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Table of contents

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Formation of management and technological maturity levels of enterprises for their dynamic development

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ABSTRACT

Currently, the market environment contains many factors influencing the enterprise's competitiveness. Instability, the unpredictability of events, and insufficiently effective functioning of market mechanisms alter the management focus and processes engaged in an enterprise's functioning. Some of them are intensive in terms of required resources and finance. Such a dynamic situation requires the enterprise management to build innovative solutions to flexibly respond and timely adapt to change. Therefore, this study aims to develop theoretical and applied approaches to determining the level of managerial and technological maturity of the basic set of technologies implemented in enterprises. In the context of this issue's development and aiming to achieve the purpose, the study proposed a model approach where the introduction of individual technologies allows combining the rules for determining the enterprise's management and the technological maturity level, i.e., its readiness for such changes. The construction of the model was based on the analysis and calculation of statistical data from four groups of technologies (corporate, industrial, decision support, and information technologies, which are divided into subclasses) and based on the theory of dynamic innovation development. The results were tested at seven food industry enterprises in Ukraine. Based on the study, the actual level of managerial and technological maturity of enterprises was determined, creating one complex set of technologies that depend on the level and structural changes in management and the level of technological maturity of enterprises. It can be used as a typical model for differently sized enterprises representing various industries.

KEY WORDS

innovation dynamics, technological maturity, food enterprises, development management, resources

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Introduction

Key management issues of an enterprise as an open economic system are especially relevant in the dynamically developing market environment. This situation largely ensued due to globalisation and current modern world challenges, such as accelerated innovation and information development, digitalisation, global integration processes, the Covid-19 pandemic, and armed conflict (e.g., Katou, 2021; Kaźmierska-Jóźwiak et al., 2021; Pelle & Tabajdi,

Shpak, N., Vytvytska, O., Martynyuk, O., Kylaec, M., & Sroka, W. (2022). Formation of management and technological maturity levels of enterprises for their dynamic development. *Engineering Management in Production and Services, 14*(3), 1-12. doi: 10.2478/emj-2022-0022

2021; Skrodzka, 2021). Climate change is yet another significant contributor (Shpak et al., 2022; Szpilko & Ejdys, 2022). Such changes in the external environment should be reflected by suitable organisational activities, including CSR and business ethics (Vveinhardt & Sroka, 2020). Under these conditions, management technology becomes a continuous creative analysis process, involving some coordination of management procedures and the selection of the most appropriate tools and methods for management regulation and decisions. Forms of information interaction and tangible or intangible transmission become the management object. It is based on the sequence of using tangible resources and intangible assets, opportunities, and the existing potential in the enterprise system (Sowden et al., 2008). New tools and elements The adaptive mechanism of dynamic enterprise development is supplemented by new tools and elements derived from the existing and recent knowledge on enterprise management methods, techniques, and procedures (Usyk et al., 2015). The managerial and technological maturity stages transform the existing management technologies into innovative ones and stimulate the transition to a higher level of development (Martyniuk et al., 2019).

In the 60s of the 20th century, the research focus fell on innovative management technologies as a key aspect of enterprise development and competitive advantage. Now, they are developing the most actively (Florek-Paszkowska et al., 2021). Some researchers, such as Weiner (2009), Mandra (2012), and Verba (2014), claimed that technologies in an enterprise should function as an active tool for change and influence the business process development. However, little is said about the ability of technologies to initiate innovation and become the primary tool for managing dynamic development. Several scholars have identified organisational commitment as an essential prerequisite for successfully implementing organisational change (e.g., Bella, 2007; Darwish, 2000; Lau & Woodman, 1995; Vakola & Nikolau, 2005; Yousef, 2000).

The study into the implementation of certain technologies and their impact on the development efficiency and enterprise operation is becoming increasingly important among scientists and practitioners. The reason behind such an unfolding is the emerging new concept of enterprise management and the systematisation into a single choice methodology, identifying a basic set of innovative technologies appropriate for each enterprise to determine their managerial and technological maturity level. This necessitates further research and scientific substantiation. Therefore, the study aims to develop theoretical and applied approaches to determining the managerial and technological maturity level of the basic set of technologies implemented in enterprises. The study's main objectives are (i) to determine the components and factors particular to the actual level of managerial and technological maturity of enterprises; (ii) to form a set of technologies depending on the level and purpose of structural changes in enterprise management and technological maturity; (iii) to offer a standard model for differently sized enterprises and industries and to test it at seven food industry enterprises in Ukraine.

The article is structured as follows. First, it presents the theoretical research foundations. The theoretical discussions presented in this section focus on studying the formation of technological components required for the diagnostics of the managerial and technological maturity level, assessing the technological maturity of several models. The following presentation provides the basic assumptions behind the formation and implementation model of a set of innovative technologies in the food industry and its development. The next section presents the research results conducted at seven enterprises in the Ukrainian food industry. Finally, the discussion and conclusions are offered.

1. Literature review

The increasing pressure on the quality of products and services prompts enterprises to choose new approaches over traditional quality management methods as the used approach to quality can provide a competitive advantage in terms of unwavering quality, development, and time-to-market measurements (Wijaya & Suasih, 2020; Sujova & Simanova, 2021). As a result, management literature presents many variable management methods and techniques supporting the market activity of businesses. The methods can increase business efficiency and uprate their market value, e.g., by improving the ability to adapt to the current market strategy (Jurczak & Jurczak, 2021). The theory of cyclical and innovative development of enterprises was traced in the works of Tugan-Baranovsky and Schumpeter, whilst innovation issues were identified by Kondratiev. Simon Kuznets' Nobel Prize Lecture on new approaches to the theory of innovation focused on the problem of the relation-

ship between innovation and economic growth. The English researcher Freeman made a significant contribution to the formation of innovation theory, analysing industrial cycles, primarily long waves of economic development. In the twentieth century, these theories were actively developed in different directions. For example, equilibrium states were studied by Sowden et al. (2008), Goncharenko (2012), Lee et al. (2019), Shpak et al. (2019), Didyk (2016), and Kononiuk (2022). These studies focused on the socio-economic processes of the environment and the benefits of the enterprise. Less attention was dedicated to the state of the company's transition as a point of development and possible management changes. Besides, innovative management processes also have a multifaceted nature in research. Kerzner (2007) introduced the theory of management maturity levels. Theories of innovation dynamics as a basis for studying the enterprise as an open socio-economic system are presented by Khaken (2003), Bokhashko (2013), Gutsalyuka (2012), and Hagen et al. (2014).

The force majeure events of 2021 and 2022, such as quarantine restrictions, proved the relevance of the theory in determining the enterprise's managerial and technological maturity, the formation of necessary optimal development technologies, and the urgent implementation need. Now, the enterprise development dynamics are changing so rapidly that classical methods appear insufficient. Therefore, the introduction of technologies to which the company is adapted will allow it to respond quickly to environmental changes.

Approaches to measuring and assessing the enterprise's technological maturity level and managerial maturity separately have significantly different purposes, content, and the depth of factors and criteria analysis. The enterprise's technological maturity research has gained importance to allow the implementation of business processes or individual IT technologies (Grim, 2009; Potoczek, 2021). For example, the formation of enterprise management technologies with in-depth substantiation of basic management technologies and characteristics of their managerial and technological maturity levels is based on the study of existing classical models of such companies as Wipro, Harman Communicate, Real Story Group, Hewlett-Packard, CMMI (the Capability Maturity model by the US Mellon Institute), or Kerzner's models (Project Management Maturity Model, PMMM) and OPM3 (Organisational Project Management Maturity Model).

The essence of the existing assessment methods is to determine the enterprise's readiness for the technological improvement of the IT system without considering the update of existing technologies, equipment, organisational and information infrastructure, professional competencies, and enterprise management technology.

Technological components of management–technology maturity level diagnostics were formed based on the study of the following models' technological maturity assessment: (i) maturity assessment models developed by such consulting companies as Wipro, Real Story Group, (CMS Watch), Smigiel Consulting Group and Harman Communicate (Galimov, 2009); (ii) technological maturity assessment models developed by HewlettPackard experts (HP Enterprise Services, 2001–2015); (iii) models offered by a consulting company Infosys Technologies Limited, within the enterprise transformational development model (Reghunath Balaraman, Aromal Mohan) (HP Enterprise Services, 2001–2015); (iv) the technique for determining the technological maturity level, developed by the company Directum, presented on the site ECMJournal 2010; and (v) the model of the business processes maturity level, developed in the form of tests by the company FineXpert.ru 2003.

Furthermore, the following models were evaluated to base the formation of components for managerial maturity diagnostics of managerial–technological maturity level: (a) the Capability Maturity Model Integration by the Carnegie Mellon University, USA. CMMI is a process maturity model for software or the ability of a company to develop quality software (2010); (b) Kerzner's Maturity Model focused on the development of project management practices (Project Management Maturity Model, PMMM, 2003); (c) the PM Maturity model of Berkeley's University of California quantifying the project management maturity (2017); (d) the Organisational Project Management Maturity Model (OPMM) — an international standard of the Project Management Institute (2003).

Considering the above, the managerial and technological maturity level depends on the set of management technologies implemented at the enterprise. The change in the enterprise development level, progressively and regressively, is primarily determined using an innovative set of management technologies with high adaptability.

The enterprise's managerial and technological maturity levels are grouped according to the main

Tab. 1. Characteristics of the enterprise managerial–technological maturity levels by results of existing model generalisation

The level of managerial and technological maturity	Management characteristics at a given level
Level 1 — Initial, specialised management (Initial)	Business processes occur for the first time; management methods and tools are not used, or no single management strategy exists
Level 2 — Cyclical, control with scheduling elements (Repeatable)	Basic business processes are sustainable; the collection and processing of information are generally irregular, and no single management strategy exists
Level 3 — Process, process management (Processes)	The enterprise's basic business processes are formalised; the collection and processing of information are regular; a unified management strategy is based on experience in operational management; the use of specialised management technologies is intensified
Level 4 — Progressive, development management (Progress)	All business processes of the enterprise are formalised and refined; a unified management strategy is intentionally formed; management problems are subject to comprehensive analysis, elimination, and prevention
Level 5 — Dynamic, continuous improvement management (Sustained dynamic)	All business processes of the enterprise are subject to continuous improvement; the purpose is the dynamic development of the enterprise; the strategy is formed, constantly refined, and adjusted

business process parameters at a given level of enterprise management based on the results of the generalisation of existing models (Table 1).

The company uses the theory and methods of innovation dynamics to identify certain needs and interests, decide on the existing managerial and technological maturity level, and consider the possibility of moving higher or lower. This transition is possible by using the theories paradigm on the development states and life-cycle phases inherent in every company. Also, it is possible to use activity optimisation mechanisms and create conditions for the company to promote its development in dynamics.

The implementation of management technologies with an optimally adaptive innovation component will create a path to a new higher managerial and technological maturity level. Conversely, the inadequate and untimely introduction of even the most efficient technology will burden the enterprise and create conditions for economic and industrial decline. Therefore, it is important to comply with the existing level, stimulating further enterprise development and supporting it long-term in a dynamic business environment.

Under modern, dynamic and highly competitive conditions, there are cases when companies with a sufficient level of managerial and technological maturity find themselves in crisis and are forced to fight for their survival. However, in such a case, only a small number of companies dare to introduce new management technologies with innovative effects.

2. Basic assumptions of the model

The enterprise development methods are dialectically connected with the corresponding development models, so regardless of the methods influencing the managed system, certain changes are expected in the current state. The use of management models can adequately reflect and describe the various discrete states of the enterprise. The transition between discrete states of a functioning enterprise means the system's exit from the equilibrium conditions and the growing uncertainty level in the change process (Kerzner, 2007). A system of differential equations is used to choose such system parameters that allow predicting the impact. The functional criterion of system quality $Q=Q(x,u,t)$ is a set of management technologies that can be applied. The process of enterprise functioning as a developing system is described by the vector differential equation (1). And equation (2) shows what fixed states an enterprise can have at a certain time.

$$\frac{dx}{dA} = B(t)X(t) + U(t,\gamma) \quad (1)$$

where: $x = (x_1, x_2, ..., x_n)$- system state vector;

B(t) — deterministic dimension matrix ^{mxn};

$U(t,\gamma) = (U_1(t,\gamma_1)),(U_2(t,\gamma_2)),...,(U_n(t,\gamma_n))$

n — dimensional control vector,

which depends on a random vector $\gamma = (\gamma_1, \gamma_2, ..., \gamma_m)$.

If the initial state of the system is a condition $x=(t_0)=x_0$ and the system quality criterion is functional $Q=Q(x,u,t)$, then they are functions of a random argument γ.

The type of control is selected so that the functionality can fall within the specified interval with the maximum probability.

Select the control type $U(t,y)$ that way Q to allow the functionality to fall within the specified interval with maximum probability (Q_1, Q_2).

Formula (2) is a mathematical expression of control of economical systems with additional connections.

Consider two systems of equations with respect to random parameters (2):

$$\begin{cases} Q(\gamma_1,\gamma_2,...,\gamma_m)=Q_1 \\ \Psi_1(\gamma_1,\gamma_2,...,\gamma_m)=Q_1 \\ ....,...,...,....,..... \\ \Psi_{m-1}(\gamma_1,\gamma_2,...,\gamma_m)=Q \end{cases} \quad \begin{cases} Q(\gamma_1,\gamma_2,...,\gamma_m)=Q_2 \\ \Psi_1(\gamma_1,\gamma_2,...,\gamma_m)=Q_2 \\ ....,...,...,....,..... \\ \Psi_{m-1}(\gamma_1,\gamma_2,...,\gamma_m)=Q \end{cases} \quad (2)$$

where: Q_1 and Q_2 — some fixed values of the functional Q.

Then, the solution of a particular case of equation (2) in will be (3):

$$x(t)=\frac{Ax_0e^{A\alpha t}}{1+x_0e^{A\alpha t}}+\gamma \quad (3)$$

where: $x=(x_1,x_2,...,x_n)$- system state vector;

Tab. 2. Formation of a basic set of innovative management technologies according to a certain level of managerial and technological maturity

The level of maturity	Grouping	Basic technologies and compositions
Initial	Corporate	Missing
	Production	Supply chain management; operational management
	DSS technology	Fragmentary decisions of the head
	Information technology	Information and accounting technologies (accounting, warehouse, logistic); WEB-business card
Cyclic	Corporate	Change management; budgeting system; brand management
	Production	Financial management; logistics management; marketing management
	DSS technology	Personnel management; BSC systems; benchmarking; outsourcing; risk management
	Information technology	Control and cost information technologies; information technology planning, ARM formation
Process	Corporate	Strategic planning; CRI Office; TQM implementation; controlling
	Production	Quality management; MRP technologies; MFE
	DSS technology	Management accounting and reporting; CRI systems; business process engineering and reengineering; crisis management; downsizing
	Information technology	CIS implementation; implementation of virtual offices, PR and sales informatisation; new business model formation; use of cloud technologies
Progressive	Corporate	Formation of mission and vision; corporate culture introduction; management of knowledge bases; QMS implementation; implementation of the sustainable development concept
	Production	Innovation management; investment management; CRM technologies; ERP, MRP II technologies; MFE
	DSS technology	Process-oriented management; social management; prognostic management; scenario planning; modelling the optimal decision-making mechanism; knowledge management
	Information technology	An online store implementation; developing own media resources (chats, messengers, video reviews, and directories)
Dynamic	Corporate	Strategic alliances; mergers and acquisitions
	Production	Price optimisation models; project management; environmental management, interactive marketing technologies; innovative production modernisation
	DSS technology	Benchmarking; ABB (Process-Oriented Budgeting); VIM (intellectual capital management)
	Information technology	Customisation and big data creation; activity software (creating your own software and custom software); use of mobile applications with artificial intelligence — creating business models

Note: DSS — decision support system.

