



**Eligijus TOLOČKA**

**THE IMPROVEMENT OF TECHNOLOGICAL  
INNOVATIVENESS' EVALUATION UNDER  
ASPECT OF INFLUENCING FACTORS**

**Summary of Doctoral Dissertation  
Social Sciences, Management and Administration (03S)**

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**LEIDYKLA  
Vilnius TECHNICA 2006**

VILNIUS GEDIMINAS TECHNICAL UNIVERSITY

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VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETAS

**Eligijus TOLOČKA**

**TECHNOLOGINIO INOVATYVUMO  
VERTINIMO TOBULINIMAS ĮTAKOJANČIŲ  
VEIKSNIŲ ASPEKTU**

Daktaro disertacijos santrauka  
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## **1. General characteristic of the dissertation**

### **Topicality of the problem**

The industrial sector has a huge impact on the overall economy of the country, thus the capacity of this sector to successfully compete on an international level predetermines the developmental prospects of the country. To improve the competitiveness of industrial enterprises, innovative technologies are being applied; therefore, deeper knowledge of innovative technologies, particularly, of the aspects influencing their formation and adaptation, as well as the improved management and evaluation of technological innovativeness, characterize the urgency of this topic of management and administration science, which has yet been paid little attention. To achieve a long-lasting and successful development of industry, more active development of innovative technologies is necessary: it would periodically improve different qualities of the output and positively influence various structural elements of organization thus stimulating their improvement. These strivings are especially important when there exists an understanding, that it is unrealistic to achieve any improvement of international competitiveness of industrial enterprises and of the overall industrial sector, unless innovative technologies are formed and adapted, and improved evaluation of technological innovativeness is applied. Therefore, it may be stated that there exists rather an urgent need for a reliable model, which could enable the greater majority of industrial enterprises to perform a quantitative evaluation of technological innovativeness, based on the analysis of factors which have an impact on the formation and adaptation of innovative technologies.

### **The aim and tasks of the work**

The aim is to create a technological innovativeness' evaluation model, based on the analysis of factors having impact on the formation and adaptation of innovative technologies, which would enable enterprises to objectively assess the relative influence of each factor on these processes. Such a model would offer an opportunity to objectively evaluate the comparative influence that each of the factors exerts on technological innovativeness, and also, while making decisions, would enable to improve the competitiveness of industrial enterprises through the application of innovative technologies. This model would enrich the science of management by infusing up-to-date scientific knowledge. To achieve the aims, the following tasks were carried out:

1. Research the topic of technological innovativeness' evaluation under the broader context of industrial innovative activities;

2. Research the evolution of adaptation of innovative technologies, as well as its urgency, in highly developed countries and in Lithuania;

3. Analyse the results of research carried out by national and foreign authors on innovations, technologies, and technological innovativeness' evaluation published in scientific sources;

4. By means of research, identify factors influencing the technological innovativeness, as well as its influence on the formation and adaptation of innovative technologies in industrial enterprises;

5. Create the technological innovativeness' evaluation model based on the quantitative evaluation of factors influencing the formation and adaptation of innovative technologies;

6. Verify in practice the technological innovativeness' evaluation model through the research into Lithuanian manufacturing enterprises and to assess the reliability of this model; by means of research, to assess factors influencing the effectiveness of formation and adaptation of innovative technologies and their impact on Lithuania's manufacturing enterprises and the country's overall economy;

7. Prepare recommendations on the major factors influencing the technological innovativeness for national industrial enterprises.

### **Scientific novelty**

1. Theoretical and practical experience in Lithuania and foreign countries on technological innovativeness' evaluation has been thoroughly researched and analysed;

2. The main factors influencing the formation and adaptation of innovative technologies, as well as their characteristic indexes, have been researched;

3. The theoretical model of technological innovativeness' evaluation based on quantitative assessment of factors which influence the formation and adaptation of innovative technologies has been created.

### **Methodology of research**

To achieve improvement in technological innovativeness' evaluation, systemic analysis of internal and external environmental factors which directly or partly influence the formation and adaptation of innovative technologies has been applied. This particular analysis enables us to evaluate the variety of technological innovations being researched, and also to perceive the formation and adaptation of innovative technologies as activities of particular importance inherent to manufacturing enterprises. The indispensable information for the purposes of this analysis has been taken from notified national and international

researchers' studies printed in various scientific publications; also, information and data presented by businessmen has been used. By means of interviews and systemic analysis methods, the factors influencing the formation and adaptation of technological innovativeness' evaluation have been identified, and by applying the synthesis method, the technological innovativeness' evaluation model has been shaped.

