# Smart innovation management for better business performance*

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The purpose of the research is to verify which innovation influencing factors are crucial for achieving optimal business results. The study encompassed low and medium-low technology Slovenian companies. The results showed that two key aspects of the innovation and economic performance of companies need to be addressed: smart financial investments in innovation and management of organisational aspects of the innovation process. The most innovative companies invest less in technology, yet more in other categories: external R&D, training, and marketing. In addition, influential organisational factors are related to the vision and strategic aspects of encouraging innovation. We can conclude that *smart* innovation management is a prerequisite to better innovation results and, in turn, also better economic results. The implications are relevant for managers so that they can appropriately invest in innovation and address organisational issues.

**Keywords:** innovation management, innovation performance, low and medium-low technology, holistic innovation, smart innovation
**JEL Codes:** O31, O32, O34

## Introduction

The research on innovation within the manufacturing sector has been traditionally focused on high and medium-high technology companies (Heidenreich 2009).

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As a result of criticism of this mainstream of innovation debate, a growing body of innovation literature has focused on low and medium-low technology (LMT) companies, which are surprisingly innovative (Hirsch-Kreinsen 2015) and which represent the largest portion in the manufacturing sector within several EU-27 "catching up" countries' economies. For example, the Czech Republic, Slovakia, and Slovenia clearly stand out for their specialisation in medium-low technology industries while Estonia, Lithuania, and Romania appear as the most specialised countries in low-technology industries (Bolea/Duarte/Chóliz 2018). Persistence of policies based on the high-tech myth are likely to lead to massive opportunity costs in the countries of Central and Eastern Europe (CEE), claims Havas (2015). A high-tech perspective also influenced innovation management in companies which frequently sought a path towards innovation via direct financial investments into machinery, technology, and innovative projects, yet less attention was paid to smart investments and other managerial approaches, which are extremely important for the company's productivity. Therefore, a more thorough research of the factors which are not directly related to financial/technological investments could represent the basis for further improvements of a company's innovation and business performance.

The broader societal and organisational context in which innovation occurs is rarely considered (Slade 2020), therefore we propose a more holistic approach in measuring innovation, a new paradigm which can be seen as a helix of four core elements: strategic, collaborative, total, and open innovation (Chen/Yin/Mei 2018). It presupposes encompassing a wide range of indicators, measuring the innovation process from its financial investments, to the organisational factors and, finally, the innovation outputs achieved (output factors). The selection of indicators proves extremely diversified. Expenditure for research and development activities (Cooper/Kleinschmidt 2007) or a number of days dedicated to education/training of employees (Leenders/Wierenga 2002) are frequently used as input indicators, representing "investments" in the organisational system. The non-financial (innovation process) indicators cover the organisation aspects or management of the innovation process and the application of adequate management techniques (market research, techniques of problem analysis and idea creation, forecasting techniques and suchlike), as well as the innovation environment within the company.

Our research was aimed at tackling the challenging research gaps in the holistic analysis of innovation factors while focusing on LMT companies in Slovenia, which is one of the CEE countries, thus, a specific social, political, and economic context has to be taken into account when generalising the results of the presented study. The following question was asked as a key research question: What are the main factors affecting innovation performance in LMT companies in Slovenia?

The objective of this paper is to identify a set of influential (1) innovation *input* factors, including the non-financial ones (i.e. innovation *process* or innovation capabilities), and (2) *output* factors, as well as discuss their interrelations.

These values and their interrelations, therefore, bring some new scientific findings to innovation management. We show that two crucial aspects of the innovation and economic performance of companies have to be addressed: (1) smart financial investments in innovation and (2) appropriate management of organisational aspects of the innovation process. It was identified that both factors are statistically independent and both essential for achieving optimal innovation financial results.

## Theoretical background

The body of literature related to technology and innovation management has significantly increased and diversified during the last decades (Meyer-Brötz/Stelzer/Schiebel/Brecht 2018). However, the management of innovation is still a very new field of research, which began in the late twentieth century and is still fragmented and without position in theoretical paradigms in the 21st century (Ratten/Ferreira/Fernandes 2017). In the past, many innovation studies were tailored to policy makers' needs – the so-called linear model was used, primarily assessing the influence of R&D expenditure on innovation capability (Johannessen 2009). However, rather than pure R&D expenditure, a company's innovation capabilities depend on several other, less tangible factors pertaining to the innovation process (Biloslavo 2005; Fatur/Likar 2009) and since there is a high demand from companies for practical approaches to managing innovation, various innovation management models and innovation management techniques or tools have been proposed (Albors-Garrigos/Igartua/Peiro 2018).

Also, some additional innovation factors are emerging. It needs to be taken into consideration that innovation is becoming cross-functional by nature and often multi-actor (Hobday 2005). In particular, companies have recognised that it is crucial to strive towards improving innovation cooperation (Hobday 2005; Likar 2008). This is not only limited to cooperation within a company, but also extends to the external environment. The open innovation concept has attracted managers' attention since Chesbrough's book in 2003 (Brunswicker/Chesbrough 2018), and the idea that innovative companies have to master both internal and external innovation has been widely confirmed (see Molden/Clausen 2021). By introducing an open innovation, a company overcomes its limitations in innovating, i.e. limited resources, on the supposition that the innovation partners have a complementary and active role in innovation activities (Lindegaard 2011). External innovation partners are not only complementary companies or suppliers, but also consumers of the company's product since the involvement of

customers in product development can enhance a company's innovation capabilities (Kurpjuweit/Reinerth/Wagner 2018).