$A(x)$ - square matrix, the elements which characterised the impact on the economic state of the enterprise system.

It should be borne in mind that enterprises as open economic systems cannot be in a state of absolute equilibrium because they are in a state of constant motion. Such systems are prone to transformations, and when the system approaches critical values of external parameters, there are sudden, unpredictable structural changes or chaos. To neutralise such effects, a certain stabiliser must be introduced into the system. The authors propose management technologies in their transformed, innovative form as such a stabiliser.

3. Model development

As mentioned, enterprises as open economic systems cannot be in absolute equilibrium due to the state of constant motion. Therefore, they are prone to transformation, and once such systems approach critical values of external parameters, sudden and unpredictable structural changes or chaos undoubtedly occur.

A particular stabiliser/inhibitor must be introduced into the system to counteract such effects. Such proposed stabilisers/inhibitors are control technologies in their transformed, innovative form.

The composition of the optimal set of management technologies should be calculated separately for each enterprise. Then, the enterprise's phase portrait is determined by balance, the actual level of managerial and technological maturity of the enterprise. Also, the genetic predisposition of the enterprise to a certain maturity level to ensure dynamic development in the future is determined.

Innovative management technology is a materialised implementation result of a newly created or improved algorithm aimed at optimal and adaptive improvement of certain enterprise activities based on the achievements of scientific and technological progress.

Once a set of measures for the management technology introduction is implemented, the final stage of this process begins, aiming to identify and eliminate shortcomings and prepare the company's staff to use the technology regularly. The final implementation stage begins with the control technology verification. The use of technology is a cyclical process, so testing is considered complete when the control cycle and technological operations and procedures are finished. Increasing the enterprise's managerial and technological maturity level is a complementary process and depends on the level of management technologies innovation and the existing complex optimality.

On the one hand, the managerial and technological maturity level is a determining indicator of the existing technologies set, and on the other hand, it is the implementation of the complex that significantly changes the enterprise's maturity level, development, and the system as a whole. The proposed basic set of management technologies in accordance with a certain managerial and technological maturity level is presented in Table 2.

The data provided in Table 2 allow determining the limits of global performance standards, starting with the introduction of individual management technologies, grouped according to research by foreign scholars and leading companies. It should be noted that the introduction of innovative management technologies has a complex effect, as it radically changes the general balance of the enterprise's system, its managerial and technological maturity level, and its development vectors.

4. Research results

Table 3 presents the effectiveness limits of innovative management technologies optimisation used by significant food industry enterprise groups. The specific attitude and priorities of specialists to the implementation results of each group of technologies were determined: corporate technologies, production technologies, DSS technology, and IT technologies.

Each enterprise was assigned a number in the study group: No. 1 — PJSC Bashtansky Cheese Factory; No. 2 — PJSC Kherson Oil Factory; No. 3 — PJSC Wimm-Bill-Dunn; No. 4 — PJSC Kalanchatsky Oil and Gas Plant; No. 5 — PJSC Zhytomyr Oil Plant; No. 6 — PJSC Yantar; No. 7 — PJSC Yagotinsky Creamery.

The cognitive performance matrix developed for the food industry enterprises shows that enterprises considered the information technologies implementation and the production of complex technologies the least important. Almost all enterprises had upgraded their equipment over the past ten years, and there was no urgent need to retool production. Automated modern production complexes allowed reducing the costs of persons/hours, with no need for additional information technologies.

Tab. 3. Determining possible optimisation effectiveness of innovative management technologies complex for food processing enterprises

Grouping	Boundary standards	S / N No. 1	S / N No. 2	S / N No. 3	S / N No. 4	S / N No. 5	S / N No. 6	S / N No. 7
Corporate technologies	90 %–70 %	85	60	95	70	85	50	85
Production technologies	19 %–48 %	45	20	30	19	20	15	45
DSS technology	60 %–70 %	60	50	40	40	65	35	75
IT technologies	70 %–20 %	60	40	60	50	70	15	80

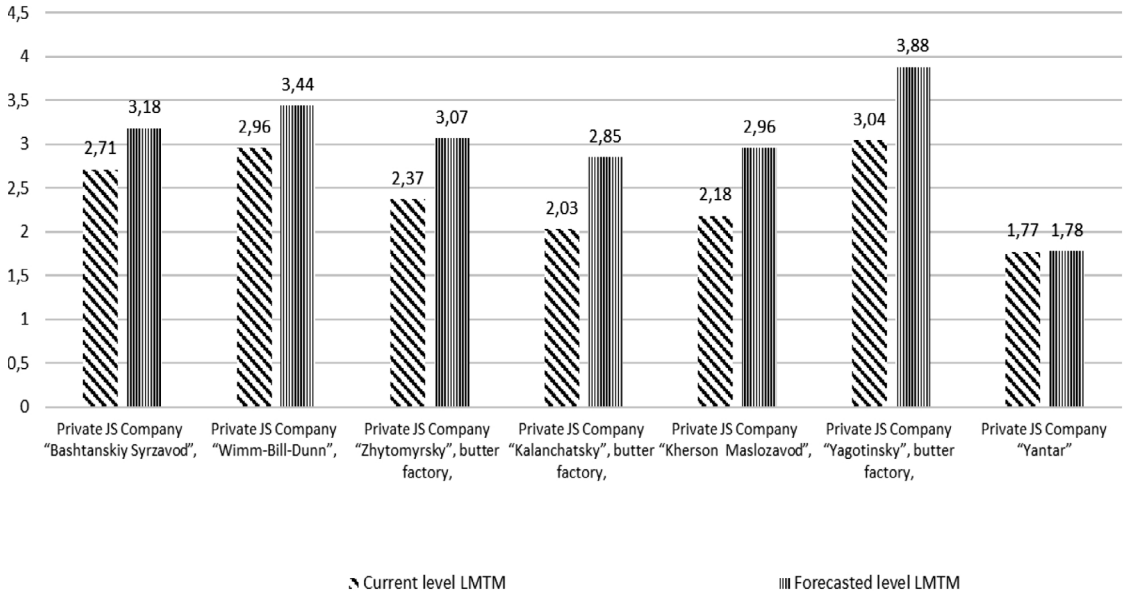

Fig. 1. Determining the managerial and technological maturity level for food industry enterprises

The quantitative and qualitative scales of differentiation of technological and socio-economic development levels were determined, and inhibitors that directly impact enterprise development were identified.

The introduction of innovative management technologies is among the top priorities for the company development of three food market leaders, PJSC Yagotinsky Creamery, PJSC Bashtansky Cheese Factory and PJSC Wim-Biel-Dann. The management of the Milk Alliance (PJSC Yagotinsky Dairy Plant, PJSC Bashtansky Cheese Factory) and PJSC Wimm-Bill-Dann also pay significant attention to corporate and DSS technologies due to their influence on the market segment development and conditions for increasing customer loyalty. The management includes professionals with extensive experience in this field.

The development lag in the PJSC Kalanchatsky Oil and Gas Plant is a warning sign that high-quality products are insufficient without adequate attention to innovative DSS technologies to achieve the necessary development impetus and the enterprise's goals.

In terms of production volumes, PJSC Yantar is an outsider despite the fifty-year history of the company's existence and the brand recognition as a child-friendly company. At some point, the company could not handle the competition and almost closed; however, a strategy to renew the main line of activity has been developing for the past two years.

The management and technological maturity were also diagnosed at other food industry enterprises, i.e., PJSC Bashtansky Cheese Factory, PJSC Kherson Oil Factory, PJSC Wimm-Bill-Dunn, PJSC Kalanchatsky Creamery, PJSC Zhytomyr Butter Factory, PJSC Yantar, PJSC Yagotinsky Creamery. The exercise allowed determining three plants in-between maturity levels 1 and 2 and four large Ukrainian plants that rose to maturity levels 2 and 3 (Fig. 1).

The process of control technology transformation into the innovative state using the key imperatives, methods, and tools of the innovative dynamics theory is investigated and substantiated. The uniqueness of an enterprise's behaviour in space (business environment) and time (equilibrium state) is determined by the point of change of the system (bifurcation point) and the movement vector of the enterprise system (attractor) if it affects the company in a certain period and a certain segment of activity can avoid crises and achieve the enterprise's development in an effective direction.

The criteria allow using a simple algorithm for determining the managerial and technological maturity level, the application of the optimal set of innovative management technologies for the company and obtaining results for their development.

The Covid-19 pandemic in 2021 has clearly shown that enterprises can find themselves in a difficult situation regardless of their development level and country of origin. This is especially difficult in a highly competitive environment. Only a few enterprises manage to adapt and overcome the consequences of such unforeseen events. It was only possible for the companies that managed to make striking changes and adaptively introduced new management technologies with an innovative effect.

5. Discussion

Most companies use a standard set of actions close to the relevant anti-crisis, corrective and other management technologies applied under conditions of unstable operation. Therefore, a detailed analysis of factors affecting the management technology choice does not always determine what technologies are needed at certain management and technological

Tab. 4. Setting performance limits of control technologies

Grouping	Management technologies	Standardisation of regulatory formats for implementation efficiency	Sources of recommendation and format definition
Corporate technologies	Balanced scorecard, strategic audit, strategic controlling	Achieving a common understanding of activities and areas of development — in 90 % of enterprises; improvement of strategy implementation — 70 % of enterprises; an increase in profit — 80% of enterprises; an increase in the planning efficiency — 90 %; the budgeting efficiency increase — 74 % of enterprises	Company research "Horvath & Partners" (2003)
	Designing effective management processes and organisational structure	Increase in return on capital; increase in competitiveness; increase in income; reducing costs; increasing customer retention rates	International standard ISO 10014
DSS technology	BPM ABB	Increasing the efficiency of key cross-functional business processes by 100 %	Lean Institute (J. Vumek, D. Jones, 2003)
	Budgeting, controlling	Increase in profitability of the main activity of the enterprise; reducing capital expenditures by 1–3 % per year	Naidermans Finance Corporation (2002)
	Personnel management technologies	19 % to 48 % non-sales related performance improvement; 48 % to 120 % increased sales performance	Competency International, (1993–2007)
Production technologies	Quality management	Increase in sales volumes — at 61 % of enterprises; increase in consumer satisfaction — 67 % of enterprises; improvement in product quality — in 78 % of enterprises	Research of the Urals Interregional Certification Centre
Information technology	Developing IT strategies, preparing TK for implementing IP	Reduction in the term of closing of the accounting period by five times; reducing the cost of management apparatus by 30 %; reduction of accounts receivable by 13 %; 70 % reduction in budgeting time	Statistics APICS (American Production and Inventory Control Society), "Corus" corporation data

maturity level or clarifies the technology for a particular enterprise.

The fundamental difference between the approaches is in determining the quantitative and qualitative scales of differentiation between technological, managerial, economic, and environmental economic development levels. Also, different approaches differently reveal factors and mechanisms of negative influence levelling on enterprise development.

According to Table 4, the limits of management technologies productivity are determined, which are grouped according to the research of foreign scientists and leading companies.

When considering corporate governance technologies and, in particular, the system of balanced scorecards (BSC), the formation and standardisation of regulatory formats were based on a study by Horvath & Partners. They found that with the implementation of BSC, a common understanding of activities and development directions increases in 90 % of enterprises, thus improving the implementation of the strategy in 70 % of enterprises. However, they do not associate increasing budgeting efficiency with growing profits. The research was supplemented and found that all these qualitative parameters were directly related to the quantitative result of increased profits.

Support and decision-making technologies indirectly capitalise on and increase the company's efficiency; however, studies of the largest international corporations, including the Lean Institute (James Vumek, Daniel Jones), Naidermans Finance Corporation, and Competency International, have substantiated and set the limits within which quality positions can change. This research partly confirmed such findings in theory and practice.

In accordance with the International Standard ISO 10014, the introduction of effective management processes and organisational structure reflects an increase in competitiveness, income increase, cost reduction, and customer retention improvement. Therefore, this research suggests a direct effect on return on capital. It should be noted that quality management technologies were introduced only by those Ukrainian enterprises that entered the international market or had foreign investors. Hopefully, under the conditions of victory and joining the European Union, this will become a mandatory and necessary requirement for all Ukrainian enterprises.

According to the Statistics APICS (American Production and Inventory Control Society), "Corus" corporation data, the development and active implementation of IT technologies, especially the latest generation, reduces the cost of management by 30 % and budgeting time by 70 %. However, this is typical for the US, which regulates the IT market and rules governing budgeting and doing business. In Ukrainian businesses, the introduction of modern IT technologies increases management efficiency by 10–15 times. A certain managerial phenomenon occurs in developing countries, where the payback of technology or IT systems is five times faster than in developed countries.

The implementation of innovative management technologies radically changes the overall balance of the enterprise's system, its management and technological maturity level, and the development vectors. The adaptation mechanism encompasses qualitative changes in the enterprise through an introduced innovative set of management technologies. The basic set of innovative technologies is compiled for using the full range of management technologies for a targeted impact on the enterprise through the improvement of the managerial and technological maturity level to achieve dynamic development.

Conclusions

The innovative dynamics concept was used to substantiate the possibilities of movement and development among food technology enterprises. The methodological apparatus allowed to form the concept of "innovative management technology". A comparative analysis of management and technological maturity evaluation was performed on the basis of different models, such as CMMI (Capability Maturity Model Integration) by the Carnegie Mellon University, Kerzner's Maturity Model, PM3M Portfolio, Programme, and Project Management Maturity Model) by the Ministry of State Trade of the United Kingdom, and the PM Maturity model of Berkeley's University of California. It allowed to form five managerial and technological maturity levels and determine the characteristic processes that occur in the enterprise at each maturity level. Each of the five levels has its own strategies for describing and formalising business processes, management technologies, the state of information, and communication space formation.

In contrast to existing models, methodological approaches to determining the state of financial and economic equilibrium in a changing business envi-

ronment allow to form the existing vectors of enterprise development and choose a multivariate model of its dynamic development. This constitutes the research's contribution to the theory. They can be used as a typical model for enterprises of different sizes and industries. The proposed approaches were used by enterprises and allowed a quick result in the development and saving of resources.

The study has limitations. First, companies from a developing country (Ukraine) were analysed only, thus making it unclear whether the proposed approaches can be used in more developed countries. Secondly, the number of analysed companies (seven) is relatively small. Therefore, further research on a larger sample should be conducted. Furthermore, future research should be more in-depth, apply the optimal set of innovative management technologies for enterprises, and consider the basic set that affects the activities of the enterprise and the effectiveness of its development.

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Selected contextual factors and entrepreneurial intentions of students on the example of Poland

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ABSTRACT
The article analyses the influence of contextual variables on students' entrepreneurial intentions. The research seeks to extend previous findings concerning the impact of various contextual factors on entrepreneurial intentions. The main focus was on public policy, business environment and education as the contextual traits. The study answers the following questions: What role do contextual variables play in the formation of the entrepreneurial intention of young people? What factors comprise a latent variable — contextual factor? What is the relationship between various contextual factors? The survey was conducted among students of the Faculty of Engineering Management at Bialystok University of Technology (Poland). Data were collected from the sample of 332 respondents. This research used a causal quantitative methodology using structural equations (Structural Equation Modelling, SEM). The impact of education (E) on the business environment (BE) and of the business environment (BE) on public policy (PP) was confirmed. A direct influence of contextual factors — education (E), business environment (BE) and public policy (PP) — on entrepreneurial intentions (EI) has not been positively verified. The main theoretical conclusion is that contextual factors do not directly explain the entrepreneurial intentions of the surveyed student population in Poland. Decision-makers and politicians should consider additional measures to improve public policy in the country, but above all, measures that promote intentions indirectly. They aim to improve the educational environment in the country that is strengthening entrepreneurship education programmes in universities and earlier education stages and activities in the business environment, supporting the creation of new companies.