### **Practical value**

Hereby a practical means for the evaluation of technological innovativeness has been prepared, the use of which enables us to determine more precisely and evaluate more effectively the innovative technologies' formation and adaptation potential accumulated by industrial enterprises. Vast amounts of scientific material and practical information have been analysed, comprising evaluation of innovations, technologies, and technological innovativeness conducted in different areas of industry. On the basis of this analysis, practical recommendations for national manufacturing industry and other sectors on the improvement of main factors influencing technological innovativeness have been prepared. Huge sector of national and foreign industrial enterprises could make practical use of the research results and proposals raised in this work for the perfection of their technological innovativeness' evaluation, and also for the purposes of better organisation and management of innovative technologies' formation and adaptation. The results of this work may also be applied for training students in industrial engineering and management.

### **Defended propositions**

- technological innovativeness evaluation model;
- device for the improvement of main factors of innovative technologies' formation and adaptation.

### **The scope of the scientific work**

The scientific work consists of the general characteristic of the dissertation, 3 chapters (1<sup>st</sup> – topic of technological innovativeness in management theory and practice; 2<sup>nd</sup> – evaluation of technological innovativeness in the context of existing evaluations in management; 3<sup>rd</sup> – development of technological innovativeness' evaluation), conclusions and propositions, list of literature, list of publications and addenda. The total scope of the dissertation – 146 pages, 35 pictures, 12 tables and 2 addenda.

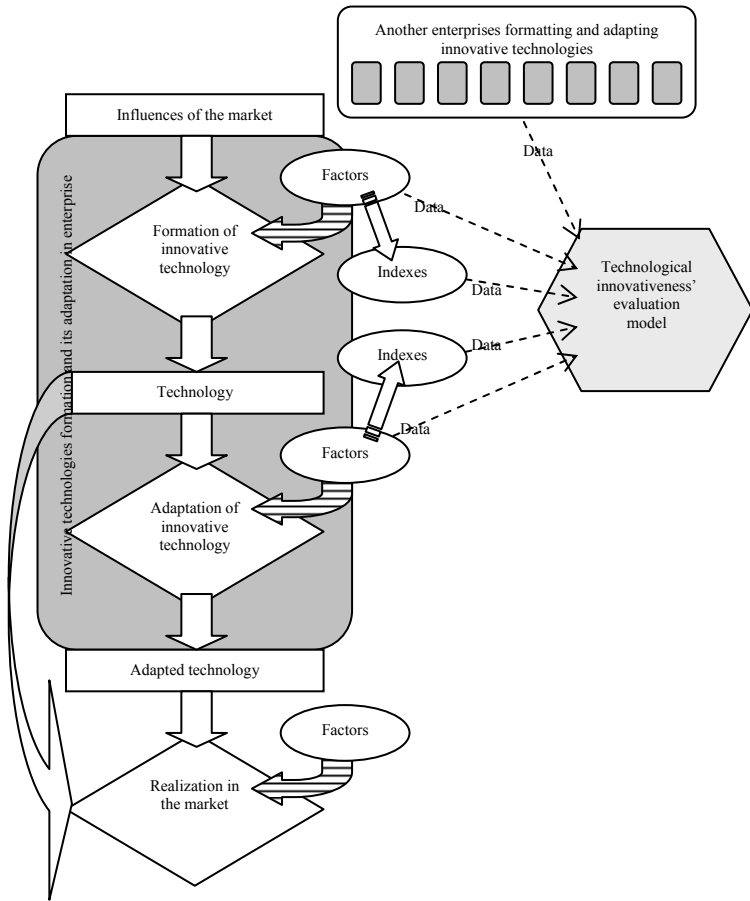


## 2. Methods of modelling of technological innovativeness' evaluation model

With the intent to distinguish only the innovative technologies' influence over the commercial success of an enterprise's products in the market, it is reasonable to conduct a purposeful research of the practice of innovative technologies' formation and adaptation as conducted by a particular enterprise which reveals the technological innovativeness of the enterprise, and which can be estimated by improving the technological innovativeness' evaluation. To that end, the technological innovativeness will be researched as an outcome of the implementation of innovative technologies' formation and adaptation processes directly dependent on determining factors (Fig 1.).

The effectiveness of implementation of these processes is achieved through ensuring certain favorable factors in an enterprise's internal and external environment, which are predetermined and measured by objective indexes and by the usage level of these factors. Having identified concrete factors and characteristic objective indexes, it is possible to estimate the presence of innovative technologies' formation and adaptation factors in the enterprise, as well as its technological innovativeness. For this purpose, the model for technological innovativeness' evaluation is being formatted, which would enable us to analyse the situation prevalent in enterprises concerning the factors which ensure the formation of technologies and their adaptation. It is the magnitude of securing necessary factors that defines the real situation in an enterprise concerning the formation and adaptation of innovative technologies'; in its own turn, it describes technological innovativeness of an enterprise on the whole.