However, the innovation research generally examines fragmental aspects of innovative capability rather than providing the whole picture of the mosaic, probably due to the complexity of the innovation phenomena (Wang/Ahmed 2004). Borrás and Edquist (2019) notice that most innovation policies today are partial rather than holistic. Some scholars therefore propose a holistic approach to innovation, for example combining R&D and creativity and including recent trends such as design thinking and open innovation (Manceau/Morand 2014). The theoretical framework by Lawson and Samson in 2001 had already emphasised the following innovation factors: vision and strategy, harnessing the competence base, leveraging information and organisational intelligence, possessing a market and customer orientation, creativity and idea management, organisational systems, culture and climate, and management of technology. Adams et al. (2006) proposed a seven-dimensional conceptualisation of innovation management: 1) Inputs (people, physical and financial resources, tools), 2) Knowledge management (idea generation, knowledge repository, information flows), 3) Innovation strategy (strategic orientation, strategic leadership), 4) Organisation and culture (culture, structure), 5) Portfolio management (risk/return balance, optimisation tool use), 6) Project management (project efficiency, tools, communications, collaboration), and 7) Commercialisation (market research, market testing, marketing and sales). Urh et al. (2019) also tackle the difference between operational and structural indicators. The use depends on the context: operational indicators can be used only when the process has already been established or implemented in the company, whereas structural indicators could be used immediately in the phase of business process model design. Jaruzelski et al. (2011), however, emphasise that more important than any of the individual elements is the role played by corporate culture – the organisation's self-sustaining patterns of behaving, feeling, thinking, and believing – in tying all individual factors together. We took these models and specific factors into consideration and developed our own model of innovation input, output, and capabilities' factors.

### *Innovation management in CEE countries*

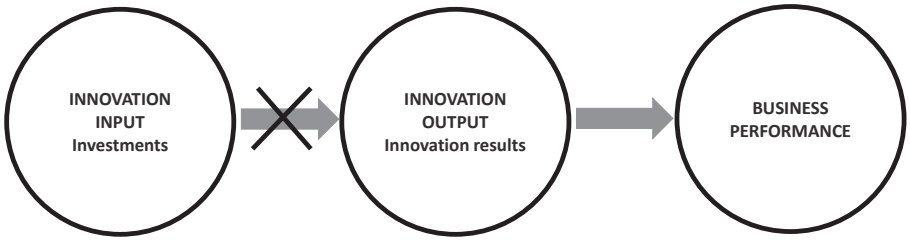
The economic growth of CEE countries in the last two decades was not driven by innovation, Prokop et al. (2019) claim. They are still lagging behind in innovation performance when compared to the regions in Western European (WE) countries (Ganescu/Serbanica 2021). CEE countries are not only limited by financial resources but they also have relatively low human and social capital (Nowinski/Rialp 2013), a shorter history of modern corporate governance (Szukits 2019), and are still catching up with the well-established human

resource management practices in developed countries (Klindzic/Poloski Vokić/Hernaus 2018). Smaller countries, especially, are dominated by multinational firms, while innovation policy models produce weak innovation performance and undeveloped local and regional innovation networks (Prokop et al. 2019). CEE countries, in comparison with WE countries, also face problems such as lack of funds and insufficient incentives to cooperate, difficulties in sharing information and strategic planning, less developed social capital, and mental lock-in (see Kotkova Striteska/Prokop 2020) or suffer from not-invented-here (NIH) syndrome (Vávra/Vohralík/Prokop/Stejskal 2021), i.e. unwillingness to accept external knowledge sources. Prokop et al. (2019) showed that companies in small CEE economies, such as Slovenia, have an ever-low ability to cooperate with triple helix (i.e. academia, industry, and government) partners, low trust, and a low number of facilitators for knowledge or technology transfer.

Present research does not support acceptance of an open innovation paradigm in CEE countries. Despite a growing consensus among researchers that external knowledge sources play a key role in enhancing firms´ innovation, Prokop et al.'s (2021) research, which was focused on six CEE countries (Czech Republic, Slovakia, Poland, Estonia, Latvia, and Lithuania), showed that internal R&D overcomes external resources in its importance. Gyamfi and Stejskal (2020) also show that internal sources of information and knowledge from internal innovative activities highly influence the innovation performance of SMEs in CEE countries. Innovation in these countries is thus characterised by a low tendency to collaborate within the innovation ecosystem (Gyamfi/Stejskal 2021). A high importance of investments directed towards exclusively internal cooperation, which greatly enhances the ability to create innovation, was also confirmed by a study on the Czech chemical industry (Hájek/Stejskal 2018). Such research indicates that the level of external cooperation in order to increase innovation capacity is still low in CEE countries.

CEE countries are "different" from West and South European countries. Since they have a unique systemic heritage, attempts simply to copy the experience of the high-income economies failed, as Varblane et al. (2007) explained. Dobrzanski (2018) confirmed that increasing spending on innovations is not causing proportional effects for the CEE region (while West European economies are spending on R&D more effectively). This is the so-called "regional innovation paradox" already identified by Oughton et al. (2002): the need to spend on innovation in lagging regions, but at the same time the absence of effective investment that would give a successful innovation output. The simplified vision of the innovation process as presented in Figure 1 obviously does not bring the desired results for CEE countries.

**Figure 1. Innovation paradox in CEE countries.**




This is confirmed also by Prokop et al. (2019), who claim that it is not possible to apply standard Western innovation performance approaches, but rather one should propose their modifications or to seek the specific models applicable to CEE countries. Vávra et al. (2021) suggest that it is necessary to deeply analyse the role of firms' internal R&D, the absorptive capacity of firms within CEE countries, and their social capital. Our research, though focused on only one CEE country, aims to contribute to a greater clarification in these research niches.