KEY WORDS
student entrepreneurship, contextual factors, entrepreneurial intentions, education, public policies, business environment

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Introduction

Over the last several decades, the phenomenon of entrepreneurship has gained enormous importance on a global scale as a perceived important source of innovation and economic growth for countries and regions (Audretsch, 2002; Christensen, Johnson, & Rigby, 2002; Mai & Gan, 2007). Entrepreneurship is the subject of extensive research that examines it from various perspectives: motivation (Shane et al., 2003; Oosterbeek et al., 2009), barriers

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(Gorji & Rahimian, 2011; Sobel et al., 2007; Klapper et al., 2004), intentions (Fayolle & Liñán, 2014), gender (Sarfaraz et al., 2014; Warnecke, 2013), pandemic perspective (Zahra, 2021; Ratten, 2020) and many other.

Entrepreneurship is a multi-dimensional and multi-threaded global process that has the effect of setting up a new company (Ahsan et al., 2019; Baciu et al., 2020; Bosma et al., 2009; Szydło et al., 2022). Two lines of research address variables favouring entrepreneurship in general: personal/individual (Canedo et al., 2014; Tomczyk et al., 2013; Martinez-Gonzales & Kobylińska, 2019) and contextual (Busenitz et al., 2014; de Castro et al., 2005; Mai & Gan, 2007; Krueger et al., 2000; Lee et al., 2011).

Studies using the individual approach have focused on the specific attributes of entrepreneurs (e.g., skills, self-efficacy, competencies, motivation, and attitude) (Gupta & Fernandez, 2009; Abdullah, 2018; Jahanshahi, 2018; Salhi, 2018). Within the contextual approach, environmental and external factors (e.g., public policy, education, culture, and business environment) are among the many factors supporting entrepreneurial activity (Civera et al., 2021; Ahadi & Kasraie, 2020; Fuller et al., 2018; Ucbasaran et al., 2001; Szpilko et al., 2021). Research in the area of entrepreneurial intentions generally focuses on identifying personal factors that explain the willingness to become an entrepreneur, minimising the importance of other factors.

The issue of individual entrepreneurship has always been the subject of scientific research, leading to many studies in an attempt to identify the factors that predict the behaviour of future entrepreneurs. Entrepreneurial Intention (EI) is well known as a reliable predictor of real entrepreneurial behaviour (Fayolle & Liñán, 2014). Since the intention is considered to be the best predictor of behaviour, a thorough understanding of the parameters influencing EI is essential to assessing business behaviour (Ajzen, 1991; Krueger et al., 2000).

Entrepreneurial intention is shaped by a specific environment, and some environmental factors are more favourable than others (Civiera et al., 2021; Suresh & Ramraj, 2012). No consensus exists in the literature regarding contextual factors that best explain the influence of specific variables on entrepreneurial intentions (Vuong, 2020). The literature highlights the role of entrepreneurial policies and programmes important for a favourable entrepreneurial climate in the country (Davari & Farokhmanesh, 2017) and the importance of the business environment and infrastructure (Guglielmetti, 2010). The role of the appropriate education system also has been highlighted because it allows for the development of entrepreneurial intentions, shaping values related to self-employment (Liñán et al., 2011; Van Der Sluis et al., 2008). There is ample empirical evidence that education is essential to nurturing entrepreneurial individuals and, thus, creating entrepreneurial communities (Gurtner & Soyez, 2016; Dvouletý, 2018).

Researchers point to the need to study entrepreneurial intentions in a regional context in various segments of the population, as sociological research indicates a progressive homogenisation of patterns, including cognitive, relational and behavioural, derived from the process of globalisation (Nowak, 2006). This is especially true for generations such as Generation Y (young people born approx. between 1980 and 2000).

Some authors (Nabi et al., 2010) suggest their great importance in changing the generation of the current entrepreneurial population. There is a particularly high interest in learning about entrepreneurial intentions among university students, as they are a good representation of this generation (Gurtner & Soyez, 2016; Utami, 2017).

This study devoted to the entrepreneurial intentions of university students in Poland aimed to respond to the concerns and suggestions found in the literature and elaborate on the framework of the contextual approach.

The article addresses the expectations that future entrepreneurship research may propose new theoretical models that use engagement theories to describe and explain entrepreneurial commitment (e.g., Fayolle & Liñán, 2014).

While the literature presents many different approaches to environmental factors that can influence the entrepreneurial intentions of young people, it is important to focus on selected variables that can show entrepreneurial relevance, which can be a benchmark, especially in central decision-making. For this reason, the authors present the developed structural model using a set of responses from young Polish students. The small number of variables contained in the model allows for explaining and managing the shaping of intention in the context of the students. This study specifically answers the following questions: What role do contextual variables play in shaping entrepreneurial intention for young people? Which of the contextual variables have the greatest impact on the entrepreneurial intentions of young

people? What are the relationships between contextual factors?

The study uses a two-stage approach. In the first step, confirmatory factor analysis (CFA) was used (CFA allows specifying the relationships between latent variables and their observed indicators), and in the second step, the measurement model was applied to build a structural model. The fit, reliability and validity of the models were tested.

The cause–effect model proposed in the article is new due to the type and number of contextual variables and the relations it contains. The model includes "basics" contextual variables (e.g., education, business environment) and "action" contextual variables (e.g., public policy) that influence entrepreneurial intention. However, the results of the study did not confirm that contextual factors could explain students' entrepreneurial intentions. In the structural model presented in the article, only two paths turned out to be statistically significant. However, the influence of contextual factors — education (E), business environment (BE) and public policy (PP) — on entrepreneurial intentions (EI) has not been positively verified.

The article is structured as follows. The first section offers an introduction, and Section 2 provides a literature review and hypotheses. Section 3 presents the sample, data collection procedure, measures and variables. Section 4 compiles analysis results, and Section 5 concludes and establishes future research directions.

1. Literature review

1.1. Entrepreneurial intention

The literature emphasises that intentions strongly predict actual future entrepreneurial behaviour (Krueger et al., 2000). Entrepreneurial intent (EI) is the first act in the entrepreneurial process (Khalifa & Dhiaf, 2016). Many studies have tried to determine the factors having the greatest impact on entrepreneurial intentions (EI) (Lee et al., 2011; Kobylińska, 2020; Bjekić et al., 2020). So far, the intention is the best predictor of individual behaviour, especially when it is rare, difficult to observe, or associated with unpredictable time delays (Krueger & Brazeal, 1994). Entrepreneurial intention (EI) has been described as a desire to start and a sincere motivation and willingness to engage in an entrepreneurial venture (Osadolor et al., 2021). In recent years, several articles in this area of research have been published, identifying various factors that precede entrepreneurial intentions, both individual and contextual (Shirokova et al., 2016; Farashah, 2015; Lüthje & Franke, 2003). Previous studies in this area have analysed the role of students' personal and environmental factors in shaping their entrepreneurial intentions, but the results of these studies remain contradictory (Szwarc et al., 2009; Nabi et al., 2017).

As indicated in the literature, the entrepreneurial intention is a state of mind leading to the choice of self-employment over working for someone else. Many studies analyse the positive relationship between EI and entrepreneurial activity and its subsequent relationship with economic development (Turton & Herrington, 2020; Guerrero & Peña-Legazkue, 2013). The interest in studying entrepreneurial intentions is related to many factors. As research shows, the intention strongly correlates with the behaviour of creating a firm; in some cases, this correlation even exceeded 0.96 (Shirokova et al., 2016). Intention also explains the high percentage of the variance in entrepreneurial behaviour, the variable that most accurately predicts entrepreneurial behaviour (Shirokova et al., 2016; Liñán & Fayolle, 2015). On the other hand, intention measures the will and personal effort an entrepreneur is willing to undertake to start a business (Thompson, 2009; Oftedal et al., 2018). Two models serve as a guide to understanding the development of entrepreneurial intentions: Ajzen's planned behaviour (TPB) theory (Shapero & Ajzen, 1991) and Shapero and Sokol's (1982) business event model (EEM) for a business event (Shapero & Sokol, 1982). In Shapero and Sokol's model, the intention of entrepreneurship is shaped based on perceived desire, perceived vitality and propensity to act. On the other hand, the planned action theory holds that the intention to start an activity depends on three variables: attitude to behaviour, perceived control of behaviour, and subjective norm. Intent models are the subject of research in psychology, marketing, and management, and previous research has revealed especially interesting empirical conclusions. Due to the predictive power of intention over entrepreneurial behaviour, the entrepreneurial intention has been used as a dependent variable in most of the designed models (Krueger et al., 2000; Fitzsimmons & Douglas, 2011). Although both models have been empirically tested and provide satisfactory predictions of entrepreneurial intentions, the literature is dominated by the use of planned behaviour theory (Kautonen et al., 2015).

The most influential articles on entrepreneurial intention can be divided into several groups. The first category includes publications on theoretical and methodological issues testing the main models. The second category includes articles focusing on variables such as gender, family roles, social capital and personality traits. The third group of research concerns the role of education in the context of entrepreneurship. Numerous publications focus on the role of context and institutions, including samples from several countries. The last group of articles analyses the relationship between intention and behaviour, confirming the high predictive potential of intention in entrepreneurial behaviour (Gonzales & Kobylińska, 2019).

1.2. Contextual factors

Most of the research focuses on personal factors influencing entrepreneurship (Claar et al., 2012; Rosique-Blasco et al., 2018; Frohman, 1997; Lee et al., 2004). A definite minority of articles focus on the importance and role of contextual factors in entrepreneurial intentions. The knowledge about the contextual background of entrepreneurial plans is less extensive, especially at the level of the analysed country.

In addition to personal variables, entrepreneurship at the regional level also requires contextual factors, also known as external or extrinsic variables (Simón-Moya et al., 2014; Ahadi & Kasraie, 2020). Entrepreneurship takes place in a specific environment, and some environmental factors are more favourable than others (Civera et al., 2021; Matos & Hall, 2019). No commonly accepted contextual factors influencing entrepreneurship have been identified in the literature, although they are usually classified as formal institutional and informal institutional (Salimath & Cullen, 2010; Tur-Porcar et al., 2018; Nguyen, 2020; Tleuberdinova, 2021). From a formal institutional perspective, the importance of government policies and programmes, infrastructure and market development is emphasised (Touzani, 2015; Cherrier et al., 2018; Méndez-Picazo et al., 2021). The role of the education system was also emphasised as it allows for the development of an entrepreneurial vocation, self-employment values, entrepreneurial competences and entrepreneurial intentions (Schøtt & Cheraghi, 2015; Bergmann et al., 2016).

According to Hatos et al. (2012), the most frequently mentioned contextual predictors are the labour market situation, access to financing, housing origin, income level and income expectations, law, research/development/technology, market characteristics, entrepreneurship education and culture, level of economic development, entrepreneurship development policy, stage of the economic cycle. Rahaman et al. (2020) discussed five variable contextual factors: social networks, access to capital, university education, structural support, and business information. When it comes to contextual variables related to entrepreneurship, Global Entrepreneurship Monitor (GEM) includes them in its reports as "entrepreneurial framework conditions" (Sá & De Pinho, 2019). These variables can be considered an important part of business creation and directly influence entrepreneurial opportunities, competences and preferences (Bosma et al., 2021; Herrington & Coduras, 2019). GEM context variables can be divided into formal institutional or informal institutional. Regarding the formal institutional framework, GEM contains three variables related to government actions: "Taxes and Bureaucracy", "Governmental Policies: Support and Relevance", and "Government Entrepreneurship Programs" (Bosma et al., 2021).

The first variable relates to the importance and overall support that government provides to entrepreneurship through policy making. The second concerns the extent to which tax policy and bureaucracy can facilitate or slow down entrepreneurship. The third variable relates to government programmes that directly promote entrepreneurship at the national, regional or municipal levels (Martínez-González et al., 2021). These three variables are important for entrepreneurship as government support for entrepreneurship is considered a fundamental aspect in the literature (Akinyemi & Adejumo, 2018; Nakku et al., 2019). Additionally, in the formal institutional framework, GEM includes two contextual variables related to infrastructures for entrepreneurship. First, "Commercial and Legal Infrastructure" refers to the presence of property rights, commercial, accounting and other services, and legal and opinion-making institutions that support or promote the entrepreneurial process. Second, "Physical Infrastructure" means the ease of access to physical resources (e.g., transportation, communication) (Martínez-González et al., 2021). In this way, GEM considers the importance of infrastructures in the literature (Bennett, 2019; Muñoz et al., 2020). Considering the importance given to the market in the entrepreneurial literature (Zhao & Lounsbury, 2016; Ali et al., 2020), GEM considers two variables related to these aspects: "Internal Market Dynamics"

and it is related to the level of fluctuation in markets from year to year. The second is "Internal Market Openness (Market Burdens or Entry Regulation)", which is the extent to which new firms are free to enter existing markets. GEM also reflects the importance attached to education in the entrepreneurial literature. GEM considers education using two variables (Wei et al., 2019). "Entrepreneurial Education at School Stage" refers to the extent to which entrepreneurship training is integrated into the primary and secondary education system, and "Entrepreneurial Education at Post School Stage" refers to the extent to which entrepreneurship training is included in higher education. It also includes two more contextual variables within the formal institutional context: "Entrepreneurial Finance" refers to the availability of financial resources for small and medium enterprises (Bonini et al., 2019; Brown et al., 2020).

The second is "R&D Transfer", a contextual variable that has also been considered in the entrepreneurial literature (Sá and De Pinho, 2019). This is defined as the degree to which national R&D will lead the entrepreneurial process. According to the literature, GEM considers the informal institutional context mainly through the prism of the culture and social norms (Hechavarría & Ingram, 2019).

In the GEM model, the informal context-related institutional variable is called "Cultural and Social Norms", which is the degree to which social and cultural norms encourage or enable actions leading to new business activities (Bosma et al., 2021). Some of the entrepreneurial literature suggests that socio-cultural factors, such as fear of failure, perceived opportunities, perceived opportunities, and role models, are the most important drivers of entrepreneurial behaviour (Arenius & Minniti, 2005; Koellinger et al., 2005).

However, increasing attention is being paid to several contextual factors influencing entrepreneurship (Rahaman et al., 2020; Farashah, 2015; Gelard & Saleh, 2011). It is difficult to predict factors that are crucial to the intentions of young people. The literature review resulted in the following factors playing the greatest role in predicting the entrepreneurial intentions of students from the perspective of contextual factors.

1.3. Education (E)

It is now widely accepted that education is necessary to nurture an entrepreneurial individual and, therefore, create an entrepreneurial community. Research by Hollenbeck and Hall (2004) and Wilson et al. (2007) explored and emphasised the importance of education in the context of entrepreneurial intentions. Robinson et al. (1994) found a strong relationship between education and the likelihood of becoming an entrepreneur and being successful as an entrepreneur. However, these authors did not determine the specific type of education (early school or studies) conducive to entrepreneurial attitudes (Lorz et al., 2011).

Education introduces young people to entrepreneurial logic, common challenges and general procedures. In addition, educational institutions provide micro-environments conducive to the development of an entrepreneurial culture and ensure a network of relationships with other research centres, reputable companies and consultants (Lredo, 2007; Kibler, 2013; Valliere, 2017; Passaro et al., 2018). Entrepreneurship education is to be implemented through various educational initiatives (e.g., courses, training, and workshops) (Fayolle & Cheerful, 2015). These educational initiatives encourage people to come out of the shadows and act on their passions (Thompson, 2004; Passaro et al., 2018).

Some authors suggest that entrepreneurial skills are more easily developed earlier in life because returns from training programmes later in life depend on prior investment in entrepreneurial skills (Huber et al., 2014). Some authors suggest that the level of skills and competencies which are honed by entrepreneurial education is not completely understood (Solesvik, 2019). The skills development model introduced by Cunha and Heckman (2007) emphasises that cognitive and noncognitive skills are developed at different stages in life, where the skills learned during one period in life (e.g., at primary school) increase the benefits of investing in these competences in subsequent periods (e.g., at high school or university).

