A company thus has two general ways to increase its efficiency and build up its competitive position. Firstly, it can do it by itself, solely on the basis of its own assets or secondly, jointly with other entities, making use of their wealth. At present, the latter option seems undoubtedly more justified, since in this period of environment turbulence even the largest companies are forced to constantly

develop their competitiveness in cooperation with other entities (Stankiewicz 2005). What is more, the demanding conditions of operating in a strongly competitive and global environment make it literally impossible for any company, even one with enormous financial potential, to independently generate within an organization any knowledge which would effectively and efficiently determine its manner of operation (Nizard 1991). It has become customary to assume that an organization, operating in an open system, is unable to single-handedly generate all relevant assets to ensure its survival while at the same time of efficient functioning, is engaging in cooperation with other entities (Pfeffer and Salancik 1978).

The main area of study undertaken in this paper is pro-technology innovation activity. One of the tried and tested ways of boosting the efficiency of innovation activities is cooperating with external entities in order to make use of available and often tested solutions from the company's environment. Results from empirical studies directly indicate that by combining external sources of knowledge and innovation with a company's own assets equates to increasing the efficiency of the process of creating its intellectual property and innovation by reducing costs and achieving higher profits from commercializing these innovations (Bae and Chang 2012). Cooperation with other organizations may provide a company with measurable benefits that would be otherwise unattainable. The most important of these are: increased efficiency by obtaining economies of scale, transfer of technological solutions, raising the innovation level, and at the same time the competitiveness of cooperating companies, as well as the possibility of undertaking investments due to the accumulation of financial assets (Ford et al. 2003; Child and Faulkner 1998).

One of the key objectives within innovation management is shaping the optimum conditions for undertaking innovative activity, while taking into account that creating innovation is a process which goes beyond the borders of an organization (Guinet 1995). As a rule, innovations are created in the course of cooperation and for the purpose of satisfying the needs of other entities functioning in the market environment. Bearing in mind that a company is in possession of particular and at the same time limited assets, it can obtain results beyond its potential by appropriate forms of collaboration and involving external entities in their R&D activities (Freeman 1991). Within the concept of open innovation, it has been directly stated that cooperating with surrounding entities in the process of making innovations should be emphasized. It is considered necessary to re-orient R&D activities based on an organization's internal assets towards developing the ability to acquire knowledge from external entities and aiming to fully utilize already existing intellectual property and innovation (Chesbrough 2006). The foremost advantage resulting from cooperating on innovative activities includes the opportunity to reduce expenses by eliminating the replication of R&D undertaking of individual cooperators (Zander 1999).

It thus seems fully justified to use external sources of innovation. In fact, every company should arm? itself with outside assets, including acquired knowledge, organizational systems, product solutions and innovative technologies, which may come from other companies, R&D institutions, universities, government laboratories etc. (Narayanan 2001).

At present, it seems difficult to even imagine a company which would not make use or not be interested in perfecting its potential by means of knowledge and technology transfer, especially when one takes into account that a necessary condition for survival on a more and more radically changing market is the need for flexibility in terms of technological development strategy, resulting from the necessity to react to and anticipate quickly market changes, in addition to flexibility of technology conditions, flexibility in creating a company's offer, and tailoring it to its customers' needs (Timmor and Rymon 2007). The way a company operates, including technology management, should thus permit this institution enough leeway to make necessary, sometimes even radical modifications when faced by a market's new expectations. In such conditions, the best way to introduce successful technological innovation may be its transfer.

Making use of other companies' scientific and technological achievements is common practice in economy, partly because it is the quickest, the most economical, the least risky, and sometimes even the only possible way to obtain new technological solutions. Even if the practice of technology transfer is not as optimistic, it should nevertheless be assumed that self-developing technology usually carries greater risk, takes longer, and costs more than acquiring and adapting previously developed technology from outside sources (*Course*... 2001).

It is true that the essence of technology transfer concerns the utilization of already existing knowledge, unlike R&D activity, which means further development or creating new (Trott 2008). However, the transfer of already existing and exploited technologies allows a company to prevent the creation of a technological gap developing in relation to its market rivals, especially in situations of limited capabilities. Despite the fact that the change obtained in this manner is considered an innovation only from the point of view of the company which introduces it, it provides the basis for achieving certain economic results and exercising control, in the sense of helping an organization to keep up with its competitors (Griffin 2016). It is also possible, and even desirable, that technology is transferred from its original source, such as from research facilities, which conducted basic, applied and developmental studies. Such technology providers may give a company a competitive or perhaps long-term advantage, offering benefits resulting from developing the technology independently within an organization, provided exclusive rights to the acquired knowledge are secured.