### *Hypothesis development*

Based upon a sample of Slovenian LMT companies, the persistence of the "regional innovation paradox" in CEE countries is investigated (Figure 1), where higher R&D investments do not necessary translate into higher returns in terms of scientific excellence and economic performance (Muscio/Reid/Rivera Leon 2015). CEE countries can be viewed as a proxy for Innovation Followers while WE countries represent Innovation Leaders. Innovation Leaders are companies with the most successful innovation output (how we measure innovation output is explained in the methodology section). By innovation investments (or innovation input) we mean all financial investments in the innovation process.

Our basic hypothesis is:

*H:* *Innovation investments are only productive to a certain extent, i.e. they are required for a company (or country) to become an Innovation Follower from a Non-Innovator, but not sufficient to become an Innovation Leader.*

Following the hypothesis, we can assume that Innovation Followers among LMT enterprises might record even higher innovation investments than innovation leaders yet worse innovation and, consequently, business results.

As shown in the Theoretical Background section, researchers have already tested similar hypotheses on different data. Dobrzanski (2018) showed that CEE countries are not able to achieve innovation outputs proportional to their R&D

spending. The study was limited to 20 EU countries where Slovenia was not included; the methodology employed was Data Envelopment Analysis. Muscio et al. (2015) investigated the determinants of regional economic performance by focusing on the effects of EU funding. They used Eurostat's and World Bank's data and they confirmed the "regional innovation paradox".

Our study differs from the above research since we are focused on the data of one CEE country only. However, we also identify companies who are Innovation Leaders and those who are lagging in terms of innovation performance.

Further, we have to investigate what can be done to improve the innovation performance of Innovation Followers. For this reason, a third dimension – besides innovation input and innovation output (Figure 1) – was added into our research model: innovation capability, a company's ability to identify new challenges, develop original ideas, and transform them into new business products. Factors that can improve a company's innovation capability can be individual, organisational, or technological (Lin 2007). We are focusing on the organisational factors which are described in the Methodology section.

For this purpose, we set four hypotheses:

*H1: Innovation input (financial investments) has positive influence on innovation capability (organisational factors).*

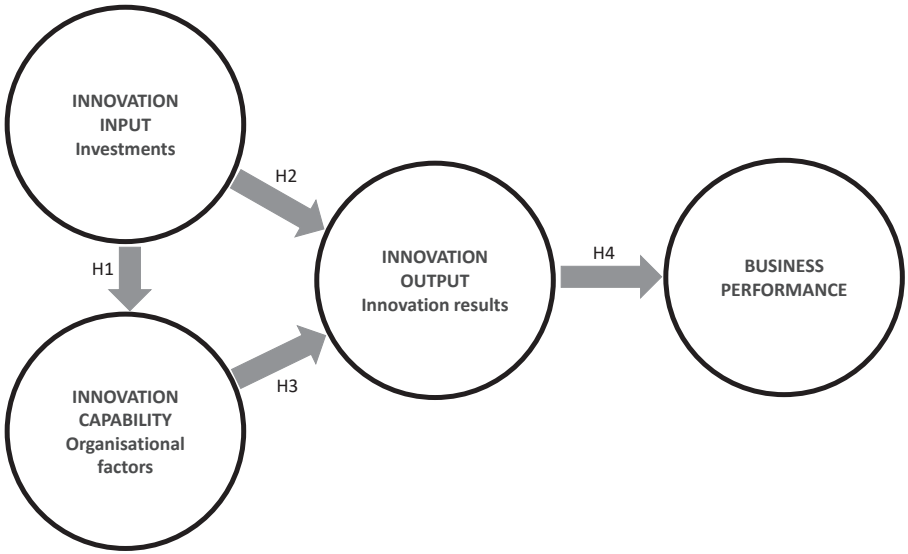
*H2: Innovation input (financial investments) has positive influence on innovation output (innovation results).*

*H3: Innovation capability (organisational factors) has positive influence on innovation output (innovation results).*

*H4: Innovation output (innovation results) has positive influence on business performance.*

The fourth hypothesis might look trivial since it was already confirmed many times. However, since innovation performance (innovation output) and business performance are still different phenomena (and assessed by different criteria) we included it in our research model.

**Figure 2. Research model.**




We are testing a relationship presented in Figure 2 above. Therefore, innovation input is, in our case, measured by financial investments in innovation while innovation capability is measured by organisational factors. Specific variables are listed in the Results section.

## Methodology

Within the study, four categories of potentially influential innovation factors were included:

**Innovation input**: the financial investments in the innovation process, addressed by the following variables: (1) R&D machinery and equipment, (2) other investments in internal or external R&D, (3) costs of marketing new products, and (4) other costs related to development or commercialisation of innovation.

**Innovation capability**: organisational factors dealing with managerial aspects of innovation processes, addressed by the following variables: (1) staff training, (2) focus on new opportunity identification, (3) focus on intellectual property protection, and (4) others, including an organisational culture which refers to the shared values, attitudes, and norms of behaviour that create the propensity for individuals in an organisation to act in certain ways (Čater/Pučko 2010).

**Innovation output**: the two relatively independent variables that represent a measurable output from the innovation process were defined as: RII ("Index

of revenues from innovation"), i.e. a relative share of turnover resulting from innovations, and RMI ("Index of revenues from market innovation"), i.e. a ratio of turnover from innovations new to the market to total innovation turnover (Fatur/Likar 2010).