While entrepreneurship education from an early age is certainly a desired behaviour, universities are pillars of knowledge that provide students with the skills needed to develop entrepreneurial tendencies (Volkmann et al., 2019). The literature on the subject emphasises that universities can support the entrepreneurial attitudes of young people by initiating many programmes aimed at promoting an entrepreneurial culture, supporting it and helping to create start-ups (Laredo, 2007; Franzoni & Lissoni, 2009; Fini et al., 2011). Especially academic entrepreneurial ecosystems affect the nature and quality of entrepreneurial activity and shape the direction and potential

benefits associated with the identification, creation and implementation of opportunities (Kobylińska & Lavios, 2020).

Since adequate education is considered to be one of the most important "essential" contextual factors influencing entrepreneurial intentions, the following hypothesis is formulated:

H1: Education (E) positively influences the entrepreneurial intentions (EI) of students.

However, some researchers find no direct link between entrepreneurial education and entrepreneurial intention (Fayolle & Gailly, 2009; von Graevenitz et al., 2010; Sánchez, 2013). Furthermore, some counter-effects have been found for students who previously had significant exposure to entrepreneurship education (Oosterbeek et al., 2010; Fayolle & Gailly, 2015) so that individuals may be discouraged by realistically looking at what is needed to start their own business and critical issues related to its management.

According to (Paço et al., 2011), education and training are important because they can change an individual's personal attitude towards competences and own skills.

As Fayolle and Gailly (2013) noted, little knowledge is available about the potential causal relationship between certain educational variables (e.g., pedagogical methods, course content, resources available, etc.) and their impact on entrepreneurial intentions and/or behaviour (values, attitudes, skills, etc.).

Entrepreneurship education aims to empower people, especially young people, to be responsible and vulnerable. Entrepreneurs should promote thinking and be involved in economic development and the creation of sustainable societies (Tajpour et al., 2018).

Their knowledge and awareness can improve the quality of the business environment, which is created by them.

Some models of entrepreneurial intention encompass an indirect influence of education on entrepreneurial intention (Passaro et al., 2018). Thus, people educated and trained in entrepreneurial education can create and be a part of a better business environment in the country.

They are more aware of what infrastructure and available technologies in the country can better meet the needs of entrepreneurs. Therefore, the following hypothesis was formulated:

H2: Education (E) positively influence the business environment (BE).

1.4. Business environment (BE)

The shaping of individual entrepreneurial aspirations not only occurs under the influence of the assessment of one's own possibilities and abilities but is also shaped by the attributes of the entrepreneur-friendly environment (Bosma, Schutjens, & Stam, 2009).

The notion of the entrepreneurial environment is crucial in studying the impact of the business environment on entrepreneurship and individual entrepreneurial behaviour (Grundstén, 2004). Nam and Hwansoo (2019) defined the entrepreneurial environment as the sum of the legal and institutional environment, financial environment, market environment, and entrepreneurial infrastructure, among others. A favourable business environment influences the dynamics of entrepreneurship in a given country. This environment includes economic development and institutions that affect the quality of management, access to capital and other resources and the perception of entrepreneurs (Fereidouni et al., 2010).

Some researchers have investigated the relationship between the perception of the entrepreneurial environment and the entrepreneurial intentions of individuals. Nam & Hwansoo (2019) indicated that the attitudes of entrepreneurs are significantly influenced by their perception of the entrepreneurial environment. Zhao et al. (2019) confirmed that students when considering the decision to start a business, assess whether the perceived environment is conducive to entrepreneurial activities. Stam (2010) pointed out that a favourable environment, along with its institutions and demand for products and market opportunities, may determine people's preferences to become entrepreneurs, which in turn may motivate entrepreneurial behaviour. It can be concluded that the business environment is also the "basic" contextual factor of entrepreneurial intentions.

The expected relationship between perceptions of the business environment and motivation to start a business is largely based on the pragmatic belief that times of economic recession or depression are unfavourable for entrepreneurs (Fereidouni et al., 2010). In connection with the above, the following hypothesis was adopted:

H3: Business environment (BE) positively influences the entrepreneurial intentions (EI) of students.

Research results show that countries with the highest rates of entry into enterprises provide entrepreneurs with a stable political climate, good govern-

ance, modernised business registers and simplified legal forms of running a business (Klapper et al., 2011). A good business climate in the country with appropriate market opportunities and technological development may affect the state's policy towards entrepreneurs in terms of lowering taxes or interest rates, which may further affect the entrepreneurial intentions of young people. The possible impact of the business environment on public policies favouring entrepreneurship allows for the following hypothesis:

H4: The business environment (BE) has a direct positive influence on public policy (PP).

1.5. Public policy (PP)

The literature on the subject includes research on government policies and regulations and their impact on entrepreneurship (Campbell & Mitchell, 2012). Public policy in the field of entrepreneurial practice aims to encourage entrepreneurship by creating a favourable environment for entrepreneurs. Government policy in this context includes all activities aimed at regulating and improving the conditions for entrepreneurs in terms of provided support, implementation measures and financing.

Literature from several studies has shown that government policy is positively related to entrepreneurship (Mason & Brown, 2011; Greene, 2012). Various authors suggest that economic policies stimulate and influence entrepreneurial intentions (Castaño et al., 2016). In the case of public support policies, it is assumed that the government is a leader in entrepreneurship development; it can provide support policies and the necessary resources within its capabilities (Obaji & Olugu, 2014).

The Global Entrepreneurship Monitor (GEM) report highlights the important functions of institutions that provide favourable conditions for the growth and development of entrepreneurial activity (Rahaman et al., 2020). Previous research has indicated the role of governments in improving access to capital through public funds, lowering entry barriers for new firms, and developing entrepreneurship support programmes (Murray, 2007; Li et al., 2020). Kreft and Sobel (2005) argued that entrepreneurship development requires an environment with low taxes, low tax regulation and private property rights.

Many authors argue that entrepreneurship is promoted by a solid regulatory framework, clearly defined property rights, transparent and easy procedures required to start a business, and effective political and economic institutions (Groşanu et al., 2015). Some studies have been dedicated to specific regions of the world, such as Eastern Europe (Manolova et al., 2008). The predominance of high-quality economic, political and legal institutions tends to direct efforts toward productive entrepreneurship and help sustain economic growth (Sobel, 2008).

In conclusion, the literature from several studies has shown that government policy is positively related to entrepreneurship (Greene, 2012; Texteira et al., 2018). Some authors argue that public policy is conducive to creating a favourable business environment (Kuriakose, 2013; Sarfati, 2012). However, knowledge is lacking regarding the extent to which support through public procedures and policies implemented by government institutions will be able to influence the entrepreneurial intentions of young people. It can be assumed that public policies are so-called "action" contextual variables that can ultimately determine the will to start a business and can positively influence entrepreneurial intentions. Therefore, the following hypothesis is formulated:

H5: Public policy (PP) positively and directly affects entrepreneurial intentions (EI).

2. Research methods

This study aimed to investigate the relationship between selected contextual factors and entrepreneurial intention. First, a comprehensive literature review was performed. This step allowed for the formulation of a theoretical framework with the hypotheses.

These studies were performed using a causal quantitative methodology with structural equations (Structural Equation Modelling, SEM). The SEM model was chosen for its advantages in studying human behaviour and for its optimal predictive potential (Sarstedt et al., 2014). SEM enables the building of the model using variables that are abstract and cannot be measured directly by a single item, such as public policy, business environment, education assessment or entrepreneurial intention.

Structural Equation Modeling (SEM) combines regression analysis with confirmatory factor analysis and allows testing of research hypotheses with high possible complexity of relationships between variables. A typical SEM analysis includes the following stages (Konarski, 2009): model specification and identification; estimation of model parameters; model quality assessment — the assessment of com-

pliance of the estimated model with the observed data set and eventual model verification, i.e., introducing modifications to the initially adopted model.

The study uses a two-stage approach. In the first step, confirmatory factor analysis (CFA) was used (CFA allows to determine the relationships between latent variables and their observed indicators), and in the second step, the measurement model was applied to build a structural model. The fit, reliability and validity of the models were tested.

Data analysis was performed using SPSS Statistics 21.0 software and IBM SPSS AMOS 21.0 used for structural equation modelling.

2.1. Sample and data collection

The sample consisted of young students from Poland, considering the suggestions of other authors regarding the importance of higher education in entrepreneurship and the need to deepen studies in this segment of the population. Many authors indicate that university students are a segment of interest in research on entrepreneurship in general and entrepreneurship intention in particular (Oftedal et al., 2008). The sample was deliberately selected from among students of the Faculty of Management Engineering studying in business-related study fields (management, production engineering, tourism and recreation, logistics) as this context makes it easier to approach and promote entrepreneurship. For the distribution of the questionnaire among students, the days and hours were randomly selected from among classes with the highest student attendance so that the number of students in the sample of each course was representative. The survey was handed over to the students personally by the author of the study at the turn of January and February 2020. Data were collected from the sample of 332 respondents (161 men and 171 women).

The sample size meets the minimum rule of ten times the number of observed variables (items) in quantitative research using a questionnaire (with a total of 17 predictive items observed).

2.2. Measures and instrument

To understand the factors influencing the entrepreneurial intentions of university students, the study used a quantitative method of collecting and analysing data. The questionnaire was used to gather information, as is usually the case in this type of research. The survey consists of two parts: general questions (gender, field of study, and the year of study) and part of Likert's 17 five-point questions with five alternative answers (1 — "strongly disagree", to 5 — "strongly agree") related to contextual variables. The items were taken from existing scales of previous studies. Elements corresponding to intention were designed in line with the comments by Liñán and Chen (2009) and Miranda et al. (2017). For the design of elements related to contextual factors, the variables described in publications (Martinez-Gonzales & Kobylińska, 2019; GEM, 2019; Miranda et al., 2017) were suggested.

Aiming to identify the structure of data and reduce the number of variables and check the dimensionality of each research construct (contextual variables), an exploratory factor analysis with the varimax rotation was performed. Due to low correlation with other items, six items were excluded from the analysis. In the final solution, only items with a loading higher than 0.5 were considered. The identified factors are (consistent with the intended solution) education (E), public policy (PP), business environment (BE) and entrepreneurial intention (EI).

3. Research results

The model was defined in the first step. Model specification means building a model that represents the assumed relationships between variables. Then, the identification of the model was checked (the possibility of unambiguous determination of the model parameters), and the model parameters were estimated.

Then, a measurement model was developed. For this purpose, confirmatory factor analysis (CFA) was used, which allows specifying the relationships between theoretical constructs (contextual variables) and their observed variables (questionnaire statements). Standardised regression weights connecting a given observable index with a latent variable were significant ($p<0.01$) and higher than 0.54 (Table 1).

The measurement model was tested for reliability and validity. Cronbach's alpha ranged from 0.59 to 0.78, Average Variance Extracted (AVE) from 0.37 to 0.55, and Composite Reliability (CR) from 0.60 to 0.79, indicating sufficient enough internal consistency's reliability and the appropriateness of the scales for the measurement of the constructs in the study.

The quality of the model is related to the assessment of the compliance degree of the estimated model with the data. Evaluating the fit of the model is

Tab. 1. Confirmatory factor analysis results

Construct		Standardised loading (λ)*	AVE	CR	α
E	*To create a company, it is necessary …*				
E1	that entrepreneurship begins to be taught in universities	0.56	0.44	0.60	0.59
E2	that entrepreneurship begins to be taught before university	0.75			
PP	*To create a company, it is necessary …*				
PP1	a good financial and banking situation in the country	0.54	0.37	0.64	0.63
PP2	government policies that favour entrepreneurship	0.66			
PP3	appropriate fiscal policies	0.62			
BE	*To create a company, it is necessary …*				
BE1	appropriate transportation and infrastructure in the country	0.69	0.43	0.69	0.68
BE2	an adequate technological development in the country	0.68			
BE3	entrepreneurship environment opportunities	0.59			
EI	*Entrepreneurial Intention*				
EI1	I intend to create a company in the future	0.84	0.55	0.79	0.78
EI2	It is very likely that in the future, they will be an entrepreneur	0.73			
EI3	I already feel motivated to create a company	0.65			

*Parameter significant at the 0.001 level

complex and requires the consideration of at least a few measures (no single measure can be used to evaluate a model uniquely). AMOS program automatically calculates 25 measures of the model fit. One of the most popular measures for assessing structural models: CMIN/df (χ2/degree of freedom)=1.33, the root mean square error of approximation RMSEA=0.03, the goodness-of-fit index GFI=0.97, the adjusted goodness-of-fit index AGFI=0.95, the comparative fit index CFI=0.98, the normed fit index NFI=0.94, the parsimonious goodness-of-fit index PGFI=0.60 exceed the recommended values and indicate a good model fit (Konarski, 2009).

Then, the measurement model was used to build the structural model (Fig. 1).

Only two paths turned out to be statistically significant in the structural model. The obtained results confirm the influence of education (E) on the business environment (BE) and of the business environment (BE) on public policy (PP), which supports hypotheses H2 and H4. However, the influence of contextual factors — education (E), business environment (BE) and public policy (PP) — on entrepreneurial intentions (EI) has not been positively verified; thus, hypotheses H1, H3 and H5 were not supported.

The measures for the final structural model fit — CMIN/df (χ2/degree of freedom)=1.34, the root mean square error of approximation RMSEA=0.03, the goodness-of-fit index GFI=0.97, the adjusted goodness-of-fit index AGFI=0.95, the comparative fit index CFI=0.98, the normed fit index NFI=0.94, the parsimonious goodness-of-fit index PGFI=0.59 — indicate a good structural model fit (Konarski, 2009).

4. Discussion of the results

The literature review noted that universities are a potential source of future entrepreneurs, and creating a business is an option increasingly appreciated by students in each country (Gonzales & Kobylińska, 2019).

Previous research has shown that entrepreneurial intentions depend largely on personal factors. This relationship is particularly evident in explana-

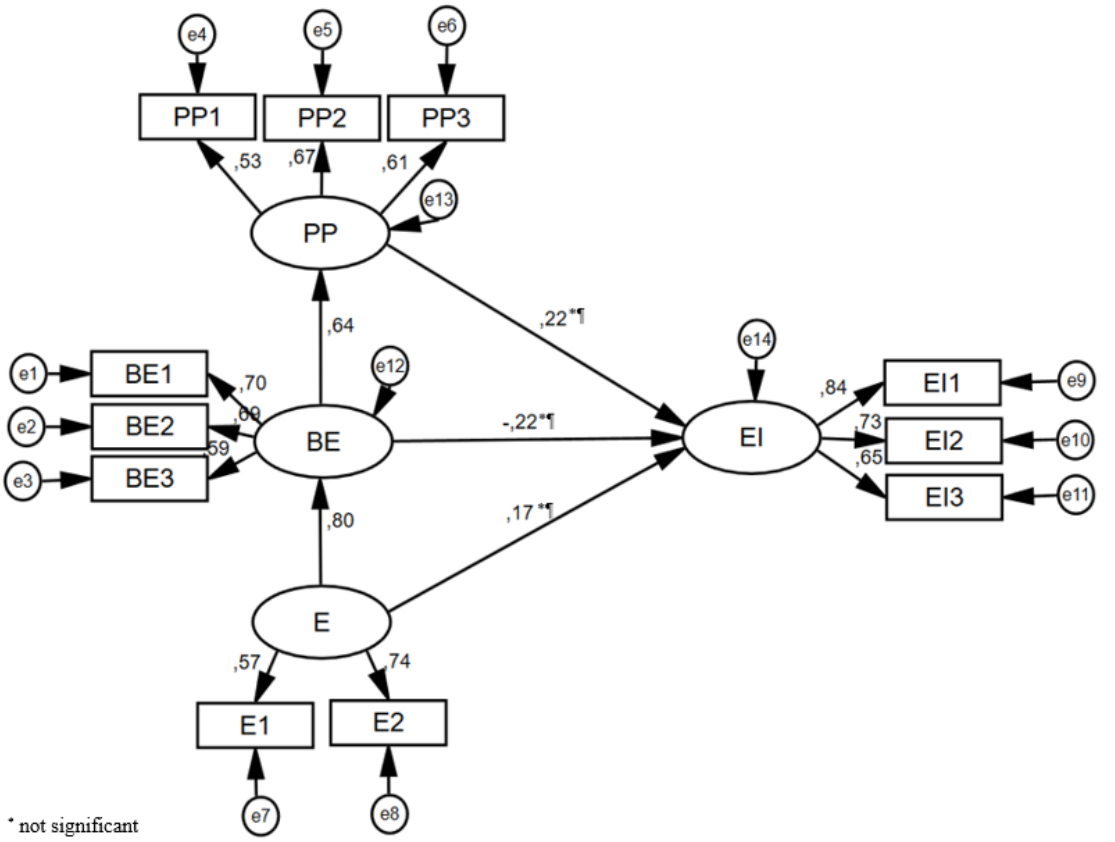

Fig. 1. Structural model

tory cause intention models (Elfving, Brännback, & Carsrud, 2009). This study considers contextual factors that, based on a literature review, may seem important in explaining entrepreneurial intentions.