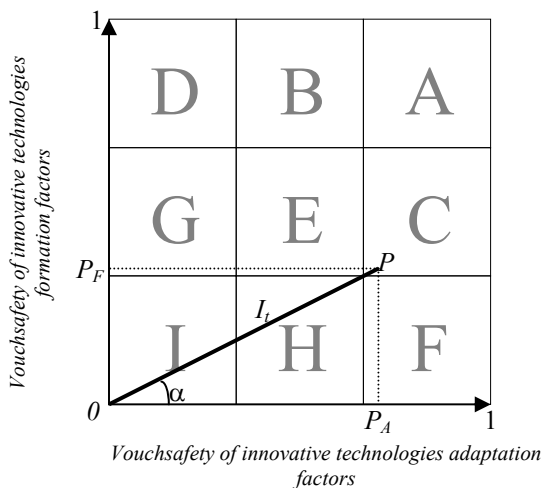
The most convenient and descriptive way leading to a clear graphical representation of the technological innovativeness of an enterprise in the environment of its most immediate competitors is making use of the Cartesian system of axes: on the ordinate axis, we mark the position of the vouchsafety of innovative technologies' formation factors, and on the abscise axis, we mark the position of the vouchsafety of innovative technologies' adaptation factors in enterprises (Fig 2.). Thus, having marked in the graph the real numbers representing the level of formation and adaptation of innovative technologies in an enterprise, and having drawn perpendicular lines to each of the axis, we get the concrete point of intersection  $P$ , which is in a particular position of coordinate system, and which characterises the vouchsafety of innovative technologies' formation and adaptation factors in a certain enterprise, as compared to other enterprises.



**Fig 1.** The environment of application of technological innovativeness' evaluation model

The graph may be divided into nine zones, where each zone gives a general definition of the vouchsafety of innovative technologies' formation and adaptation factors in an enterprise. The generalised zones may be described in the following way:

A – the vouchsafety of factors is well ensured both for the formation of innovative technologies and for the adaptation;



**Fig 2.** Technological innovativeness evaluation model

B – the vouchsafety of factors is well ensured for the formation of innovative technologies, but only satisfactorily for the adaptation;

C – the vouchsafety of factors is well ensured for the adaptation of innovative technologies, but only satisfactorily for the formation;

D – the vouchsafety of factors is well ensured for the formation of innovative technologies, but badly for the adaptation;

E – the vouchsafety of factors is satisfactorily ensured both for the formation and adaptation of innovative technologies;

F – the vouchsafety of factors is well ensured for the adaptation of innovative technologies, but badly for the formation of innovative technologies;

G – the vouchsafety of factors is satisfactorily ensured for the formation of innovative technologies, but badly for the adaptation;

H – the vouchsafety of factors is satisfactorily ensured for the adaptation of innovative technologies, but badly for the formation;

I – the vouchsafety of factors is badly ensured both for the formation and for the adaptation of innovative technologies.

By drawing a straight line from the point  $P$  to the incipiency point of coordinates  $O$ , we get a right-angled triangle  $OPP_A$ , where the vertical line  $OP_A$  represents the dimension of vouchsafety of technological innovativeness' adaptation by an enterprise; the other perpendicular line  $PP_A$  is also the dimension familiar to us as the vouchsafety of technological innovativeness'

formation factors, and the hypotenuse  $OP$  represents the dimension we are aiming at finding, i.e. the dimension of enterprises' technological innovativeness, which may be easily estimated using the Pythagorean theorem:

$$I_t = \sqrt{P_F^2 + P_A^2}, \quad (1)$$

here:  $I_t$  – technological innovativeness of an enterprise;

$P_F$  – innovative technologies formation factors' vouchsafety in an enterprise;

$P_A$  – innovative technologies adaptation factors' vouchsafety in an enterprise.

The technological innovativeness will not have any dimension as its defining innovative technologies formation and adaptation factors' vouchsafeties in an enterprise also haven't got any dimensions.

Angle  $\alpha$  shows the balance between the innovative technologies formation factors' vouchsafety and the innovative technologies adaptation factors' vouchsafety in an enterprise. It enables enterprise to recognize their strengths and weaknesses while implementing innovative technologies' formation and adaptation, and also to take corresponding decisions aiming at the improvement of one or both of these processes.