The third variable, "Average total benefit from innovation", measures the respondents' perception of company benefits from several types of possibly introduced innovations. It is a simple average, calculated from data on various types of innovation (Fatur/Likar 2010).

**Business performance:** here, some standard company financial indicators were considered (ROA, ROE, value added per employee, growth in salaries).

### *Data collection*

The data consists of two sets. With the participation of the Statistical Office of the Republic of Slovenia, data on medium sized and large companies from one of the largest economy sectors in Slovenia, i.e. low and medium-low technology (LMT) companies (see e.g. OECD 2011), was obtained. The LMT category includes: (1) building and repairing of ships and boats; (2) rubber and plastics products; (3) coke, refined petroleum products, and nuclear fuel; (4) other non-metallic mineral products; (5) basic metals and fabricated metal products; (6) other manufacturing; (7) recycling; (8) wood, pulp, paper, paper products, printing and publishing; (9) food products, beverages, and tobacco; and (10) textiles, textile products, leather, and footwear.

Collected data are based on the Eurostat recommendations for the fifth unified (harmonised) inventory of innovation activity, CIS (Community Innovation Survey). These data were supplemented with (1) master data of companies from the Business Entities statistical database, with (2) financial data from balance sheets and income statements from the AJPES (Agency of the Republic of Slovenia for Public Legal Records and Related Services) database, and (3) with data on the structure of employees from the Statistical Register.

The second set of data derives from our own questionnaire and is related to innovation capability, specifically to organisational aspects. As the CIS methodology does not appropriately address the organisational factors, this part of the survey was designed on the literature review with the aim to comprehensively address crucial organisational aspects related to mastering the innovation process (Ropret/Fatur/Rodman/Likar 2012). We defined eight organisational factors following the literature review and methodological (Cronbach $\alpha$ coefficient $\geq$ 0.6) suggestions and defined the variables as averages from corresponding indicators based on the following factors: (1) The role of managers' support, (2) Organisational culture and climate, (3) Training and development of staff competences, (4) Opportunity identification and idea generation, (5) Innovation

collaboration inside the company and with the company's environment, (6) System of material and intangible rewards, (7) Vision and strategic aspects of encouraging innovation, and (8) The role of intellectual property protection. Based on these factors, a questionnaire was prepared. The questions were assessed on the Likert scale from 1 (lowest) to 7 (highest) agreement.

In the survey, the total population of 442 LMT companies (i.e. from the census) was encompassed. We received 60 completed questionnaires representing a 14 % response rate, which is low but not too bad for postal surveys (see e.g. Keegan/Lucas 2005; Crouch/Robinson/Pitts 2011). Looking at this response rate as "a sample", a further question is whether a sample of 60 units is sufficient to allow us to make inferences about the entire population. There is no clear answer to this issue. While some claim the minimum sample size to get meaningful results is 100, others claim a sample of 30 is generally considered sufficient to ensure that the sampling distribution is approximately normal.

### *Data analysis*

Data analysis was conducted in four stages. First, we classified companies into four groups regarding innovation performance. Then, the relation between innovation and business performance was established. Next, financial investment and organisational factors affecting innovation performance factors were identified, and the actual innovation patterns of companies analysed based on study of the differences among innovation groups.

In stage 1, the companies were classified into the groups pursuant to their innovation performance (Non-Innovators, Innovation Followers, and Innovation Leaders) using RII and RMI. As a limit of division, median values of both variables were calculated for (i) the sample of all the companies participating in the Community Innovation Survey for Slovenia, and (ii) having any revenues from innovation (RII > 0). Thus, groups are defined as companies recording certain levels (median) of RII and RMI:

Non-Innovators: RII and RMI equal to 0

Innovation Followers: RII <= 20 and/or RMI <= 40

Innovation Leaders: RII > 20 and RMI > 40.

As mentioned, a limit of division, the medians, were set, thus ensuring comparable representativeness of companies across all three groups. The methodology is explained in detail in Fatur et al. (2010).

The second stage was to assess whether the group of Innovation Leaders is also the most successful one in terms of business performance. This was achieved by way of estimating business performance output (i.e. balance sheet data for

all companies – the census) differences between the three RII/RMI innovation groups.

The third stage was to identify the most influential financial investment and organisational factors relevant to a company's innovation output, by using linear regression analysis. The following relations were analysed:

- the influence of financial investment on organisational factors (H1),
- the influence of financial investment on innovation output (H2),
- the influence of organisational factors on innovation output (H3).

For each of the three groups, linear regression analysis was performed to determine the strength of the relation between the dependent variables and eight factors. Due to the small sizes of groups and relatively strong correlations among the eight independent variables, which might lead to a problem of multicollinearity, simple linear regression was used to calculate the strength of the relation between the dependent variable and each of the independent factors, separately. Altogether, for each dependent variable eight such regression analyses were conducted. R squared, as the result, indicates which of the eight factors is the best predictor for a particular dependent variable.

The fourth stage was to analyse the innovation patterns (innovation financial investment and organisational factors) of the different innovation performance groups: Non-Innovators, Innovation Followers, and Innovation Leaders. In particular, it was analysed in which elements of financial investment or organisational factors there are significant differences among groups. As regards census data, we estimated financial investment differences among company groups. In the case of data which was based on the sample, a non-parametric test (Mann-Whitney) was applied so as to examine the innovation organisational factors differences ($\alpha \leq 0.1$).

## Results

The results are presented in separate sections in accordance with the methodology.