In the structural model presented in this article, only two paths turned out to be statistically significant: the impact was confirmed of education (E) on the business environment (BE) and of the business environment (BE) on public policy (PP). However, the influence of contextual factors — education (E), business environment (BE) and public policy (PP) — on entrepreneurial intentions (EI) has not been positively verified.

Understanding and being able to predict the entrepreneurial intentions of young people becomes an important issue in the context of supporting them with the right tools and policies. The results of the study did not confirm that contextual factors can explain the entrepreneurial intentions of students. Considering the hypotheses posed in the previous sections of the article, there has been insufficient empirical evidence to find significant relationships between contextual factors, such as education, public policies or the business environment.

The presented research results partially confirm empirical evidence that individual factors explain entrepreneurial intentions to the greatest extent, although contrasting with the results of previous studies, where some contextual variables were important in explaining intentions.

In the case of contextual factors, it should be assumed that they do not have a direct impact on entrepreneurial intentions but may reinforce some personal factors. As indicated in previous studies, education can strengthen entrepreneurial attitudes, while the business environment can influence subjective norms, and public policy can influence the perceived control of entrepreneurial behaviour. As some authors have noted (Fini et al., 2012), it is possible that awareness of external support would come into play at the later stages, when individuals are actually implementing entrepreneurial activities.

The explanation for this result (irrelevance of contextual factors for entrepreneurial intentions) may be the lack of entrepreneurial culture in the context of the region where the study was conducted. Podlaskie Voivodeship is a region in the eastern part of Poland that historically has not been characterised

by having a high rate of entrepreneurial activity (Kobylińska, 2021).

Conclusions

The study presented in this article aimed to examine the influence of contextual factors on the students' entrepreneurial intentions.

In the presented study, an attempt was made to meet the expectations of some researchers that future research in the field of entrepreneurship may propose new theoretical models describing and explaining the entrepreneurial involvement of young people. Few articles are available in the literature analysing the relationships between various contextual factors that may shape entrepreneurial intentions. Therefore, this article aims to fill this gap in the literature. Based on theoretical analyses, contextual factors were selected from among the most often emphasised as important for strengthening entrepreneurial intentions. Aiming to verify the research hypotheses, a sample of Polish students was studied. Statistical analyses resulted in three main conclusions: (1) contextual factors do not explain the entrepreneurial intentions of the surveyed population, (2) education affects the business environment in the country, and (3) the business environment affects public policies. The presented study aimed to deepen the existing understanding of the relationship between contextual factors and the students' entrepreneurial intentions. The results of this study show that external contextual variables cannot directly stimulate the entrepreneurial intentions of young people. There may be several reasons for such a situation: incorrectly selected variables, a homogeneous research sample, and the regional context.

Certainly, Polish decision-makers and politicians should consider additional measures to improve public policy in the country (factors related to the appropriate fiscal and economic policy), but above all, measures that indirectly stimulate intentions. They are aimed to improve the country's educational environment by strengthening entrepreneurship education programmes at universities and earlier education stages and activities in the business environment, supporting the creation of new companies. Better education in the field of entrepreneurship in the country and the purposefulness of the business environment stimulating the opening of companies can contribute to a better entrepreneurial climate and, thus, to the improvement of the quality of the business environment. On the other hand, entrepreneurship-friendly public policy can be created as a response to a good quality business environment co-created by decision-makers with appropriate education in the field of entrepreneurship. The study presented in the above article has some limitations. First, the selection of the sample for this study was not random, and all students came from one province, which may affect the representativeness and universality of the results. Future research may be conducted on a larger sample of respondents from different socio-demographic groups or students from different regions of the country.

Moreover, research can be conducted in different countries with different cultures, social norms and different socio-economic conditions. These contextual factors can have a significant impact on the entrepreneurial intentions of young people in different regions. Moreover, this study only considered a limited number of contextual variables to predict entrepreneurial intentions. For future research, it may be useful to explore the broader context of the external environment, considering more variables.

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Influence of intercultural competence on an organisation's success and personal career: the case study of Lithuania

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ABSTRACT
This paper aims to identify the influence of intercultural competence on an organisation's success and personal career in Lithuania. The study described in this paper is a part of international research on intercultural competence. An online questionnaire survey was conducted in Lithuania with non-probability convenience sampling to find out the views of employees working in different sector organisations. The survey was filled out by 1193 respondents from Lithuania. Employees' intercultural competence (knowledge/cognitive dimension, skills/behavioural dimension, and attitudes/emotional dimension) was evaluated using 5-point Likert items and is elaborated elsewhere. The multivariate analysis was used to analyse the survey data and test three hypotheses stating that (1) employees support the notion that higher intercultural competence can foster an organisation's success and personal career, (2) organisations tend to leave the development of intercultural competence to employees, and (3) current intercultural knowledge and skills are inadequate to operate in a multicultural work environment. The analysis showed that half of the respondents agreed with the statement that the development of intercultural competence (ICC) helped the personal career and an organisation's success. The statement regarding organisations tending to leave the intercultural competence development to their employees was only supported by less than one-third of the respondents. Besides, the data did not fully support the statement that employees' current intercultural knowledge and skills were inadequate to operate in a multicultural work environment, as no more than one-third of the respondents had frequent or very frequent issues when communicating with foreigners due to inadequate intercultural knowledge and skills in various sub-areas. The paper elaborates on detailed results.

KEY WORDS
competence, intercultural competence, multicultural environment, personal career, career strategies

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Introduction

Cultural labour force differences lead to changes in an organisation's functioning. They are as important as economic competition and technological changes. In many countries, the population of working people is becoming increasingly diverse culturally and ethnically. Such diversity determines new requirements for employees, including a good command of foreign languages and an ability to handle different cultures and understand their attitudes, val-

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ues, and perceptions. People failing to meet these requirements have limited career opportunities (Waheed, 2015).

The growing numbers of working women, immigrants, and racial and ethnic minorities are intensifying the labour force pressure on organisations required to accommodate gender, racial and ethnic differences effectively. This also poses challenges to employees as they need to understand diverse cultures and work with people possibly having significantly different values and perceptions or perspectives. In many organisations, career success may depend on the employee's ability to adapt to a multicultural environment (Statnicke, 2019).

Labour market transformations caused by the global shift are stimulating organisational changes. One of such changes resulting in more efficient work and response to modern-environment requirements is restructuring into project teams responsible for specific tasks. For an individual employee, this means, first, working with new people, often of diverse nationalities, second, a wide variety of assigned tasks requiring new competence and skills and, third, the opportunity to find a new future path (idea, international relations, experience etc.). An employee's suitability for a job is determined by their competence, diversity and versatility of skills in a multicultural environment and their readiness to undertake more varied tasks. Therefore, the assumptions are highlighted for continuous organisational renewal. Another crucial outcome of organisational change is a decline in organisational career development structures. An employee's career is a personal matter, influenced by organisational changes focused on the employee's individual career development and organisational success.

A significantly greater focus of the scientific literature on such topics as the multicultural environment, intercultural competence etc., has been noted recently. These topics have been addressed by scholars such as Bird, Mendenhall, Stevens and Oddou (2010), Deardorf (2006) and others. According to Gražulis (2016), the current society's perception of intercultural differences in countries and various ethnic groups has been formed by countless efforts of scientists.

The study results presented in this paper are a part of international research by scientists from Poland, Slovakia, the Czech Republic, and Lithuania. It began in 2019 and was implemented in stages. This research involved 1193 respondents from different sector organisations (private, public, and non-governmental) in Lithuania. The research focused on the problem that despite the importance of intercultural competence for organisational success and personal careers, it may be somewhat underdeveloped to operate in a multicultural work environment successfully, and its development may be unsystematic. Therefore, the paper aims to identify the influence of intercultural competence on an organisation's success and personal career in Lithuania. Three hypotheses were formulated in the above-mentioned international study and verified during this research: H1. Employees support the notion that higher intercultural competence can foster an organisation's success and personal career; H2. Organisations tend to leave the development of intercultural competence to employees; and H3. Current intercultural knowledge and skills are inadequate to operate in a multicultural work environment.

1. Literature review

In the work environment, a person's competence can be assessed by their ability to perform assigned tasks efficiently and effectively. Scientists (Boyatzis, 1982; etc.) describe competence as a key personal characteristic having a causal relationship with effective or improved work performance. As noted by Matveev (2017, p. 34), competence can be viewed as an integrated mix of knowledge, personal characteristics, and skills that can lead to effective performance. Elaborating on the topic of competence, Sudnickas & Kravičiūtė-Ališauskienė (2011) emphasised that it cannot be universal in all cultures, professions, and service types. Summing up the majority of literature sources on competences, a consensus can be found that competence consists of knowledge, skills, and attitudes (Deardorff & Jones, 2012).

Intercultural competence is defined as an ability acquired based on specific knowledge and attitudes enabling individuals to work effectively in the context of different cultures (Mažeikienė & Virgailaitė-Mečkauskaitė, 2007; Szydło & Grześ-Bukłaho, 2020) or as an ability to develop targeted knowledge, skills and attitudes leading to effective and appropriate behaviour and communication in intercultural interactions (Deardorff, 2006; Szydło et al., 2020). According to Spitzberg and Changon (2009), intercultural competence is appropriate and effective management of interaction between people representing different or divergent, affective, cognitive, and behavioural orientations to the world.

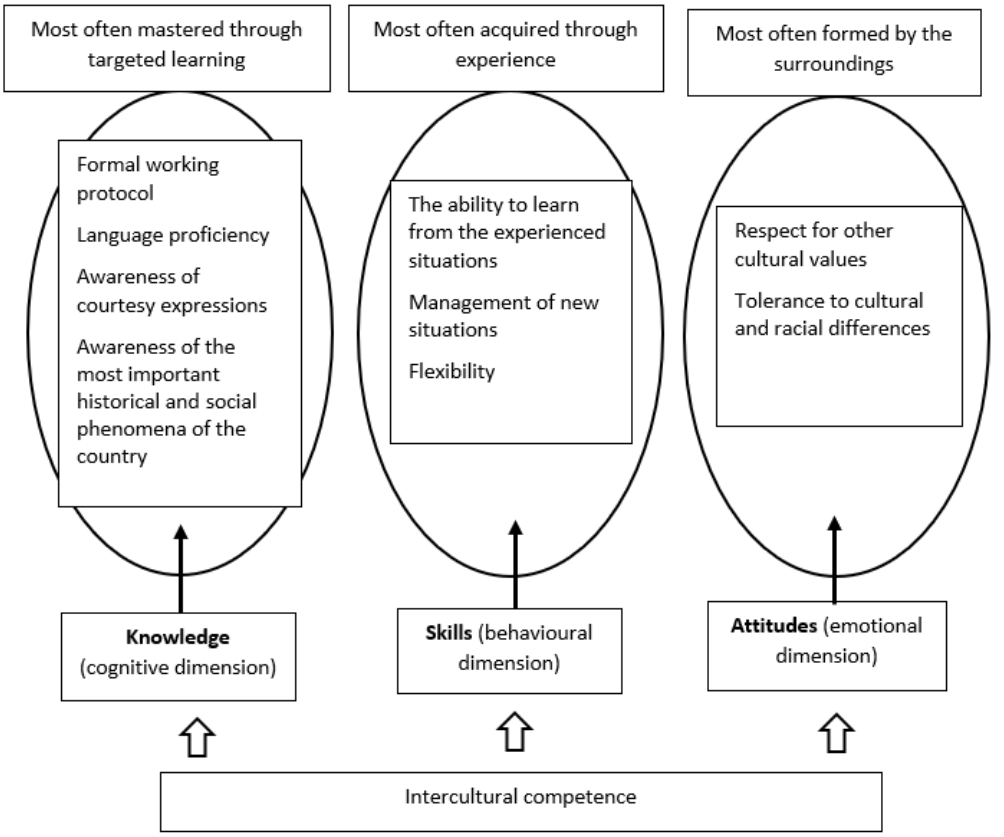

Fig. 1. Intercultural competence research model

Source: elaborated by an international group of scientists, 2017, based on Spencer & Spencer, 1993; Chen & Naquin, 2006; Campion et al., 2011; Deardorff & Jones, 2012.

Intercultural competence can be divided into three main categories: cognitive, affective, and behavioural. Cognitive competence relates to a person's ability to process information, affective competence refers to emotional responses, and behavioural competence concerns behaviour (Lloyd & Härtel, 2010).

Scientists (Spencer & Spencer, 1993; Chen & Naquin, 2006; Campion et al., 2011; Deardorff & Jones, 2012) concur that defining the concept of intercultural competence requires considering such dimensions as knowledge and abilities (skills) and attitudes. Based on these dimensions, Fig. 1 presents a theoretical model for research on intercultural competence. This theoretical construct has been empirically validated.

Next, as the article aims to identify the influence of intercultural competence on an organisation's success and personal career, it is essential to analyse the concept of career. Scientists define this concept differently; however, several key highlights can be identified (Greenhaus & Callanan, 2006):

- the term "career" usually refers to a "person's movement in time and social space". Most often, it is a movement in a professional or organisational space or spaces by consistently performing specific work duties or taking on other work roles directly unrelated to formal duties (a narrow concept of career);
- movement in a social space is "compared to a pre-known reference point" in a social structure or a network of relationships (an objective career). Thus, understanding of an individual's career is acquired by indicating their relationship with social structures, other individuals or groups and people of other cultures, guided by such norms as duties, status, values, responsibility areas, change in competences, and direction and speed of progress. These norms give a different value to various roles assumed by the indi-

vidual, and among these roles, this movement takes place in a defined social system and a multicultural environment;

- a career can also be understood as "a movement from one person's identity to another" (a subjective career). Usually, these identities and their changes are related to work, professional and organisational roles but may include social roles in developing competences and leisure (a broad career concept). Therefore, in this sense, a career is a kind of an individual's identity change, the quality of which is assessed by the individual's criteria.

An in-depth analysis of the career definition revealed it as a complex, multifaceted phenomenon, the essence of which could be understood using the systems theory. Such an analysis has been done by several scholars.