The effectiveness and efficiency of a company's innovation activity based on external sources are determined by its absorptive capacity. As an element of innovation potential (Zastempowski 2010), it determines the company's abilities to assess the value of new knowledge, acquire and use it for commercial purposes, which translates into generating new market value within the company's offer (Cohen and Levinthal 1990). In other words, it conditions an organization's ability to evaluate new knowledge, acquire it, and use it for the purpose of cooperation with its environment (Van den Bosch et al. 1999). The absorptive capacity is thus meant to serve the purpose of acquiring technological knowledge from the environment, and transforming it into innovation, based on an organization's existing knowledge. Its function is not limited to just gaining knowledge, but also to absorb,

process and in particular to use this knowledge for the company's development through introducing innovation and increasing efficiency. It should be remembered that knowledge absorbed from the environment is a valuable asset for a company as long as it constitutes an actual source of generating new value within it, which facilitates the accomplishment of the desired result in the competition process. This means that absorptive potential is viewed also as the ability to learn from other organizations by engaging in interactions with them (Lane and Lubatkin 1998), thus solving an organization's internal problems (Cohen and Levinthal 1990). The concept of absorptive capacity, due to its significance and the interest it raises, is visibly evolving, as a result of which it is being modified and extended. Among others, it has been significantly modified by S.A. Zahra and G. George, who perceived absorptive capacity as a dynamic ability to create knowledge and utilize it, thereby increasing a company's potential to produce innovation and maintain competitive advantage (Zahra and George 2002). The ability's dynamic character means that it is supposed to undergo changes, be adjusted to the organization's functioning conditions and include procedures and processes of operation. A general model of the concept of absorptive potential is briefly presented by Fig. 1.

A special example of using absorption capacity is the acquisition of technology from the environment. In this case, absorptive potential should be understood as a set of specialized assets, especially non-tangible ones, which allow a company to effectively obtain, assimilate and use new and strategically valuable technologies in order to accomplish its desired results (Glabiszewski 2016). It thus defines the structure of direct sources and stimuli of desired activity, aimed at absorbing innovative technologies. It should be assumed that the absorptive potential in relation to technology transfer is expressed by the ability to conduct successful absorption of technology, meaning one in which a relevant technology is acquired, then appropriately applied, with possible adaptations and development considered, and finally utilized in a manner which would allow for the effective gain of competitive advantage (Glabiszewski 2015). It thus determines the extent to which a company is able to recognize the value of a new technology in its environment, and consequently acquire, assimilate, and use it for the realization of its goals, which results in a growth of its innovation and flexibility, and in consequence influences the level of profits gained during a competitive process (Miles 2012).

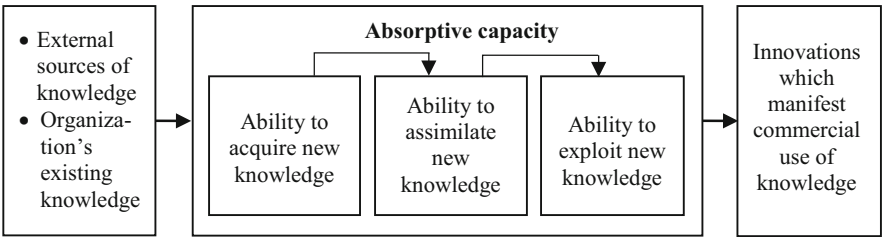

Fig. 1 Absorptive capacity model

It turns out that the extent of using the absorptive potential in the process of innovative technologies transfer is not limited to simply acquiring a new technology, applying, adapting or perfecting it, but also includes such actions that lead to the company's achieving of expected, and at the same time desired, results (Glabiszewski and Zastempowski 2016). Hence, the outcomes obtained as a consequence of technology transfer serve as a basis for evaluating the effectiveness and efficiency of the process and using absorptive capacity as part of it.

3 Methodology and Hypotheses

The empirical part of the article was written on the basis of research findings obtained in 2014–2015 by means of an online survey using a CSAQ-a Computerized Self-Administered Questionnaire (Tourangeau et al. 2013), in which the respondents filled in a digital version of the survey questionnaire available online. It was sent to the heads of 155 commercial financial sector companies registered in Poland, namely all banks, property and life insurance companies, investment funds (TFI) and universal fund management companies (PTE). In total, 108 entities filled in the online survey questionnaire, constituting 70% of the population under study. Analysis is based on the results from 37 TFIs, 26 banks, 19 property insurance companies, 17 life insurance companies and 9 PTEs.