### *Classification of innovation groups*

The results reveal the situation in Slovenia regarding innovation output (RII/RMI). Most companies belong to the group of Non-Innovators (53.2 %), followed by Innovation Followers (40.3 %). Only 6.6 % of companies are the Innovation Leaders.

### *The relation between innovation output and business performance*

The results related to H4 show that the business performance of Innovation Leaders is mainly considerably better than that recorded in the groups of Followers and Non-Innovators. The return on equity (ROE) proves to be more than 30 % higher in Leaders than in the remaining two groups; the average growth in salaries is higher by about 40 %. Also, the return on assets (ROA) is higher in Leaders. Leaders also perform slightly better in terms of value added per employee – particularly in comparison with Non-Innovators (30 % more). It is interesting that Followers (even though with better innovation results concerning RII/RMI compared to Non-Innovators) perform almost equally well as regards ROE. H4 can thus be confirmed.

### *Factors affecting innovation performance*

In this section, we discuss the interrelations among financial investment, organisational factors, and innovation output. The aim is to identify how innovation input (financial investment) and innovation capability (organisational factors) influence innovation output. Additionally, interrelations between the financial investment and organisational factors are analysed. A linear regression analysis was performed so as to determine the strength of relation (standardised regression coefficient – β) among variables:

(1) **financial investment** on **organisational factors** (H1),
(2) **financial investment** on **innovation output** (H2),
(3) innovation **organisational factors** on **innovation output** (H3).

The results indicate different influences of the encompassed innovation factors; the impact of the financial investment is not unidirectional, while the innovation organisational factors proved to be generally positively influential.

(1) We tested H1 by performing a linear regression analysis, wherein financial investment represented the independent variable and organisational factors (see above, Data collection paragraph) represented the dependent variable. The results indicate that a rise in a company's financial investments in innovation may not significantly contribute to improvements in any of the organisational factors. Surprisingly, the only significant, yet negative, influence of total innovation expenditure as a share of total turnover, was identified, namely Organisational culture and climate. Less than 10 % of the variation within organisational culture and climate is indicated to be directly related to changes in this financial investment. Therefore, financial investment does not directly influence organisational culture and climate; we did not confirm H1.

(2) As regards H2, we studied the influence of the financial investment on innovation outputs (i.e. RII, RMI, and Average total benefit from innovation). The results showed that by raising total innovation expenditure the company

may increase the share of innovation revenues appertaining to market novelties (RMI) – the standardised β coefficient's value β = 0.239. However, there is no significant influence of Innovation expenditures on the Index of revenues from innovations (RII) or Average total benefit from innovation. Due to the low variance explained, the total innovation expenditure seems not the only influential factor to be taken into account. Therefore, H2 is only partially confirmed.

(3) Next, we tested H3. We applied regression analysis to study the influence of organisational factors on innovation output (RII, RMI, and the Average total benefit from innovation) (Table 1). As regards significant influences on revenues from all innovations (RII), The role of intellectual property protection and The role of managers' support are the innovation organisational factors exhibiting a moderately strong influence. 20 % of variation within RII is indicated to be directly related to changes of The role of intellectual property protection and 13 % to changes of The role of managers' support. The other significantly influential factors are: Organisational culture and climate, Training and development of staff competencies, and Vision and strategic aspects of encouraging innovation. All of them display a similar, weak-to-medium influence. We can confirm H3. A company may achieve new-to-market innovation revenues (RMI), depending on adequate organisational culture and climate; slightly less by protecting the IP (The role of intellectual property protection). Besides being slightly more influential, Organisational culture and climate also explains a higher portion of RMI variability than The role of intellectual property protection.

Regarding the influences on the Average total benefit from innovation – all innovation organisational factors were indicated as significantly influential, which highlights their overall importance in generating comprehensive innovation benefits (not only financial). Five of these presented factors had already demonstrated a significant influence on RII & RMI, yet three additional factors were indicated to be influential on the variable Average total benefit of the company from innovation: System of material and intangible rewards, Opportunity identification and idea generation, and Innovation collaboration. Possibly, the three latter organisational factors contribute mainly to immaterial/non-financial innovation benefits, which are not encompassed within financial innovation outputs such as RII and RMI.

**Table 1. Results of regression analysis.**

| Innovation output (dependent. variable) | Regression estimates | Innovation organisational factor (independent variable) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | F1 Training and development of staff competencies | F2 Opportunity identification and idea generation | F3 Innovation collaboration inside the company & with company's environment | F4 Organisational culture and climate | F5 System of material and intangible rewards | F6 Vision and strategic aspects of encouraging innovation | F7 The role of intellectual property protection | F8 The role of managers' support |
| RII – Index of revenues from innovation | β | **0.250*** | 0.157 | 0.191 | **0.298**** | 0.169 | **0.288**** | **0.454**** | **0.355**** |
| | Sig. | 0.074 | 0.266 | 0.175 | 0.032 | 0.231 | 0.050 | 0.004 | 0.010 |
| | R square | 0.063 | 0.025 | 0.036 | 0.089 | 0.029 | 0.083 | 0.206 | 0.126 |
| | N | 52 | 52 | 52 | 52 | 52 | 47 | 39 | 52 |
| RMI – Index of revenues from market innovation | β | 0.137 | 0.050 | 0.145 | **0.359**** | 0.013 | 0.003 | **0.279*** | 0.174 |
| | Sig. | 0.295 | 0.702 | 0.268 | 0.005 | 0.922 | 0.983 | 0.058 | 0.183 |
| | R square | 0.019 | 0.003 | 0.021 | 0.129 | 0.000 | 0.000 | 0.078 | 0.030 |
| | N | 60 | 60 | 60 | 60 | 60 | 60 | 55 | 47 |
| V_17_a Avg. total benefit of the company from innovation | β | **0.486**** | **0.413*** | **0.515**** | **0.269**** | **0.355**** | **0.525**** | **0.379**** | **0.567**** |
| | Sig. | 0.000 | 0.001 | 0.000 | 0.038 | 0.005 | 0.000 | 0.009 | 0.000 |
| | R square | 0.236 | 0.171 | 0.265 | 0.072 | 0.126 | 0.276 | 0.144 | 0.321 |
| | N | 60 | 60 | 60 | 60 | 60 | 55 | 47 | 60 |