No individual pursues a career in isolation as it requires maintaining various connections in a sufficiently broad context. Patton & McMahon (2006) proposed using the systems theory as a meta-theoretical structure with high potential and capable of helping to understand the career development processes. They distinguished the individual's system and the context system, to which the social subsystem and the environmental–social subsystem belong (the context system also includes the organisation). The most important factors acting in the individual's system are age, health, gender, physical characteristics, ethnicity, culture, personality traits, values, beliefs, inclinations, interests, and abilities. Depending on the situation, these factors have a greater or lesser impact on an individual's career decisions. Particular importance is attached to factors operating in the individual's system, their interaction and the result of such interactions. However, it must be recognised that interaction between individual factors can also have negative or neutral effects on the individual's career. Thus, no single factor of the individual's system functions in isolation. In this regard, even the individual's ethnicity or a culture that is associated with the individual's development has no unambiguous independent influence on the individual's career decision (Patton & McMahon, 2006; Czerniawska & Szydło, 2021).

Family, friends, the cultural environment and the workplace, community groups, educational institutions and media are attributed to the social subsystem. Every social structure and institution is a source of certain values, beliefs, and attitudes, having a possible effect on an individual's career decisions. The composition of the social system and the intensity of its elements affect an individual's development when the context of career decisions changes. Therefore, all processes occurring in the systems, their interaction and their individual elements can potentially affect an individual's career.

In today's rapidly and constantly changing work environment, career management requires an employee to be engaged, extremely active and responsible, meeting the needs and understanding the values of their colleagues and their own, and occupying a place in the professional community and society. The modern scientific literature on career establishes that the process of an individual's career management is influenced by three factors (sometimes referred to as the "Big Three") — values, interests, and competencies (including intercultural competence) — that are considered the most important (Swanson & D'Archiardi, 2005). Values are fundamental principles that we follow or must follow in our lives. They are constantly forming and changing in the process of personal development and socialisation and reflect the beliefs acquired in the process about what should be considered important and pursued in life and what could be the result of consciously chosen actions. Measuring work values provides potentially valuable information in the career management process (Rounds & Armstrong, 2005).

Currently, general competence development in terms of career management has become essential due to rapid changes in the work environment. Professional competence quickly becomes obsolete if unused or fails to upgrade continuously. It is impossible to become a competent specialist once and forever. Successful performance of constantly changing complex modern tasks requires new professional competence. Therefore, it is meaningful to establish a solid framework of general competence that adapts effectively to a constantly changing environment and, if necessary, acquires the professional competence required at a given time and place (Osiceanu, 2016). The development of competence usually requires time and financial resources, and these are always limited. Therefore, career attainment requires forecasting the need for competence to develop only what would be most likely needed, considering that it is practically impossible to know exactly. Thus, career success is greatly influenced by a person's managed competence portfolio and their ability to develop it in the right direction.

A person must constantly shape their career identity and direction in a complex world of multi-

cultural organisations, which no longer has strictly defined models, standards, norms or rules for dealing with different cases. They must solve career issues that often present several solutions, choosing between different career opportunities and finding the most suitable option for them (Valickas et al., 2012). Career management strategies need to be explored next. They are focused on the expression of intercultural competence in an organisation (Greenhaus, Callanan, & Godshalk, 2010):

- Acquiring competence in a current position or job is a key career strategy. Essentially, it means that employees holding a specific position in an organisation seek ways to improve the performance of their duties or functions. It can be achieved by formal and non-formal learning, the acquisition of improvement-enabling information, international contacts, and job assignments leading to the increased value of an employee in an organisation and labour market in general in the long run.
- Creating new opportunities by working and interacting with employees from different cultures. This strategy consists of two sub-strategies to expand career opportunities, including self-nomination and the development of intercultural contacts. The self-nomination strategy is about informing employees or managers of senior positions in an organisation regarding their latest achievements, career aspirations, and desired tasks. The strategy of developing international contacts is similar to self-nomination but aimed at meeting new people holding various positions in an organisation or having a status in a professional community rather than to people already known.
- Participation in an organisation's politics includes various positive and negative actions, such as consensus with co-workers and managers, praise, promotion of the established order, withholding complaints about rules and regulations during meetings with significant persons, forming informal unions and coalitions with other employees in the organisation. This also includes harming the interests of others or spreading rumours about colleagues. It must be acknowledged that in many cases, involvement in politics at the organisational level is necessary for career advancement, even though some actions in this context may seem unethical and reprehensible.

An individual's career competence consists of many skills necessary in the modern work environment, which can be successfully applied in practice. Therefore, many foreign authors (Arnold, Davey, Jacobs, and so on) use the term "individual/'s career competence" to describe a person's readiness for a particular activity and career development. The emphasis is on the practical application of relevant skills rather than knowing how to do it or having a formal qualification. Thus, career competence is a collection of skills necessary for employees in the modern work environment, which they can successfully apply in practice, integrating them into the organisation's development and coordinating individual and organisational goals.

2. Research methods

So far, there has been no international research on intercultural competence conducted jointly by researchers from several countries (Lithuania, Poland, Slovakia, the Czech Republic, Latvia, and Ukraine). Research performed in individual countries is usually of local cognitive nature and focuses more on general multiculturalism tendencies. This study stands out for its complexity; it seeks to reveal the respondents' intercultural competence and the reserves available for the development of competence and aims among subordinates and their managers to define the directions of systemic changes.

The survey questionnaire on intercultural competence was composed of seven question blocks. This paper presents only a part of the survey results. The Cronbach's alpha coefficient calculated with SPSS (Statistical Package for the Social Sciences, version 21) was used to assess the scale of internal consistency. The Cronbach's alpha coefficient for individual question blocks of the questionnaire was not lower than 0.8, indicating a good design of the questionnaire.

To find out employee views representing different sector organisations, an online questionnaire survey was conducted in Lithuania with non-probability convenience sampling. Employees' intercultural competence (knowledge/cognitive dimension, skills/behavioural dimension, and attitudes/emotional dimension) was evaluated using 5-point Likert items (Adamoniene et al., 2019).

The respondents partook in the survey voluntarily; they were informed about the object and the aim of the research, its practical value, research methods and procedures, data anonymity and the use for scientific and publication purposes. Informed consent

was received in the form of agreeing to proceed with the survey following the introduction of the research.

Two methods were used to select respondent groups:

1) probability-based, with known chances for each study population's element to get into the sample. This selection was performed by dividing the general population into groups similar by important research characteristics (e.g., state or local institutions). The random sampling method was then applied to select several groups for the study. The survey was conducted using an online resource.

2) non-probability-based, with the unknown distribution of the respondents in the population. The essence of this research method is that the required number of the research group members was randomly selected from the population list. Using this method, a freely available online survey was published.

In total, 1193 respondents participated in this research in Lithuania. The majority of participants (72.8 %) were women. 20.5 % were younger than 25, 32.5 % — 25–35, 25,8 % — 35-50 years old and 20,.8 % were over 50. 84.5 % of respondents had a university education. 27.6 % represented private sector organisations, 68.2 % — public sector organisations, and 1.8 % — non-governmental organisations.

This paper deals with the following sections of the questionnaire:

- Demographic characteristics of the respondents;
- Statements intended to evaluate the influence of intercultural competence on an organisation's success and personal career;
- Statements intended to evaluate the situation of intercultural competence development in organisations;
- Statements intended to measure the level of intercultural competence while operating in a multicultural work environment.

The following hypotheses were already justified in the previous part of the paper:

- H1. Employees support the notion that higher intercultural competence can foster an organisation's success and personal career;
- H2. Organisations tend to leave the development of intercultural competence to employees;
- H3. Current intercultural knowledge and skills are inadequate to operate in a multicultural work environment.

The hypotheses were tested using binary logistic regression, general linear modelling and exploratory factor analysis (EFA) in IBM SPSS 25.0 statistics software. Due to a relatively high non-response rate, some ordinal variables were recoded into categorical with an explicit "no answer" (NA) category.

3. Research results

This section presents the research results for testing the hypotheses against the survey data.

H1. Employees support the notion that higher intercultural competence can foster an organisation's success and personal career.

Respondents were asked two questions: do they believe that the intercultural competence (ICC) development would foster their personal success (career) and the development of intercultural competence would foster an organisation's success. The univariate analysis of answers revealed that respondents tended to agree with both statements (Table 1).

Tab. 1. Respondents' opinions on the link between the ICC development and personal career or an organisation's success

	Development of ICC would help personal career	Development of ICC would help the organisation
Yes (1)*	659 (55 %)	808 (68 %)
No (0)**	534 (45 %)	385 (32 %)
Total	1193 (100 %)	1193 (100 %)

* Multiple responses indicating positive answers are aggregated into the "yes" category

** Aggregated responses: "It does not depend on my intercultural competence", "Not interested, do not know", "No answer"

To explore the profiles of those agreeing and disagreeing with these statements, the binary logistic analysis for both dependent variables was conducted.

The first group of predictors included variables of interest to the authors: gender, age groups, education, occupation (student, blue collar, white collar, manager, businessperson, other), the organisation's size, seniority, and sector. The second group of variables related to contacts with foreigners: frequency of contacts and business and personal trips abroad. The third group of variables included a measure (ICC score) and other aspects of intercultural competence (Table 2).

Binary logistic regression analysis of the main effects (Table 3) revealed that the model correctly classified 73.5 per cent of cases (61.2 per cent of zeros and 82.4 per cent of ones). Nagelkerke R Square was 0.374, and Hosmer–Lemeshow test was insignificant.

Tab. 2. Variables in the third group of predictors

Variable	Number of items
ICC score based on multiple items (based on EFA and CFA results) *	20 items
Importance of knowing the languages (based on EFA results)	1 item
Importance of flexibility (based on EFA results)	Average of 3 items
Importance of tolerance (based on EFA results)	Average of 3 items
Importance of knowing international and national norms (based on EFA results)	Average of 2 items
Methods of fostering intercultural competence at work	1 item
Perceived need for international communication in the future	1 item
Most frequent problems with foreigners at work	Average of 9 items
Opinion about the frequency of leaders' intercultural competence assessments	1 item

* see Adamoniene et al., 2019

In the first group of variables, the youngest (< 25) age group was more likely to acknowledge the influence of intercultural competence benefits on personal career compared to older age groups (35 and above); less educated (those with higher education) respondents also had a different perception of the influence that intercultural competence had on personal career compared to bachelor's and master's degree holders; however, gender, sector, size of an organisation and seniority had no effect. Age appeared to be the strongest predictor of all variables in terms of odds ratios (not presented).

The second group of variables had no statistically significant effect on the perceived influence of intercultural competence on a personal career.

In the third group of variables, the perceived importance of knowing international and national norms is a statistically significant predictor (the higher the perceived importance of these norms, the higher the perceived influence of intercultural competence on personal career). Employees who get training and business trips to foster their intercultural competence (compared to those who are not provided with any) are much more likely to acknowledge the importance of intercultural competence on a personal career. Similarly, those who believe that international communication will intensify in the future (as compared to those who foresee no change) are more likely to perceive the positive influence of intercultural competence on their personal career. Those who think that a leader's intercultural competence assessments should be held more than once a year (compared to the "once a year" category) are more likely to perceive the positive influence of intercultural competence on personal career, but those who see no need of such assessments are much less likely to do so. Other variables in this group are not statistically significant predictors.

Next, the same binary logistic regression analysis with the second variable was conducted to measure whether the development of intercultural competence would lead to an organisation's success.

This binary logistic regression analysis revealed that the model correctly classified 79.5 % of cases (45.3 % of zeros and 93.1 % of ones). Nagelkerke R Square was 0.353; and Hosmer–Lemeshow test was insignificant. There were no statistically significant predictors in the first two groups (the last column in Table 3).

In the third group of variables, a higher ICC score, training, and business trips to foster intercultural competence as compared to no training, believing that international communication would intensify in the future (as compared to the "no change" category), assessing a leader's intercultural competence once a year (compared to no need to assess at all) predicted a positive outcome. This means that intercultural competence impacts an organisation's success. An opinion about the frequency of a leader's intercultural competence assessments is the strongest predictor in terms of the odds ratio coefficient.

The other variables had no statistically significant influence on the outcome variable.

The results for both dependent variables were similar in that both were statistically significantly predicted by the methods of fostering intercultural competence at work, assessments of future international communication development and opinions about the frequency of a leader's intercultural competence assessments. Looking at the differences, the perceived influence of intercultural competence on an organisation's success is influenced by the ICC score; in contrast, the perceived influence of intercultural competence on a personal career is affected by age, education, and the perceived importance of knowing international and national norms.

Tab. 3. Binary logistic regression B coefficients and bootstrapped p-values for the perceived influence of intercultural competence on personal career and on organisation success, n=998

Predictor	Categories	ICC influence on personal career (1) vs. no influence (0)	ICC influence on organisation success (1) vs. no influence (0)
		B (p-value)	B (p-value)
Constant		-1.199 (0.126)	-1.129 (0.196)
Female	Female (1) vs. male (0)	-0.043 (0.832)	-0.009 (0.972)
Age groups	[25–35) vs. less than 25	-0.376 (0.202)	-0.045 (0.859)
	[35–50] vs. less than 25	**-1.439 (0.001)**	-0.538 (0.108)
	Above 50 vs. less than 25	**-1.675 (0.001)**	-0.535 (0.182)
Education	Bachelor vs. high school	**-0.613 (0.018)**	-0.294 (0.268)
	Master vs. high school	**-0.57 (0.045)**	0.099 (0.774)
	PhD vs. high school	0.137 (0.791)	-0.428 (0.455)
Sector	Public vs. private sector	0.015 (0.938)	-0.104 (0.63)
	NGO vs. private sector	-0.495 (0.199)	0.052 (0.904)
Organisation's size	Medium vs. small	0.198 (0.364)	0.099 (0.684)
	Large vs. small	-0.204 (0.301)	-0.196 (0.358)
	NA vs. small	0.484 (0.566)	-1.428 (0.062)
Seniority	<1 vs. >5 yrs.	0.337 (0.263)	-0.092 (0.774)
	[2; 5] vs. >5 yrs.	0.231 (0.291)	0.16 (0.514)
Frequency of contacting foreigners		-0.047 (0.543)	0.006 (0.953)
Frequency of business trips abroad		0.058 (0.611)	0.104 (0.369)
Frequency of personal trips abroad		-0.08 (0.516)	-0.189 (0.127)
ICC score		0.23 (0.087)	**0.441 (0.001)**
Importance of knowing the language		0.069 (0.535)	-0.007 (0.941)
Importance of flexibility		0.074 (0.533)	0.133 (0.287)
Importance of tolerance		0.04 (0.783)	0.016 (0.919)
Importance of knowing international and national norms		0.217 (0.016)	0.149 (0.121)
Methods of fostering intercultural competence at work	Not interested vs. no development	-1.354 (0.001)	-1.067 (0.013)
	Don't know vs. no development	-0.137 (0.635)	-0.507 (0.066)
	Spread of good practices vs. no development	0.384 (0.059)	0.323 (0.17)
	Training and business trips vs. no development	0.972 (0.001)	0.848 (0.002)
International communication	Don't know vs. will not change	-0.903 (0.001)	-0.885 (0.002)
	Will decrease vs. will not change	-0.209 (0.671)	-0.578 (0.229)
	Will increase vs. will not change	0.684 (0.001)	0.894 (0.001)
	NA vs. will not change	0.738 (0.079)	-0.36 (0.217)
Communication problems with foreigners at work		0.157 (0.081)	0.033 (0.751)
Opinion about the frequency of a leader's intercultural competence assessments	More than once a year vs. once a year	**0.611 (0.034)**	-0.085 (0.776)
	Less than once a year vs. once a year	-0.336 (0.085)	-0.43 (0.051)
	No need at all vs. once a year	-0.941 (0.001)	-1.511 (0.001)
	Other vs. once a year	-0.371 (0.412)	-0.482 (0.388)
	NA vs. once a year	-0.695 (0.262)	**-1.158 (0.032)**

H2. Organisations tend to leave the development of intercultural competence to employees.