For the practical usage of the technological innovativeness' evaluation formula (1), it is essential to have data of innovative technologies' formation and adaptation factors' vouchsafeties in an enterprise which can be estimated using formulas (2) and (3):

$$P_F = \frac{\sum_{k=1}^h (\mu_{Fk}^{S_{Fk}} \cdot \omega_{Fk} - 1)}{\sum_{k=1}^h (\mu_{Fk} - 1)}, \quad (2)$$

here:  $S_{Fk}$  – condition of factor  $k$  influencing innovative technologies formation in an enterprise;

$\mu_{Fk}$  – importance of factor  $k$  influencing innovative technologies formation in an enterprise ( $\mu_{Fk} = 1 \div 10$ );

$\omega_{Fk}$  – profit level of factor  $k$  influencing innovative technologies formation in an enterprise ( $\omega_{Fk} = 0 \div 1$ );

$h$  – the number of factors influencing innovative technologies formation in an enterprise;

$$P_A = \frac{\sum_{l=1}^j (\mu_{Al}^{S_{Al}} \cdot \omega_{Al} - 1)}{\sum_{l=1}^j (\mu_{Al} - 1)}, \quad (3)$$

here:  $S_{Al}$  – condition of factor  $k$  influencing innovative technologies adaptation in an enterprise;

$\mu_{Al}$  – importance of factor  $k$  influencing innovative technologies adaptation in an enterprise ( $\mu_{Al} = 1 \div 10$ );

$\omega_{Al}$  – profit level of factor  $k$  influencing innovative technologies adaptation in an enterprise ( $\omega_{Al} = 0 \div 1$ );

$j$  – the number of factors influencing innovative technologies adaptation in an enterprise.

The values of criteria are estimated by means of an examination method. Each of factors  $S_{Fk}$  and  $S_{Al}$  of innovative technologies formation and adaptation is defined by certain objectives' indexes; thus after the identification of indexes, we can estimate them by using formulas (4) and (5):

$$S_{Fk} = \frac{\sum_{b=1}^m \left( \gamma_{Fb}^{\frac{F_{Fb}}{F_{Fb \max}}} - 1 \right)}{\sum_{b=1}^m (\gamma_{Fb} - 1)}, \quad (4)$$

here:  $F_{Fb}$  – value of enterprise index  $b$  for innovative technologies formation factor  $k$ ;

$F_{Fb \max}$  – benchmarking value of index  $b$  for innovative technologies formation factor  $k$ ;

$\gamma_{Fb}$  – importance of index  $b$  for innovative technologies formation factor  $k$  in enterprise ( $\gamma_{Fb} = 1 \div 10$ );

$m$  – total number of indexes for innovative technologies formation factor  $k$ .

$$S_{Al} = \frac{\sum_{d=1}^n \left( \gamma_{Ad}^{\frac{F_{Ad}}{F_{Admax}}} - 1 \right)}{\sum_{d=1}^n (\gamma_{Ad} - 1)}, \quad (5)$$

here:  $F_{Ad}$  – value of enterprise index  $d$  for innovative technologies adaptation factor  $l$ ;

$F_{Admax}$  – benchmarking value of index  $d$  for innovative technologies adaptation factor  $l$ ;

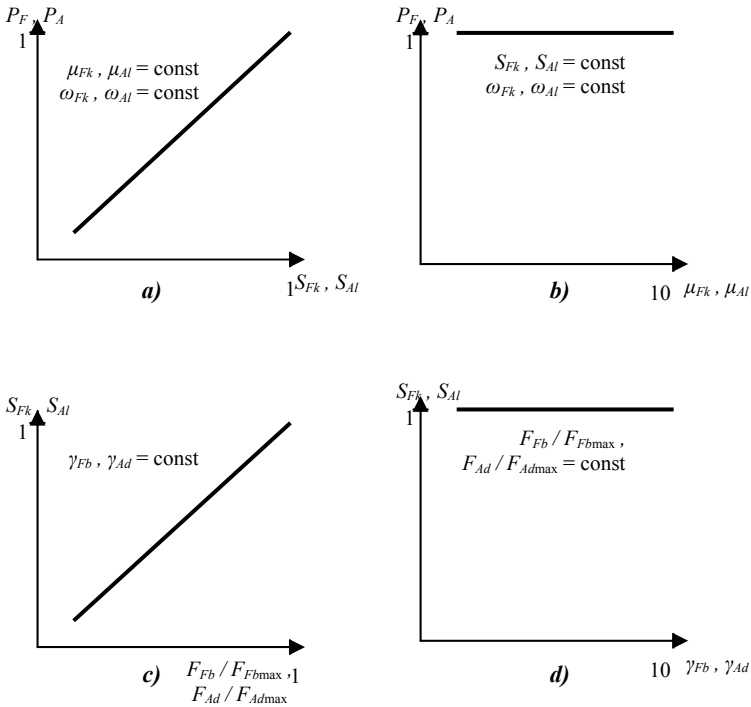
$\gamma_{Ad}$  – importance of index  $d$  for innovative technologies adaptation factor  $l$  in enterprise ( $\gamma_{Ad} = 1 \div 10$ );

$n$  – total number of indexes for innovative technologies adaptation factor  $l$ .