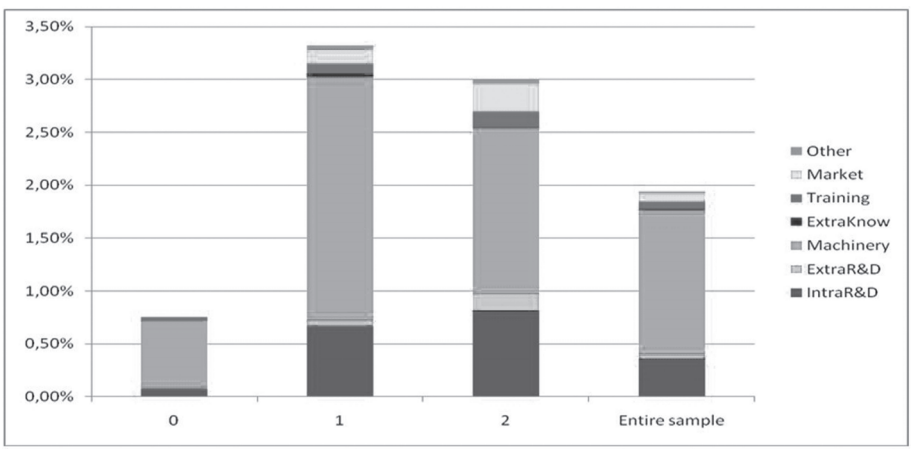
*Note. Results of regression analysis on sample (innovation process and innovation output factors). ** indicates significance (2-tailed) at 0.05 level; * significance at 0.1 level.*

*Differences among groups of Non-Innovators, Followers, and Leaders*

Finally, our basic hypothesis H could be tested. Significant differences in the innovation patterns of the Non-Innovators and Innovation Followers, compared to the Innovation Leaders, represented the foundation as to how a company may systematically progress from a Non-Innovator to a Leader. Differences among innovation groups are further presented as regards financial investment and then as regards innovation organisational factors.

In Leaders and Followers (see Figure 3), total innovation expenditure proves significantly higher (up to 300 %) than in the case of Non-Innovators; however, the difference is negligible between Leaders and Followers – the most innovative group even invests slightly less in innovation (-10 % difference).

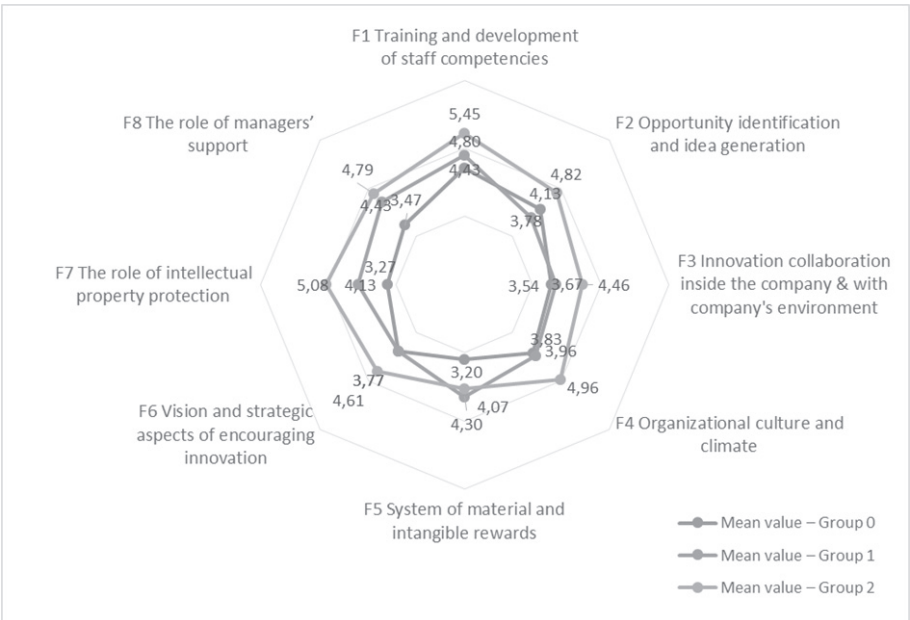
**Figure 3. Innovation input (financial expenditures) of Non-Innovators (0), Innovation Followers (1), and Innovation Leaders (2).**




Significant differences between groups were observed as regards the innovation expenditure structure. Both Followers and Non-Innovators seem to be allocating most of the expenditure to machinery and equipment (the Leaders invest as much as one third less). In contrast to this, the intramural R&D expenditures prove to be more similar in groups of Leaders and Followers, while being more than 8 times higher than in the Non-Innovators group. Regarding extramural R&D, the Leaders invest 180 % more than the Followers (and both much more than the Non-Innovators). The situation regarding the expenditure factor of market introduction is similar; Leaders invest nearly double compared to the Followers and both much more than the Non-Innovators. In addition, Innovation Leaders follow the concept of open innovation and invest much more in external R&D.