Less than one-third of the respondents answered that intercultural competence development was their responsibility (Table 4). A binary variable was constructed, where 1 indicated that the intercultural competence development was not undertaken by the organisation (27.1 %) and 0 indicated all other answers except for the missing values excluded from the analysis.

The following paragraphs explore the determinants of intercultural competence development as employees' responsibility via binary logistic regression analysis.

The binary logistic regression model of the main effects correctly classified 73.8 % of cases (94.2 % of zeros and 22.5 % of ones); Nagelkerke R Square was 0.170, and Hosmer–Lemeshow test was insignificant.

Representatives of NGOs, employees emphasising the importance of knowing international and national norms, and respondents believing that international communication would intensify were less likely to be left to their own devices to develop their intercultural competence (Table 5). On the contrary, employees of medium and large organisations as compared to small ones, employees with higher ICC scores, and respondents acknowledging the importance of knowing foreign languages, thinking that intercultural competence could expand partnerships with foreign organisations and thinking that an organisation's success does not depend on intercultural competence tended to be left to their own devices in terms of the intercultural competence development.

H3. Current intercultural knowledge and skills are inadequate to operate in a multicultural work environment.

The respondents were asked to evaluate the extent to which each aspect posed issues when communicating with foreigners on a scale from 1 ("does not pose any issues") to 5 ("poses issues very frequently"). It appeared that the greatest challenge was the language barrier: 34 % of respondents perceived it as a frequent (4) or very frequent (5) issue (Table 6). However, all other potential difficulties were not perceived as especially important as only approx. from 10 % to 20 % of respondents rated them as a frequent or very frequent issue. Averages also indicate that evaluations were at about the middle point of 5 anchors scale or lower. Therefore, the univariate analysis suggests that a significant proportion of respondents have difficulties operating in a multicultural work environment; however, the extent of the issues was less than expected.

As in previous sections, the best predictors explaining the variability of the extent of intercultural issues were identified via OLS multiple linear regression with robust standard errors.

Based on the results of exploratory factor analysis (EFA) with the single factor explaining 59 % of the total variance and all except one (0.512) factor loadings being above the threshold of 0.6, the scale of frequency of intercultural issues was constructed by calculating the unweighted average of the above-described items (Table 6). The frequency distribution of the resulting scale was not Gaussian, with the average of 2.53, median 2.56 and the standard deviation of 0.969 (Fig. 2).

The regression residuals by visual inspection and by the results of the formal tests were heteroscedastic; therefore, the robust calculation of standard errors (HC4) was used. Variance inflation factors were less than 2; therefore, the collinearity among covariates was not an issue. Potential issues with the normality of residuals were mitigated by using the bootstrapping procedure.

Education, assessment of future international communication, suggested frequency of a leader's assessments, gender, the importance of knowing languages, the importance of tolerance and context were

Tab. 4. Frequency table for methods of intercultural competence development at organisations

Methods of intercultural competence development	Group size	Percentage
Training, seminars, simulations	143	12
Business trips and internships abroad	167	14
Sharing of good practice, learning from each other	297	24.9
No development, employee's responsibility	323	27.1
I don't care about that	51	4.3
Don't know	172	14.4
Missing	40	3.4
Total	1193	100

Tab. 5. Binary logistic regression predictors of no support for the intercultural competence development situation, n=983

Predictor	Category	B (p-value)
Constant		**-1.958 (.033)**
Female	Female (1) vs. male (0)	-0.024 (.895)
Age groups	[25,35) vs. <25	0.283 (.301)
	[35–50] vs. <25	0.342 (.285)
	>50 vs. <25	0.162 (.652)
Education	Bachelor vs. high school	0.247 (.369)
	Master vs. high school	0.524 (.087)
	PhD vs. high school	0.432 (.415)
Sector	Public vs. private sector	-0.297 (.121)
	NGO vs. private sector	**-1.524 (.005)**
Organisation's size	Medium vs. small organisation	**0.459 (.033)**
	Large vs. small organisation	**0.407 (.033)**
	NA vs. small organisation	**2.657 (.001)**
Seniority	<1 year vs. >5 yrs.	0.363 (.173)
	2–5 years vs. >5 yrs.	0.006 (.973)
Frequency of contacting foreigners		0.007 (.922)
Frequency of business trips abroad		-0.108 (.309)
Frequency of personal trips abroad		-0.038 (.768)
ICC score		**0.357 (.013)**
Importance of knowing languages		**0.203 (.045)**
Importance of flexibility		-0.129 (.266)
Importance of tolerance		0.001 (.994)
Importance of knowing international and national norms		**-0.378 (.001)**
Organisation's success and ICC	Increased partnerships vs. higher trust in an organisation	**0.578 (.026)**
	Higher performance vs. Higher trust in an organisation	-0.358 (.234)
	Doesn't depend on ICC vs. higher trust in an organisation	**0.541 (.016)**
	Don't know vs. higher trust in an organisation	-0.548 (.408)
Career dependency on ICC	Opportunities to change a job vs. better international career opportunities	0.1 (.676)
	Opportunities inside the organisation vs. better international career opportunities	0.118 (.611)
	Does not depend on ICC vs. better international career opportunities	0.048 (.865)
	Do not know vs. better international career opportunities	-0.254 (.651)
Perceived need for international communication in the future	Do not know vs. will not change	-0.156 (.555)
	Will decrease vs. will not change	0.584 (.162)
	Will increase vs. will not change	**-0.461 (.007)**
	NA vs. will not change	0.784 (.114)
Most frequent issues with foreigners at work		-0.022 (.819)
Opinion about the frequency of a leader's intercultural competence assessments	More than once a year vs. once a year	0.063 (.774)
	Less than once a year vs. once a year	-0.135 (.526)
	No need al all vs. once a year	-0.028 (.919)
	Other vs. once a year	0.328 (.469)
	NA vs. once a year	-0.524 (.441)

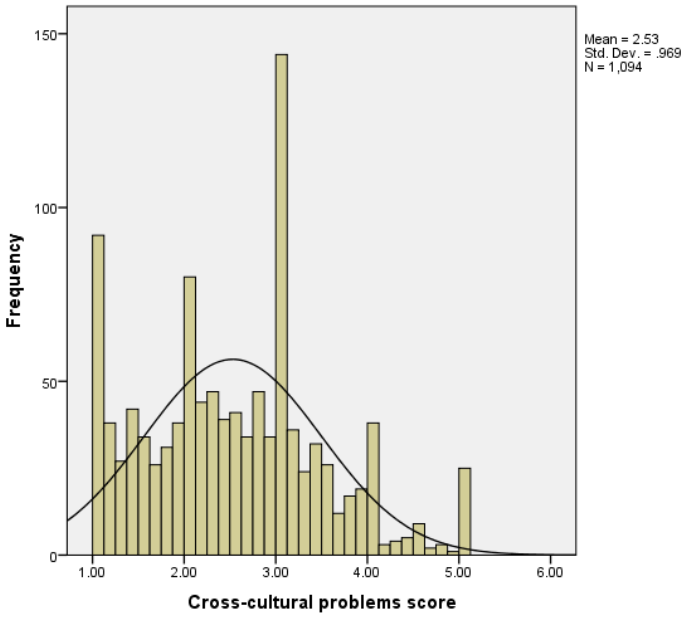

Fig. 2. Frequency distribution of intercultural issue scores

Tab. 6. Univariate description of items expressing the extent of intercultural issues

Issues	Mean	Std. Deviation	Frequent difficulties [%]	N
language	3.15	1.32	34.0	1080
different decision-making	2.63	1.19	17.4	1062
different temperament	2.58	1.29	20.3	1062
different perceptions of managerial and subordinate relationships	2.56	1.22	16.9	1064
different styles of informal communication	2.55	1.18	17.1	1061
lack of interest in foreigners among employees	2.48	1.28	17.6	1058
ignorance of foreign culture	2.37	1.19	13.7	1061
unacceptable topics of conversation (taboos)	2.19	1.19	11.3	1060
different religion	1.99	1.19	9.6	1059

statistically significant predictors of communication issue score, while age, sector, the organisation's size, seniority, the frequency of contacts with foreigners, the frequency of business or personal trips abroad, the ICC score, the importance of flexibility, the perceived influence of intercultural competence on career opportunities or an organisation's success had no significant impact.

Persons with bachelor's or master's degree diplomas were more successful in comparison to people with higher education; respondents thinking that the importance of future international communication would decrease were less successful in intercultural communication compared to those who thought it would increase; compared to participants thinking that the frequency of a leader's assessments should be conducted more frequently than once a year, almost everyone else had fewer communication problems; males had a lower score of communication issues; the perceived importance of knowing languages and the context predicted more extensive intercultural communication issues; the perceived importance of tolerance led to a lower level of intercultural communication issues (Table 7).

4. Discussion and conclusions

The staff of the 21st century is becoming extremely diverse, representing different ages, gen-

Tab. 7. Regression coefficients and p-values for predictors of communication issues, a general linear model with robust standard errors (N=1006, adjusted R-squared = 0.12)

Predictor	Category	B (p-value)
	Intercept	**2.246 (0.000)**
Age	25, <35 yrs. vs. < 25 yrs. (ref.cat.)	-0.031 (0.764)
	35–50 yrs. vs. < 25 yrs. (ref.cat.)	-0.054 (0.656)
	>50 yrs. vs. < 25 yrs. (ref.cat.)	0.063 (0.630)
Education	Bachelor vs. high school (ref. cat.)	**-0.273 (0.004)**
	Master vs. high school (ref. cat.)	**-0.366 (0.001)**
	PhD vs. high school (ref. cat.)	-0.243 (0.198)
Sector	Public sector vs. private sector (ref. cat.)	0.107 (0.131)
	NGO, other vs. private sector (ref. cat.)	0.115 (0.429)
Organisation's size	Small (<49) vs. large organisation (>250, ref. cat.)	-0.03 (0.675)
	Medium (50–250) vs. large organisation (>250, ref. cat.)	-0.016 (0.810)
Seniority	<1 year vs. >5 years (ref. cat.)	0.084 (0.449)
	2–5 years vs. >5 years (ref. cat.)	0.05 (0.522)
Frequency of contacts with foreigners	NA vs. several times per quarter (ref. cat.)	**0.596 (0.044)**
	Never vs. several times per quarter (ref. cat.)	0.01 (0.919)
	Once per half year vs. several times per quarter (ref. cat.)	0.124 (0.109)
	Once per quarter vs. several times per quarter (ref. cat.)	0.11 (0.253)
Frequency of business trips abroad	NA vs. every month (ref. cat.)	0.437 (0.187)
	Never vs. every month (ref. cat.)	0.095 (0.553)
	Once per several years vs. every month (ref. cat.)	0.072 (0.653)
	Several times per year vs. every month (ref. cat.)	0.149 (0.360)
Frequency of personal trips abroad	Never vs. several times per year (ref. cat.)	0.197 (0.104)
	Once per several years vs. several times per year (ref. cat.)	0.102 (0.096)
	Every month vs. several times per year (ref. cat.)	0.346 (0.065)
	Every week vs. several times per year (ref. cat.)	1.051 (0.100)
Assessment of future international communication	Does not know vs. will increase (ref. cat.)	-0.101 (0.391)
	Will decrease vs. will increase (ref. cat.)	**0.454 (0.028)**
	Will not change vs. will increase (ref. cat.)	-0.088 (0.159)
	NA vs. will increase (ref. cat.)	-0.101 (0.391)
Suggested frequency of a leader's assessments	Once a year vs. more than once a year (ref. cat.)	**-0.258 (0.005)**
	Less than once a year vs. more than once a year (ref. cat.)	**-0.248 (0.018)**
	No need at all vs. more than once a year (ref. cat.)	**-0.457 (0.000)**
	Other vs. more than once a year (ref. cat.)	-0.424 (0.061)
	NA vs. more than once a year (ref. cat.)	**-0.908 (0.001)**

Female		**-0.135 (0.039)**
ICC score		0.019 (0.716)
Importance of knowing languages		**0.114 (0.002)**
Importance of flexibility		0.012 (0.782)
Importance of tolerance		**-0.121 (0.008)**
Importance of context		**0.151 (0.000)**
Influence of intercultural competence on career opportunities		0.105 (0.141)
Influence of intercultural competence on an organisation's success		-0.061 (0.451)

ders, cultures, religions, abilities, beliefs etc. Many jobs nowadays require working with different people, so it is essential to constantly develop intercultural competences. Scientists tend to concur that intercultural competence has cognitive, behavioural, and emotional dimensions. The research instrument was prepared based on these dimensions, and the research was carried out in different Lithuanian organisations. The results helped to verify the hypotheses.

The hypothesis H1 suggesting that employees supported the notion of higher intercultural competence fostering organisational success and personal career, was supported by the data: the descriptive statistics showed that more than half of the respondents agreed with the statements that the development of ICC would help their personal career (55 % agreed) and an organisation's success (68 % agree). The variables that statistically significantly predicted such support were the existing methods of fostering intercultural competence at work (training and business trips compared to no development), assessments of the international communication development in the future (intensified compared to no change) and opinions about the frequency of a leader's intercultural competence assessments (e.g., once a year compared to no need al all or less than once a year). The major differences were identified in the perceived influence of intercultural competence on an organisation's success being positively influenced by the higher ICC score; on the other hand, the perceived influence of intercultural competence on a personal career was affected by younger age (below 25 compared to 35 and above), lower education (higher compared to university, except for PhD) and higher perceived importance of knowing international and national norms.

The H2 hypothesis that organisations tended to leave the development of intercultural competence to employees was not supported by the data, as less than one-third of the respondents agreed that the intercultural competence development was left to their own devices. Employees were less likely developing their intercultural competence if they were representatives of NGOs, emphasised the importance of knowing international and national norms and believed that international communication would intensify. And vice versa, employees of medium and large organisations, as compared to small, employees with higher ICC scores and respondents emphasising the importance of knowing foreign languages, thinking that intercultural competence could expand partnerships with foreign organisations and thinking that an organisation's success did not depend on intercultural competence tended to be left to their own devices to develop their intercultural competence.

The data does not fully support the H3 hypothesis that employees' current intercultural knowledge and skills were inadequate to operate in a multicultural work environment. Only one-third and less of the respondents did have frequent or very frequent issues when communicating with foreigners due to inadequate intercultural knowledge and skills in various sub-areas.

More successful in intercultural communication (having less frequent intercultural communication issues) were employees with bachelor's or master's degree diplomas in comparison to higher education; also, respondents thinking that the importance of future international communication would increase compared to those who thought otherwise; participants who thought that the frequency of a leader's assessments should be conducted more frequently than once per year compared to almost every other response category; males compared to females; respondents putting less emphasis on the perceived importance of knowing languages and the context;

and employees who emphasised the importance of tolerance.

The results of this research proved that organisations should pay as much attention as possible to the development of intercultural competence since most respondents noted that it could positively contribute to the personal career of employees and an organisation's success. Organisations in the public, private and non-governmental sectors would particularly benefit from a greater understanding of intercultural competence and methods for identifying, developing and promoting it. The development of intercultural competence should be included in organisational strategies to ensure continuous and consistent development. Finally, it should not be left solely to the own devices of employees.

As regards the research limitations, the authors did not succeed in reaching similar numbers of respondents from all three sectors. Therefore, future research should focus primarily on an equal number of respondents from all three sectors (i.e., private, public, and non-governmental) to achieve broader results and more accurate comparisons.