Maximum values of  $S_{Fk}$ ,  $S_{Al}$ ,  $P_A$  and  $P_F$  shell not exceed 1 also they will not have any dimensions because they are calculated on the grounds of coefficients and cross-rate of indexes and benchmarking indexes. Benchmarking values of indexes  $F_{Fbmax}$  and  $F_{Admax}$  are chosen in conformity with maximum values of suitable indexes in the group of enterprises being researched. It is most advisable to choose enterprises' group for the research depending on the realization of production in the manufactured on the grounds of innovative technologies.

The maximum values of objective indexes in this group of enterprises will be the benchmarking values for the calculation of technological innovativeness of enterprises in repute to the immediate competitors of direct.

Interdependence between the variables from formulas (2) – (5) which was formatted by analytical method is shown in figure 3 in a diagram form. This illustration shows us that innovative technologies formation factors' vouchsafeties in enterprise values are increased by the growing values of factors' conditions (Fig 3. a)) but not by growing of importance or profit level of factors values (Fig 3. b)). The same interdependence of variables is also in present factors' evaluation formulas formatted by analytical method. Here the results increase with growing indexes and benchmarking indexes cross-rates' values (Fig 3. c)) but not growth of indexes importance values (Fig 3. d)).



**Fig 3.** Graphical representation of interdependence between variables of technological innovativeness evaluation model: **a)** – dependence of factors’ vouchsafety of innovative technologies formation and adaptation – values on factors’ conditions values; **b)** – dependence of factors’ vouchsafety of innovative technologies formation and adaptation values on factors’ importance values; **c)** – dependence of factors’ conditions of innovative technologies formation and adaptation values on indexes and benchmarking indexes cross-rates’ values; **d)** – dependence of factors’ conditions of innovative technologies formation and adaptation values on indexes’ importance values.

The shape of formulas like these was achieved on purpose because of the want to emphasize the influence of innovative technologies formation and its adaptation factors in variable values on estimation of technological innovativeness and factors vouchsafety in an enterprise. The described technological innovativeness evaluation model could be used for the analysis of situation in innovative technologies formation and its adaptation both

retrospectively and prospectively in the context of different enterprises and technologies.

### 3. Conclusions

After the development of the technological innovativeness evaluation model and having verified and checked it in practice, the following scientific and practical conclusions were formulated:

1. The researched topic of technological innovativeness has shown that most researchers choose for their subject of research innovations in general, whereas the technological innovativeness they research is just fragmentary and a part of overall innovative activity.

2. The research of innovative technologies adaptation evolution has revealed that the proportion manufacturing of Lithuanian enterprises adapting innovative technologies is declining. It raises worries as to the competitive capabilities of the national enterprises in the international and the EU market.

3. The analysis of scientific literature on evolution of innovations, technologies and technological innovativeness has shown that quantitative estimation techniques of innovative manufacturing technologies mostly are meant to any areas of human activities, but while researching organizations belonging to one particular sector or area this universality has a deficiency – it diminishes the deepness and exactness of the research.

4. While researching manufacturing enterprises of Lithuania by questionnaire method, factors influencing innovative technologies formation and adaptation are identified, also the defining indexes which influence technological innovativeness of enterprises were identified.

5. Realized in practice created evaluation model of technological innovativeness researching national manufacturing enterprises. Taken data using in created model for technological innovativeness evaluation was got result that biggest technological innovativeness and best vouchsafety of innovative technologies formation factors' and adaptation factors' have conditional entitle enterprises „15“, „17“, „14“, „16“ and „5“. These enterprises pursue most purposeful innovative activity purport to innovative technologies formation and adaptation between seventeen researched enterprises.