As regards the organisational factors, a clear pattern may be observed within Figure 4, showing that Leaders mainly achieve the highest scores. Even though most factors achieve highest mean values in the case of the Innovation Leaders, the differences compared to the other groups are not significant (Mann Whitney test) as regards F2, F3, F5, and F6 (see Figure 4). It is worth mentioning that all these factors already proved to be significantly influential on innovation output. We suppose that the insignificant differences may be due to a relatively small sample (N=60) which was further divided into three company groups.

**Figure 4. Comparison of innovation capability (organisational factors) of Non-Innovators, Innovation Followers, and Innovation Leaders.**



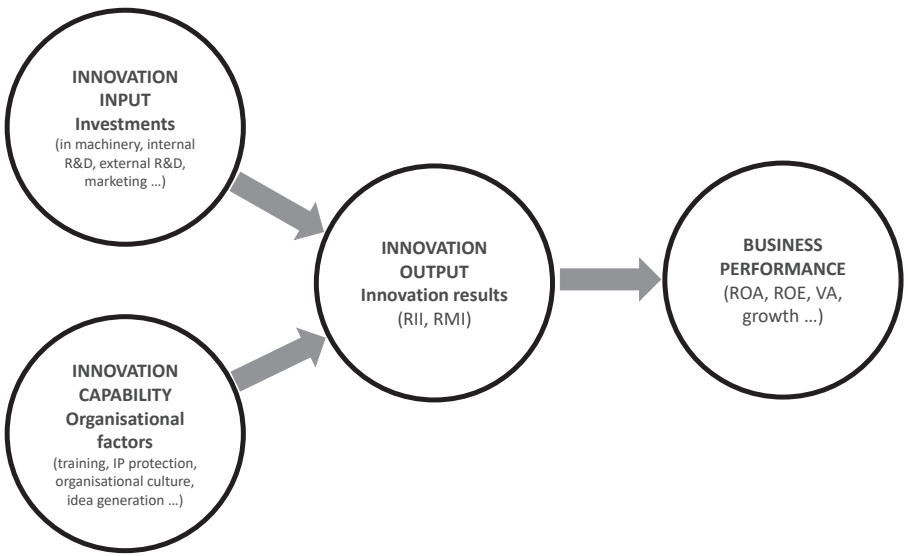

## Discussion

As shown above (H4), innovation performance of companies is positively correlated with economic performance (financial results of Innovation Leaders are better than those of Followers and Non-Innovators). Detailed study shows that the Leaders actually invest less in innovation than the Followers although Leaders and Followers both invest more than the group of Non-Innovators. Innovation financial expenditures are not related to the company's organisational factors (H1 was not confirmed). In line with the "regional innovation paradox", pure investments in innovation will not provide a desired innovation output if these investments are not purposely oriented towards certain activities.

*Investments and organisation are independent innovation success factors*

The study shows that we should consider the financial investments in innovation (i.e. innovation input) and the organisational factors (innovation capability) as independent and both important. We cannot identify a linear input/output relation, whereby financial investment would influence organisational factors, which would further influence business performance. Therefore, we would like to propose the following flow chart: financial investment and organisational factors are independent and both important (positive influence) in achieving innovation and consequently business performance (Figure 5).

**Figure 5. Flow chart supported by our research.**




*Innovation leaders are smart investors*

Followers are investing in innovation approximately three times more compared to the Non-Innovators (Figure 3). In addition, Followers are investing even more than Leaders yet they record worse innovation results. The connection of both facts implies the next "smart" finding related to better innovation management: the relation between investments in innovation and innovation results is not linear; therefore, further increases in innovation expenditures (in reference to Followers) do not compensate. We confirmed our hypothesis H where we claimed that innovation investments are only successful to a certain extent. We confirmed the "regional innovation paradox" of CEE countries where higher investments in innovation do not necessary translate into higher returns in terms of economic performance (Oughton et al. 2002, Muscio et al. 2015, Dobrzanski

2018) on the level of companies: total innovation expenditure is, in the case of Slovenian LMT companies' Leaders, lower in comparison to Followers.

A detailed analysis of specific innovation expenditure factors shows that Leaders actually invest one third less in machinery and equipment. However, they apply open innovation and invest much more in cooperation, in external R&D. They also invest nearly twice as much as Followers in market activities related to new products.

### *Smart innovation management brings financial results*

Regarding organisational factors (innovation capabilities), we realised that improvements both in revenues from innovation and from market innovation may be expected by better managing the organisational factors. Previous studies already showed that a company's performance depends on organisational factors, such as suitable leadership and an organisational culture which supports knowledge sharing (see Čater/Pučko 2010). In addition, better managing the organisational factors also positively influences the work climate, safety, work satisfaction, and several other non-financial yet important factors. These relationships have previously not been thoroughly researched within the LMT companies. However, relevance of the results may be estimated through comparisons with the manufacturing sector as a whole. The literature review regarding innovation patterns within manufacturing, from Becheikh et al. (2006) to Molden and Clausen (2021), clearly supports our findings concerning the influential innovation organisational factors: companies not only differ with respect to their investment in innovation inputs but also in their ability to convert these inputs into output and ultimately create value (Molden/Clausen 2021). An interesting parallel can also be drawn with the study of Duran et al. (2016), who discovered that family firms invest less in innovation in comparison to non-family firms, but they are more efficient in turning innovation input into innovation output.