The research conducted was the primary source of data essential for realizing the article's main empirical objective, which was evaluating the influence of absorptive capacity of finance companies operating in Poland on their activities following their transfer of innovative technologies. In order to accomplish the formulated main objective, the authors formulated two specific objectives:

1. To evaluate the impact of the development level of finance companies' in Poland absorptive capacity at the level of direct and indirect results obtained in the process of transferring innovative technologies.
2. To evaluate the impact of the development level of a company's absorptive capacity on changes of the ROA indicator which occurs as a result of transferring innovative technology.

In attempting to accomplish their specific objectives, and at the same time the article's main objective, the authors formulated and empirically verified three research hypotheses:

H1. The level of development of financial companies' absorption capacities operating in Poland has a significant impact on obtaining the anticipated level of the direct results of transferring innovative technologies.

H2. How well developed financial companies operating in Poland absorption capacities are also has a significant impact on how well they accomplish their market and financial goals resulting from the process of transferring innovative technologies.

H3. How well developed financial companies' operating in Poland absorption capacities are, also has a significant impact on increasing efficiency, expressed by the ROA profitability indicator, resulting from the transfer of innovative technology.

The aforementioned hypotheses are a result of academic analyses based on assumptions of a learning organization concept, according to which a company should, as part of its operations, acquire assets of knowledge and technology from its environment in order to obtain tangible benefits. However, these benefits should not be limited merely to the effective application of innovative technologies, or even the introduction to the market of the commercial results of such an application, but should ultimately lead to the obtaining of desired financial results, which would prove the efficiency of undertaking these pro-technology investments.

The desire to revise the assumption of the influence of companies' absorptive capacities on the efficiency of the transfers of innovative technologies made by them in the context of the Polish financial sector encouraged the authors to undertake the research problem expressed by the above hypotheses. In order to verify them, statistical and descriptive analyses of the obtained research findings were conducted, leading to the conclusions and observations presented in the following section.

4 The Influence of the Absorption Capacities of Finance Companies in Poland on the Efficiency of Conducting a Technology Transfer

The need to improve efficiency caused by growing competition encourages companies to constantly pursue new concepts, tools and management methods (Rummler and Brache 1995). Efficiency here means the dependence between the volume of assets used for the purpose of reaching particular goals and the effects achieved as a result of using these assets. The more beneficial the effects-expenses ratio, the higher the level of efficiency is achieved (Karlöf and Lövingsson 2005). In other words, efficiency is the ratio of effects to the costs of obtaining them (Davis and Pett 2002). It is a classic interpretation of efficiency confined to a narrow perception of a strictly economic nature. In order to determine it, financial indicators are used, such as profitability (Skrzypek 2012). The most popular of them include (Dudycz 2005):

- ROI—the return on investment ratio,
- ROA—the return on assets ratio,
- ROE—the return on equity ratio.

Efficiency is also at times defined as the outcome of a certain undertaking within a company's operation, which is a result of a relationship between particular effects and the expenses made in order to achieve them (Skrzypek 2012). In this paper, the

authors refer both to the perceived results of transferring innovative technologies which influence the effects-expenses ratio, as well as changes in efficiency caused by the transfers, measured by means of the ROA indicator.

The direct desired result of transferring innovative technology is introducing it for application, which translates into making an innovation which would increase the current modernity level and at the same time the company's technological potential. It is usually reflected by decreased costs or improved quality of the processes involving it, which should result in a better market offer. This, in turn, provides a means of obtaining indirect effects, mainly manifested by desired market outcomes, predominantly through increased market share and as a consequence other financial consequences, such as higher profits. The desire to achieve such results motivates companies into taking action towards transferring innovative technologies. The extent to which these results are met is a function of how well developed the absorptive capacity used for this purpose is.

In order to evaluate the results of innovative technology transfers made by finance companies operating in Poland, their managing staff were asked to define to what extent within the last 3 years they had been able to accomplish results which had encouraged them to engage in these pro-technology activities in the first place. For this purpose, a percentage scale was used, in which 0% meant that a given effect had not been achieved at all, whereas 100% meant that it had been fully achieved (completely in accordance with the expectations of the technology recipient). The results obtained, which were an arithmetic means of the evaluations made, are presented in Table 1.