6. Having researched several national manufacturing enterprises, the created evaluation model of technological innovativeness was realised in practice. During the research, data driven from the enterprises was processed by means of the newly created technological innovativeness evaluation model, and the results showed that the enterprises coded in numbers „15“, „17“, „14“, „16“ and „5“ had the highest technological innovativeness and the best vouchsafety



of innovative technologies formation and adaptation factors. Nearly all of these enterprises belonged to the category of large enterprises, therefore a conclusion may be drawn that they pursued the most purposeful innovative activity, in the sense of formation and adaptation of innovative technologies, among the seventeen researched enterprises. The reliability of created technological innovativeness evaluation model was evaluated by estimating the strength of relation between enterprises' rating, using the results of technological innovativeness evaluation model and rating using the official results of economic indexes data. The coefficient of correlation  $r = 0,976$  was estimated, which defines the strength of this relation. This meaning of correlation coefficient clearly shows that there exists a strong dependence between the variables being analysed.

7. Based on the research of manufacturing enterprises of Lithuania, the main factors influencing the innovative technologies' formation and adaptation were determined, out of which a group of factors connected to the educational background, working experience and abilities of employees partaking in these processes may be highlighted. For the improvement of this group of factors, it was proposed to refine the bachelor studies at technical universities, what would result in the improvement of professional knowledge and skills among prospective engineers, as well as among professionals already working in the field.

### **Published works on the topic of the dissertation**

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Eligijus Toločka was born in Vilnius, on 27 of January 1977.

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## **TECHNOLOGINIO INOVATYVUMO VERTINIMO TOBULINIMAS ĮTAKOJANČIŲ VEIKSNIŲ ASPEKTU**

### **Mokslo problemos aktualumas**

Pramonės sektorius daro didelę įtaką visai šalies ekonomikai, todėl šio sektoriaus sugebėjimas sėkmingai konkuruoti tarptautiniu mastu apskritai apsprendžia ir valstybės geresnes vystymosi galimybes. Pramonės įmonių konkurencingumui didelę įtaką daro naudojamos inovatyvios technologijos, todėl gilesnis inovatyvių technologijų formavimo ir jų adaptavimo veikiančių veiksnių pažinimas, geresnė jų vadyba bei tobulesnis technologinio inovatyvumo vertinimas kaip tik ir apibrėžia svarbią, tačiau mažai tyrinėtą, vadybos ir administravimo mokslo ir praktikos problematiką. Ilgalaikei ir sėkmingai apdirbamosios pramonės sektoriaus plėtrai būtina aktyvesnė inovatyvių technologijų plėtra, kuri periodiškai gerintų gaminamos produkcijos

įvairias savybes bei pozityviai įtakotų įvairius organizacijos struktūrinius elementus, skatindama jų tobulėjimą. Šie siekiai įgyja ypatingą reikšmingumą suvokiant, jog be efektyvaus inovatyvių technologijų formavimo ir jų adaptavimo, taip pat tobulesnio technologinio inovatyvumo įvertinimo, neįmanomas kryptingas pramonės įmonių, o kartu ir viso šio šalies sektoriaus konkurencingumo didinimas tarptautiniame lygmenyje. Tuo būdu galima būtų konstatuoti, jog dabar egzistuoja gana didelis patikimo modelio poreikis, kuris padėtų didžiai daugumai pramonės įmonių atlikti technologinio inovatyvumo kiekybinį vertinimą, paremtą inovatyvių technologijų formavimą ir jų adaptavimą veikiančių veiksnių analize.

### ***Darbo tikslas ir uždaviniai***

Sukurti technologinio inovatyvumo vertinimo modelį, pagrįstą veiksnių, įtakojančių inovatyvių technologijų formavimą ir jų adaptavimą, analize, įgalinančią objektyviai įvertinti santykinę kiekvieno veiksnio šiems procesams daromą įtaką. Toks modelis, kaip pramonės technologinio inovatyvumo vertinimo priemonė, ne tik suteiktų galimybes darant atitinkamus objektyvius sprendimus inovatyvių technologijų pagalba labiau stiprinti įmonių konkurencingumą, bet praturtintų vadybos mokslą aktualiomis naujomis mokslo žiniomis.