### *Smart innovation investment policy is adapted to the company's innovation level*

Another possible hint for companies is that total innovation financial expenditures need to be raised only in a specific type of company (Non-Innovators), while both Non-Innovators and Innovation Followers have an unlocked potential as regards improving the organisational factors. Regarding innovation financial expenditure (Figure 3), the Non-Innovators need to raise it by approximately 300 % so as to achieve the Leader's level. Yet both the Non-Innovators and Followers lack a proper structure of innovation expenditure; they allocate a relatively high portion of their innovation investments to machinery and equipment, yet not enough to R&D activities and market introduction of innovations. As already noted by Heidenreich (2009), those LMT companies which invest high

amounts in machinery and equipment (compared to R&D investments) consider production process improvements as highly important innovation effects, rather than the introduction of new-to-market innovations. As a result, such companies remain as Followers. The Leaders' innovation patterns suggest that the largest portions of investments should correspond not only to machinery and equipment, but also to internal and external R&D. Reliance on external R&D at the most innovative companies was already demonstrated in the study of Gurkov (2013: 66) in the case of Russian industrial companies: "The most visible routine associated with more innovative behaviour is the wide use of subcontractors for most of the activity related to innovations." This may look contradictory to the previous research on CEE countries which indicates that internal R&D is more important for innovation performance (Hájek/Stejskal 2018; Gyamfi/Stejskal 2021; Prokop et al. 2021); however, we do not deny the importance of internal R&D, but we clearly show that Innovation Leaders do rely on external R&D much more than the group of Followers and Non-Innovators.

The rest of the Leaders' expenditures consist of expenditure in market introduction of innovations, and expenditure in employee training. The importance of employee training is frequently neglected in favour of a focus on processes and tools (Michaelis/Markham 2017).

### *Smart organisational guidelines for different groups of innovators*

The guidelines regarding organisational factors are as follows: for the Non-Innovators, one of the first steps towards catching up with Innovation Leaders is in raising managers' support for innovation. As stated by Mulej et al. (2008), innovation of management generally proves to be the most important prerequisite within a company lacking innovativeness. Additionally, the Non-Innovators need to improve intellectual property, staff competencies, and organisational culture to close the gap with Innovation Leaders. The Followers require establishing a better organisational culture and climate for innovation, which proves particularly important in raising revenues from market novelties.

## Managerial implications and conclusion

Our study produced some relevant findings. Firstly, it is not only important to financially invest in the development of innovations, it is even more important to invest in a smart way. What does it mean in praxis? We confirmed that Innovation Followers do not invest less than Leaders (they invest approximately 10 % more). This is in line with the "regional innovation paradox" which compares CEE (a proxy for "followers") and WE ("leaders") countries (Muscio et al. 2015; Dobrzanski 2018; Oughton et al. 2002). But the leaders invest in a smart way and thus have better output. As regards a detailed investment breakdown,

Leaders invest one third less in machinery and equipment but they develop open innovation practices by investing much more in cooperation and in external R&D. As Sein and Vavra (2020) claim, in the era of open innovation, the ability of firms to effectively use external resources (knowledge and technology) is crucial, especially in the CEE countries which have not always been able to benefit from external knowledge sources successfully and thus lag behind WE countries. Innovation Leaders in our study thus encourage development of innovation networks, encompassing external partners, companies, institutes, and universities. They also invest twice as much as Followers in market activities related to new products. The reason may be obvious. Nowadays, the market supply is much higher than the market demand. Therefore, it is not enough to develop an innovative product. It is crucial to promote it appropriately and sell it.

But financial investments, even though they are smart, are only one part of the innovation equation (we could not confirm H1 and only partially confirm H2). Why? Research results showed that organisational changes are not directly influenced by investments in technology and innovative projects. Here we come to the next, very important "must", which is to address organisational aspects. There are managers who oversimplify their efforts to become innovative by only investing in technology and machinery. This is in line with the research of Kotkova Striteska and Prokop (2020) on CEE countries, who showed that innovation followers in these countries focus on the acquisition of machinery and other equipment. This may be a wrong assessment of the situation since innovation requires deep changes in organisation. We can suggest to the group of followers the same as Kotkova Striteska and Prokop (2020) did: to become more innovative they should focus on activities that are successfully used by innovation leaders in their countries.

Regarding total benefits from innovation, the following crucial factors were identified: firstly, "The role of managers' support", which starts with the definition of "Vision and strategic aspects of encouraging innovation". In an era when open innovation brings benefit to companies, there is the next expected factor: "Innovation collaboration inside the company & with the company's environment"; the factor "Training and development of staff competencies" also reflects a rapid changing business environment requiring appropriate competences and, thus, training.

On the other hand, these findings represent a notable but locked potential for many companies where raising financial resources is limited. We can conclude that smart investment and management of innovation organisational aspects pays off – and leads to better innovation and business performance. The implications of this study are important for managers so that they can appropriately invest in

innovation and address organisational issues. It is crucial to find a right balance among different types of financial investments.

This study has some limitations – even though the methodology is based on international references and we included all the Slovenian LMT companies, the final response rate was small and addresses only one country. Taking into consideration that Slovenia is, according to the European Innovation Scoreboard, close to the EU average regarding innovation performance, we can conclude that the methodology as well as the results may be relevant also for other EU countries, primarily for other CEE countries which in the past have faced several challenges, such as worse technological equipment (in comparison to WE countries), less advanced research and innovation systems and networks, and lower trust, entrepreneurial skills, and spirit, due to the broken entrepreneurial tradition (Sein/Vavra 2020). CEE countries were faced with similar transition challenges and have similar innovation performance and economic situations.

We believe our approach and results provided answers to the research question and opened new aspects related to efficient innovation management, but an international study encompassing more companies would enable using stronger statistical methods and would help to verify and support the findings.

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