It should be noted that the findings have been analyzed on the basis of the subjective replies of the respondents. However, respondents comprised top-rank executives, who were in possession of first-hand information on their companies' results. Subjective evaluations of the efficiency of an action appear to be commonplace and widely accepted in studies on companies (Powell 1995). In addition, evaluations of efficiency in empirical studies may be viewed in the context of scaling, which means that one can speak of higher or lower level (Winkler 2008).

It turns out that the direct results of innovative technology transfer have not been fully accomplished (for more see: Glabiszewski 2016). The highest level of

Table 1 The level of achieving expected results of innovative technology absorption

No.	Effects of technology absorption	Average grade
Direct effects		
1	Increase in the innovativeness of possessed technologies	75.9
2	Increase in the quality of conducted processes	78.9
3	Decrease in operating costs	56.8
4	Increase in the attractiveness of the market offer	73.9
Indirect effects		
5	Increased market share	65.7
6	Improvement in the achieved financial outcome	64.4

Source: Own study based on survey results

accomplishment, 78.9%, was declared by the surveyed managers in terms of improvement in the quality of business processes in the field of operational activities. The result should prove satisfying, since it concerns an especially important aspect of a service company's activity, namely customer service. Only a slightly lower score was achieved in the field of increasing the innovativeness of one's own technological portfolio—75.9%. Similar results arose in relation to the attractiveness of a broadly understood market offer—73.9%. Although the aforementioned factors do not prove the complete effectiveness of the conducted technology transfers, it was the qualitative effects that the managing staff was most satisfied with. The relatively low level of goal accomplishment in terms of costs (56.8%) proves that financial companies put largest emphasis on customer service, around which their attention and resources focus. It is to a large extent a consequence of the direct pressure of market rivals. As is commonly known, a significant jump in quality as a result of new technology is not necessarily accompanied by a decrease in costs, since cost- and quality-oriented competitive strategies are often an alternative to each other (Porter 1985).

The direct results of technology transfer should not be the primary objective of a technological undertaking, which instead should be the company's assumed strategic goals, especially market and financial ones. The level in which these were accomplished as declared by the managers surveyed was almost identical (65.7% and 64.4% respectively) and interestingly, this level is situated between that of cost- and quality-oriented direct objectives.

All the above-mentioned factors clearly define the efficiency of finance companies' operations in terms of technology transfer, yet they refer to figures that define the level of their efficiency, which is the results-expenses ratio. One can thus conclude, on the basis of these values, that the achieved efficiency is not fully satisfactory, which may imply the need for improving absorptive processes as well as absorptive capacities responsible for their realization.

In a further part of the study, an evaluation was made concerning the direction and influence of the studied companies' absorptive capacity on the results of their pro-technology absorptive activities. For this purpose, Pearson's correlation coefficients have been estimated for how well developed absorptive capacity was, as well as for how well the effects expected as a result of a conducted innovative technology transfer were accomplished. These values are presented in Table 2. In evaluating how well developed absorptive capacity was measurements for calculations were estimated on the basis of opinions expressed by the top managers of companies who evaluated the level of development of precisely distinguished abilities responsible for technology transfer (on average 0.73%). In this part of the study, a percentage scale was also used, in which 0% meant that the said abilities had not been improved at all, whereas 100% meant that they had been fully improved (see: Glabiszewski 2016). It should also be added that the correlation with the increase in the ROA profitability indicator was estimated for a smaller sample, namely 82 companies, due to the incompleteness of data obtained in the course of the research.

Table 2 Correlation between the level of development of financial companies' absorption capacities and the results of innovative technology absorption

No.	Effects of technology absorption	The degree of the development of absorptive capacity, *r*
Direct effects		
1	Increased in the innovativeness of possessed technologies	61.2***
2	Increase in the quality of conducted processes	72.1***
3	Decrease in operating costs	56.8**
4	Increase in the attractiveness of market offer	70.8***
Indirect effects		
5	Increased market share	42.7**
6	Improvement in the achieved financial outcome	48.5*
The return of assets		
7	Increase in ROA	40.7**

Source: Own study results and financial data from KNF (Polish Financial Supervision Authority) reports
*$p \leq 0.01$; **$p \leq 0.005$; ***$p \leq 0.001$

The values obtained from Pearson's correlation prove the existence of a positive and strong, or at the least moderate, dependency between the studied variables. It can thus be concluded that finance companies' absorptive capacity actually influences both direct and indirect effects achieved by them as a result of innovative technology transfer. Indirect effects are expressed in a company's strategic objectives. Nevertheless, the force of these correlations is varied. A strong influence of absorptive capacity ($r > 0.6$) has shown up in the case of the direct results of a qualitative nature, whereas in terms of other effects a moderate linear correlation has been observed ($0.4 < r \leq 0.6$).