Tam, kad būtų pasiektas tikslas, būtina išspręsti šiuos uždavinius:

1. Ištirti technologinio inovatyvumo vertinimo problematiką pramonės inovacinės plėtros kontekste;
2. Ištirti inovatyvių technologijų adaptavimo raidą bei jų aktualijas labiausiai išsivysčiusiose pasaulio šalyse bei Lietuvoje;
3. Išanalizuoti mokslinėje literatūroje pateiktus šalies ir užsienio autorių mokslinių tyrimų, skirtų inovacijų, technologijų, technologinio inovatyvumo vertinimui, rezultatus;
4. Tyrimais nustatyti technologinį inovatyvumą įtakojančius veiksnius bei jų daromą poveikį inovatyvių technologijų formavimui ir adaptavimui pramonės įmonėse;
5. Sukurti technologinio inovatyvumo vertinimo modelį, pagrįstą veiksnių, veikiančių inovatyvių technologijų formavimą ir adaptavimą, kiekybiniu įvertinimu;
6. Praktiškai patikrinti sukurtą technologinio inovatyvumo vertinimo modelį, tiriant Lietuvos apdirbamosios pramonės įmones ir įvertinti šio modelio patikimumą;
7. Parengti rekomendacijas pagrindiniams technologinį inovatyvumą darantiems įtaką veiksniams Lietuvos pramonės įmonėse gerinti.

### **Mokslinis naujumas**

1. Ištirta ir išanalizuota Lietuvos ir užsienio teorinė ir praktinė patirtis technologinio inovatyvumo vertinimo problematikoje;

2. Ištirti pagrindiniai inovatyvių technologijų formavimą ir jų adaptavimą veikiantys veiksniai ir juos apibūdinantys rodikliai;

3. Sukurtas teorinis technologinio inovatyvumo įvertinimo modelis, pagrįstas inovatyvių technologijų formavimą ir adaptavimą veikiančių veiksnių kiekybiniu įvertinimu.

### **Tyrimų metodika**

Technologinio inovatyvumo vertinimo tobulinimui yra naudojama inovatyvių technologijų formavimą ir adaptavimą tiesiogiai apsprendžiančių ar iš dalies tik veikiančių vidinės ir išorinės aplinkos veiksnių sisteminė analizė, kuri suteikia galimybę įvertinti tiriamų inovatyvių technologijų įvairovę, taip pat inovatyvių technologijų formavimą ir jų adaptavimą suvokti kaip ypatingai svarbią apdirbamosios pramonės įmonėms veiklą. Būtina informacija šiai analizei atlikti yra imama iš Lietuvos ir užsienio tyrėjų paskelbtų mokslo darbų, publikuotų įvairiuose mokslo leidiniuose, taip pat naudojamosi verslininkų pateiktomis žiniomis ir duomenimis. Apklausos ir sisteminės analizės metodais nustatomi inovatyvių technologijų formavimą ir jų adaptavimą veikiantys veiksniai, sintezės metodu yra formuojamas technologinio inovatyvumo vertinimo modelis.

### **Praktinė vertė**

Parengta technologinio inovatyvumo vertinimo praktinė priemonė, kurios panaudojimas suteikia galimybę tiksliau nustatyti ir efektyviau išnaudoti pramonės įmonėse sukauptą inovatyvių technologijų formavimo ir jų adaptavimo potencialą. Išanalizuota ir apibendrinta gausi mokslinės literatūros ir praktinių duomenų medžiaga, apimanti inovacijų, technologijų, technologinio inovatyvumo pramonės srityse patirtį. Tuo remiantis buvo parengtos praktinės technologinių inovatyvumą veikiančių pagrindinių veiksnių tobulinimo rekomendacijos šalies pramonės sektoriui. Praktiškai pasinaudoti ir pritaikyti šiame darbe pateikiamais atliktų tyrimų rezultatais ir aprobuotais pasiūlymais gali platus Lietuvos ir užsienio pramonės įmonių sektorius geresniam technologinio inovatyvumo vertinimui, taip pat inovatyvių technologijų formavimo ir jų adaptavimo organizavimui ir valdymui. Šio darbo rezultatai gali būti pritaikomi ruošiant pramonės inžinerijos ir vadybos specialistus.

### **Ginamieji teiginiai**

- technologinio inovatyvumo vertinimo modelis;

- pagrindinių inovatyvių technologijų formavimo ir jų adaptavimo veiksmių gerinimo priemonė.

### **Darbo apimtis**

Darbą sudaro bendra darbo charakteristika, 3 skyriai (pirmas – technologinio inovatyvumo problematika vadybos teorijoje ir praktikoje, antras – technologinio inovatyvumo vertinimas vadyboje esamų vertinimų kontekste, trečias – technologinio inovatyvumo vertinimo tobulinimas), išvados, literatūros sąrašas, publikacijų sąrašas ir priedai. Bendra disertacijos apimtis – 146 puslapiai, 35 iliustracijos, 12 lentelių ir 2 priedai.

### **Išvados**

Sudarius technologinio inovatyvumo vertinimo modelį ir jį realizavus praktikoje, suformuluotos šios mokslinės ir praktinės išvados:

1. Ištirta technologinio inovatyvumo problematika parodė, jog dauguma autorių tyrimų objektu pasirenka inovacijas apskritai, kurios savo ruožtu apima labai plačią ir įvairialypę žmonių veiklos sferą, todėl technologinį inovatyvumą atskirai jie tiria tik fragmentiškai ir tik kaip bendros inovacinės veiklos sudedamąją dalį.

2. Inovatyvių technologijų adaptavimo raidos tyrimas atskleidė tai, jog Lietuvos apdirbamosios pramonės įmonių dalis, adaptuojančių inovatyvias technologijas, kryptingai mažėja, kas kelia didelį susirūpinimą mūsų įmonių konkurencingumo perspektyvomis Europos Sąjungos ir tarptautinėje rinkoje.

3. Mokslinės literatūros, skirtos inovacijų, technologijų, technologinio inovatyvumo vertinimui, analizė atskleidė, jog inovatyvių gamybos technologijų kiekybinio įvertinimo metodikos dažniausiai yra numatytos analizuoti visoms žmogaus veiklos sritims, tačiau tiriant vienos srities ar šakos organizacijas toks universalumas turi ir savo pagrindinį trūkumą – mažėja tyrimų gilumas ir tikslumas.

4. Tyrimais nustatyti technologinį inovatyvumą įtakojantys veiksniai, anketinio tyrimo metodu apklausiant Lietuvos apdirbamosios pramonės įmones. Išanalizavus tyrimo rezultatus, buvo išskirti inovatyvių technologijų formavimo ir adaptavimo veiksniai bei juos nusakantys rodikliai, veikiantys įmonių technologinį inovatyvumą.

5. Sukurtas technologinio inovatyvumo vertinimo modelis, pagrįstas veiksmių, veikiančių inovatyvių technologijų formavimą ir adaptavimą, kiekybiniu įvertinimu.

6. Praktiškai patikrintas technologinio inovatyvumo vertinimo modelis, ištyrus Lietuvos apdirbamosios pramonės įmones. Tyrimo metu iš įmonių gautus duomenis apdorojus sukurtuoju technologinio inovatyvumo vertinimo

modeliu, buvo gauta, jog didžiausią technologinį inovatyvumą ir geriausią inovatyvių technologijų formavimo veiksmių ir adaptavimo veiksmių užtikrinimą turi sąlyginai pavadintos įmonės „15“, „17“, „14“, „16“ ir „5“, beje, beveik visos jos patenka į didelių įmonių kategoriją, iš to išplaukia išvada, jog jos vykdo kryptingiausią inovacinę veiklą, inovatyvių technologijų formavimo ir jų adaptavimo prasme, ištirtų septyniolikos įmonių tarpe.

7. Sukurto technologinio inovatyvumo vertinimo modelio patikimumas buvo įvertintas nustatant ryšio stiprumą tarp įmonių reitingo, sudaryto remiantis sukurto technologinio inovatyvumo vertinimo modelio pagalba gautais tyrimo duomenų analizės rezultatais, ir oficialaus tirtų įmonių reitingo pagal ekonominių rodiklių duomenis. Buvo apskaičiuotas šio ryšio stiprumą nusakantis koreliacijos koeficientas  $r$ , kuris lygus 0,976. Ši koreliacijos koeficiento reikšmė aiškiai rodo, jog egzistuoja stipri priklausomybė tarp nagrinėjamų kintamųjų.

8. Iš atlikto Lietuvos apdirbamosios pramonės įmonių tyrimo buvo nustatyti pagrindiniai inovatyvių technologijų formavimą ir jų adaptavimą darantys įtaką veiksniai, iš kurių ryškiausiai išsiskiria veiksmių grupė, susijusi su šiuose procesuose tiesiogiai dalyvaujančių darbuotojų išsilavinimu, patirtimi ir gebėjimais. Šios veiksmių grupės tobulinimui buvo pasiūlytas technikos universitetų pagrindinių studijų proceso patobulintas studijų procesas, kurį taikant būtų geriau ugdomi inovatyvių technologijų formavime ir jų adaptavime dalyvaujančių būsimų ar jau esamų darbuotojų inžinerinių ir kitų sričių gebėjimai ir įgūdžiai, bei lengviau jiems perteikiamos ir įtvirtinamos žinios. Patobulintam technikos universitetų pagrindinių studijų procesui yra siūloma ir tokių studijų rezultatyvumo vertinimo metodika.

### **Trumpos žinios apie autorių**

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**THE IMPROVEMENT OF TECHNOLOGICAL INNOVATIVENESS'  
EVALUATION UNDER ASPECT OF INFLUENCING FACTORS**

**Summary of Doctoral Dissertation**

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