The more developed absorptive capacity a financial company has, the greater the extent of its satisfaction with the results achieved, which makes it reasonable to develop further the ability to transfer innovative technologies. The phenomenon mostly refers to the improved quality of business processes, the attractiveness of the market offer, and the innovativeness of the possessed technologies, which are the fields where the goals are realized to the largest extent. A slightly lower influence of absorptive potential was noted in relation to the assumed decrease in the costs of operation. An even more moderate effect was observed in the case of the indirect results of strategic significance. One should be aware that a company's market share, as well as other financial outcomes, are influenced by a number of other factors, not only those which arise within an organization but also external ones.

A very similar level of correlation was obtained in relation to the ROA indicator, which undoubtedly confirms the reliability of the results of the survey conducted for the purpose of this paper. Although in the subjective and objective measurements taken obvious differences appear, it is visible that the latter offered a basis for study participants to express their opinions on the broadly understood results of

technology transfer. In the end, the comparison can be treated as a successful test of convergence for subjective and objective measurements of the efficiency of operation in terms of absorbing innovative technologies.

The return on assets ratio (ROA) allowed the authors of this article to check to what extent the total assets possessed by a company, including ones that determine its absorptive capacity, are able to generate profit. A Pearson's correlation coefficient estimated at the level of $r = 40.7$ in relation to the ROA indicator means that increasing the total value of assets resulting from developing absorptive potential should cause an increase in profits obtained.

The relevant force of correlations occurring among the analyzed variables above allows the authors to confirm the validity of all three hypotheses assumed by the paper, namely:

- How well developed the absorption capacities of financial companies operating in Poland are, has a significant impact on obtaining the anticipated level of direct results of transfer ring innovative technologies.
- How well developed the absorption capacities of financial companies operating in Poland are, has also a significant impact on their accomplishing their market and financial goals resulting from the process of transferring innovative technologies.
- How well developed the absorption capacities of financial companies operating in Poland are, has a significant impact on increasing efficiency, expressed by the ROA profitability indicator, resulting from the transfer of innovative technology.

It should be remembered, however, that absorptive potential is one of many factors which influence a company's competitive position. The force of its influence on the level of market and financial indicators is lower that the direct effects of technology transfer, the accomplishment of which—due to its essence—is its direct purpose.

5 Conclusion

Technology transfer has currently become a common source of innovation and company development much desired in times of strong competition. It is, however, a complex and difficult undertaking, which requires cooperation with other entities. However, engaging in it may provide a company with measurable market and financial profits, if the subject of transfer were to be a strategically valuable technological innovation especially if deriving from the originator. In addition, this form of development seems to be the shortest, the most profitable, the least risky, and sometimes also the only available option to a company lacking in technological assets. Undoubtedly, developing a new technology as a part of one's own research and development activities is a much more challenging task.

The efficiency of the innovation activities of a company based on external sources, according to the assumptions of learning organization theory, is defined

by its absorptive potential, since it determines an organization's ability to acquire, assimilate and exploit new assets of knowledge and technology. Managers' firm belief in the existence of actual dependence between how well developed the absorptive capability of a company is and the increase in a company's innovativeness resulting from using it should serve as a strong motivating factor to systematically improve the absorptive capabilities at their disposal, as they should be aware that intensifying innovation activities is an obvious way to build up a company's competitive edge, thus shaping its market and financial position within the sector.

Based on our own research findings, it should be confirmed that how well developed the absorptive capability of finance companies in Poland is, influences their accomplishments in terms of their expected level of direct and indirect results of innovative technology transfer. To a moderate extent, it also influences the strategically important market and financial outcomes of a company's activity. It turns out that it also results in an increase in operational efficiency as expressed by the level of ROA profitability indicator, which makes the research findings presented in this paper more objective.

It should be borne in mind, however, that the efficiency of each organization, including its innovation activities, is determined by various factors, both within an organization itself as well as occurring in its environment. Thus in order to affect a successful increase in the efficiency of innovative technology transfers conducted by finance companies more empirical studies need to be conducted, aimed at identifying their actual determinants, as well as verifying the impact force of these determinants already described by subject literature.

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