Literature

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Impact of COVID-19 on various areas of service operation in manufacturing companies: a pilot study

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ABSTRACT
All manufacturers were affected by the COVID-19 pandemic. It can be assumed that producers were affected as much as the service operation field (based on company categories). This article aims to ascertain how COVID-19 affected various areas of service operations in manufacturing companies. So far, no literature is available identifying the impact of COVID-19 on various areas of service operations by current manufacturers. An electronic questionnaire was prepared and sent to the manufacturers. The questionnaire was completed by 88 respondents from four selected industrial areas. The findings show no statistically significant differences in the perception of the COVID-19 impact on various areas of service operations in manufacturing companies based on CZ-NACE, the number of employees, the type of customers and the type of services provided to products. However, in the area of the type of services, one statistically significant difference was found in the statement related to increasing interest in engaging in cooperation with suppliers in the field of smart services. Theoretical implication contributes to understanding the impact of COVID-19 on manufacturers in various areas of service operation. First, the research did not reveal any statistically significant difference in manufacturing companies sorted by their CZ-NACE, the number of employees and the predominant customers in the areas of service operations. It can be considered that the companies were hit by COVID-19 very similarly. Second, the research revealed statistically significant differences in the area of processing results according to the type of services, and in this case, only in the area of increasing interest in engaging in the cooperation with suppliers in the field of smart services. From a managerial viewpoint, this paper contributes to the field of impact of COVID-19 on areas of service operation in manufacturing companies.

KEY WORDS
COVID-19, servitisation, accompanying services, smart services, areas of service operation, manufacturing companies

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Introduction

COVID-19 has had and continues to have an impact on almost everyone in terms of changes to personal lives and activities of state and private institutions. The effects are also noticeable for industrial producers, who have often been forced to change or even suspend their production during this period. The changes concerned internal and external areas, such as supply, customer pressure and competition. For the past twenty years, manufacturers have been

Kaňovská, L., & Vlčková, V. (2022). Impact of COVID-19 on various areas of service operation in manufacturing companies: a pilot study. *Engineering Management in Production and Services, 14*(3), 43-56. doi: 10.2478/emj-2022-0025

advised to compete through services aimed at customer problem solving rather than simply pushing boxes out of the factory (The Conversation, 2020) because of their impact on business, benefits for the economy, environment, and society. As customer satisfaction, competitive advantage and sustainable revenue streams are paramount for manufacturers, it is no longer sufficient to merely produce and sell physical goods. Services now perform a vital role in company efforts to establish and maintain customer bases and profit sources. "Servitisation" is now the goal for manufacturing firms (The Conversation, 2016).

Investigations of the COVID-19 impacts on accompanying services in manufacturing companies are still extremely limited due to the novelty of the topic. However, as Ardolino et al. (2021) stated, a service-based orientation of manufacturers has certainly helped to decrease the negative effects of the pandemic. Also, Rapaccini et al. (2020) informed that manufacturers, based on service-oriented business models, have been able to achieve income stability in a period strongly characterised by volatile demand and, consequently, a liquidity crisis. At present, there is probably no publicly available empirical study on this topic for manufacturing companies in the world or in the Czech Republic, where the industry is still very significant. Globally, there are some articles and research on COVID-19 and its impact on manufacturers, but there are none that directly focus on the accompanying services which these manufacturers provide. Scholars examined the COVID-19 problem faced by manufacturers from different perspectives, such as research conducted by Armani et al. (2020), which examines the impact of low-tech manufacturing solutions, arguing that solutions need to coalesce around approved designs to have a real impact. Other studies examine manufacturing from the perspective of supply chain resilience and risks (Linton & Vakil, 2020; Ivanov & Dolgui, 2020) and identify the supporting enablers and the impediments to manufacturing in a COVID-19-like environment (Okorie et al., 2020). Pekarcikova et al. (2021) investigate digitalisation's importance and influence on the competitiveness of industrial companies during the time of COVID-19. Rapaccini et al. (2020) compared the impact of the disruption caused by the pandemic on product and service businesses to develop a crisis-management model. Their research also includes the part where some statements related to various areas of service operation, mostly related to smart services, were also included, but their findings were sorted from different perspectives and were a part of a more complex view of the problems. Many published studies have focused on the potential uses of technologies for supply chain resilience (Spieske & Birkel, 2021), whereas there are still scarce studies on the technologies for supporting factories' operational processes (Ardolino et al., 2021).

All manufacturers have been affected by the COVID-19 pandemic. It can be assumed that the producers were affected as much as the companies in the field of service operation (based on company characteristics). Manufacturers from one industry with different numbers of employees, the type of customers, or provided services would probably perceive the pandemic effects in the same way. But is it so? How do manufacturers perceive the impact of COVID-19 on various areas of service operation? Are there any differences based on CZ-NACE, the number of employees, the type of customers and the type of services provided to products among manufacturing companies? The conducted research attempted to answer these questions. It aimed to ascertain the COVID-19 impact on the provision of accompanying services as well as mapping the consequences of the coronavirus crisis and company expectations.

For this article, a part of the research focused on various service operation areas. Predicting, summarising, evaluating, providing feedback, and updating information were the main research objects (Wang et al., 2022). COVID-19 could have influenced and continues to influence various service operation areas. Based on the interviews by Rapaccini et al. (2020), even in the fortnight immediately preceding the lockdown, only 30–40 % of the typical overall volume was seen in industrial sectors, with various restrictions and obligatory precautionary measures reducing the speed of execution times. These included the use of personal protection equipment, which was near impossible to obtain, difficulties involving permissions for people to move across regions and the confusion caused by the constantly changing regulations imposed at short notice at both national and regional levels (Rapaccini et al., 2020).

The originality of the paper arises from (1) the novelty of the topic focusing on the impact experienced by manufacturers due to COVID-19 in the last two years; (2) the strong interest in various service operation areas, including smart services, which is a topic that has not received much attention in the context of the pandemic. Smart services are important today due to a strong interconnection effort of servitisation and digitalisation in many current

industrial companies. (3) In addition, it can be assumed that all producers have been affected by the pandemic, and it is, therefore, questionable whether there are any differences between the characteristics of the producers (industry focus, the number of employees, the type of customers and the type of provided services) and the COVID-19 impact. It can be assumed that producers were affected as much as the service operation companies (based on company categories). There are some studies that describe the differences between industries and companies (Nayak et al., 2022), but none are aimed at service operations.

The paper consists of five parts: a literature review, mainly describing the problems of services provided by manufacturing companies, research methods with the research question and the hypothesis, research results, discussion of the results, and conclusions with implications and limitations.

1. Literature review

The current situation around COVID-19 has affected people and businesses. In the survey, completed from 28 February to 9 March, 78.3 % of respondents stated the COVID-19 pandemic would probably have financial consequences for their businesses; 53.1 % of manufacturers expected their operations to be affected in the next few months; 35.5 % stated that they were already experiencing disruptions in supply chains (National Association of Manufacturers, 2020). Based on the research into Italian companies conducted by Rapaccini et al. (2020), an action plan on the COVID-19 effects was prepared. First, short-term actions: the "new normal", where it is important to find options to deliver services that the customers can accept. Second, long-term implications: the "next normal", where it is important to create decentralised stocks of resources that can be orchestrated based on customer needs. COVID-19 has caused complications in field operations, although not to the same degree as seen in factory and warehouse production processes (most of which were completely shut down). Small and medium enterprises experienced instant adverse effects due to logistical issues, reduced capacity utilisation and demand-side effects (Juergensen et al., 2020).

Industries have traditionally focused on product strategies that emphasise technological innovation, quality improvement and/or cost reduction, depending on their market position. However, changes in the business environment, such as increased competition from emerging countries, globalisation of markets, growing customer sensitivity and changes in customer demand, demonstrate that traditional strategies can no longer be considered reliable (Lay et al., 2010). In response to these facts, an ever-increasing number of industrial companies is trying to change the exclusive focus on production to a combination of products and services. A strategy in which the services provided by manufacturers help to make the company more competitive is called a service-led competitive strategy. The implementation of this strategy is called servitisation. According to Kowalkowski et al. (2017), servitisation is perceived as a transformation process in which a company moves from a product-oriented to a service-oriented business model. The offer of services is today perceived by many manufacturers as well as customers as an essential part of the total offering of companies. Therefore, industrial companies also focus on offering a complex solution for their customers through their products and services, the so-called servitisation and the smart services (smart servitisation or smartisation).

Worldwide, 38 % of industrial companies can be classified as serviced. Such services as "maintenance and support" and "retail and distribution" are most often provided (Mastrogiacomo et al., 2019). According to Mastrogiacomo et al. (2019), although up to 45 % of 2652 manufacturing companies in the Czech Republic participate in services, only 2 % of them have transformed into service providers. A survey by Vlčková and Podskubková (2020) of 165 websites of industrial companies showed that 70 % of the monitored companies present the services offered on their websites, and 55 % of the companies also present them directly on the main page of the website. This score can also be understood as a slight increase in applied services compared to 2016 when the research identified 45 % of companies with the listing of services (Vlčková & Podskubková, 2020).

According to Fischer et al. (2012), the extension of the service offerings includes the following three service categories: (1) customer services, (2) product-related services and (3) services supporting business needs. Two different service types (basic and advanced services) are involved in the second category, product-related services. Basic services help companies quickly manage product breakdowns (e.g., spare parts, repair, inspections, and basic training). Advanced services help to avoid product breakdowns (e.g., preventive maintenance services, process optimisation, training, and maintenance contracts).

The last category of services, "services supporting business needs", was not included in the questionnaire, but two categories of services were added instead: complex solutions and smart services. A complex solution is a product solution where the end customer does not have to deal with the product's technical details, and the supplier provides all product-related operations and services, including regular inspections, service, and repairs and guarantees the overall trouble-free operation of the product.

Accompanying services that use smart technologies are often called smart services and include remote monitoring, remote diagnostics, remote repair, predictive maintenance, etc. According to Dreyer et al. (2019), "smart services are individual, highly dynamic and quality-based service solutions that are suitable for the customer, implemented through field information and analysis of data on technology, environment and social context, leading to co-creation of value between the customer and provider at all stages from strategic development to smart service improvement". However, electrotechnical SMEs also offering smart services are not yet focused on the potential financial benefits coming from their offering (Kozlowska, 2020). Companies can use digital technologies to accelerate their business processes, eliminate inefficiencies, and/or reduce costs or even sell more, but these projects are not truly transformational (Soto-Acosta, 2020). It is important to implement smart technologies into the entire strategic management of the company and to perceive them comprehensively with other activities.

Digital transformation has always been a challenge, but the COVID-19 pandemic has made people think about how they perceived this kind of organisational change before, during and after this serious threat to industry and economic stability (Jones et al., 2021). Based on research by Okorie et al. (2020), manufacturers with a high level of digitisation (in production facilities and helping in employee skills) show higher resilience and adaptability than manufacturing companies with lower digital adoption. Accelerating the digital transformation of manufacturing can "increase the visibility of pivoting and collaboration opportunities, with investment in digital upskilling becoming a serious prerequisite" (Okorie et al., 2020). A recent study by Chennevea et al. (2021) demonstrated that more than 90 % of manufacturers wanted to focus on resilience and invest heavily in their digital transformation workforce soon.

Services are now provided by many manufacturers across industries, but it is not always easy and hassle-free. It is true that manufacturing companies may consider the advanced services model to be high risk. It is difficult to break out of traditional product-based thinking and realise that the full potential of servitisation requires business model innovation, a willingness to embrace new technologies and new skills, as well as, ultimately, a major change in organisational culture (The Conversation, 2020).

The areas of service operation can be very different, for example, depending on the manufacturer's service offering, management's approach to services, customer interest, competitive pressures or a smart service offering. Based on Chowdhury et al. (2021), researchers have proposed using several technologies, e.g., digital twins, industry 4.0, 3D printing technology, artificial intelligence, and mobile service operation, for managing supply chains during and after the COVID-19 pandemic. Possible service areas focused on smart services included in the research may include the logistics of spare parts supply, service contracts with customers on the type/offer of services, interest in offering smart services to customers, interest in engaging with suppliers in the field of smart services and the need to train technicians to provide smart services to customers. Items with an emphasis on smart services include delivery and supplier relationships, contracting, technician training, and customer interest in smart services.

Although service operations may be perceived differently in each company, according to the abovementioned areas, it can be assumed that overall, they were influenced by COVID-19 in the same way, even if the companies differed in size, the type of customers, etc. To achieve the paper's aim, a research question and hypothesis were set.

Research question RQ: Is there a difference based on CZ-NACE, the number of employees, the type of customers and the type of services provided to products in the perception of the COVID-19 impacts on various service operation areas in manufacturing companies?

The research question leads to the following hypothesis: H. The COVID-19 impacts on various service operation areas in manufacturing companies do not differ statistically significantly based on their CZ-NACE, the number of employees, the type of customers and the type of services provided to products.

2. Research methods

Investigations of the COVID-19 impacts on accompanying services in manufacturing companies are still minimal due to the topic's novelty. At present, there is no publicly available empirical study on this topic for manufacturing companies in the Czech Republic, where the industry is still very significant (the share of GDP is 30 %). According to the Czech Statistical Office, the Czech industry is currently in full swing, and its production is approaching the level of 2019 (Vejvodová, 2021). However, during the COVID-19 pandemic, many manufacturers had to reduce or change their production and had problems with the supply of raw materials and the outflow of some customers. It can be assumed that the pandemic has affected many manufacturers in various areas, including the provision of accompanying services. Therefore, the quantitative research was prepared to determine how COVID-19 affected current manufacturers in the field of accompanying services.

The service category classification mentioned in this research was taken from Fischer et al. (2012) and Story et al. (2017), where the impact on different service types was differentiated from basic to advanced. Understanding of the service categories was also discussed with service managers from manufacturing companies. The parts related to the COVID-19 impact on services, expectations and various areas of service operations were inspired by Rapaccini et al. (2020) and other scholars focusing on smart services (Kowalkowski & Ulaga, 2017; Paschou et al., 2020). Therefore, the areas of service operation were described according to five different statements: COVID-19 has a negative impact on the logistics of spare parts supply; COVID-19 has a negative impact on concluding service contracts with customers about the type/offer of provided services; COVID-19 has increased the interest in offering smart services to customers; COVID-19 has increased the interest in engaging with suppliers in the field of smart services; COVID-19 has increased the need to train technicians to provide smart services to customers. The part of the research related to various areas of service operation was compared and evaluated for manufacturers according to their CZ-NACE classification of economic activities, their number of employees, the type of their customers and the type of services provided to products.

The questionnaire contained 23 questions regarding the COVID-19 impact on the sale of products and services; the outlook for the sale of products and related services; the impact on various areas of service operation; expectations for the sale of products and accompanying services, expectations of increased customer/management/competitor interest in services, and, finally, general information about the respondents, including a query on the type of services provided. All parts of the questionnaire were focused on smart services. The 4-point Likert scale was used for gathering data (1 — totally agree, 2 — partially agree, 3 — partially disagree, 4 — totally disagree, with the possibility of "without estimate/don't know"). "No answer" was excluded due to the absence of business activity for further evaluation from respondents.

The research respondents belonged to four selected industries based on the CZ-NACE classification of economic activities: CZ-NACE 20 (Manufacture of chemicals and chemical products), CZ-NACE 24 (Manufacture of basic metals), NACE 26 (Manufacture of computer, electronic and optical products) and CZ-NACE 27 (Manufacture of electrical equipment). Producers of CZ-NACE 20, CZ-NACE 24, CZ-NACE 26, and CZ-NACE 27 are important representatives of the manufacturing industry and are subcontractors for other economic sectors. Electrical engineering companies were chosen because of the connection of products with digital technologies, some manufacturers already trying to provide services using smart technologies to their products, and customers perceiving their benefits. Chemical and metallurgical companies were then chosen because of product expansion in recent years with advanced accompanying services in the form of various environmental programmes aimed at reducing waste, recycling and treatment. Due to the growing society's pressure for sustainable development, these companies and their customers are approaching changes in the business strategy aimed at offering an entire comprehensive solution, where they offer their products in the form of services.

The companies were approached in September 2020 using email addresses acquired from the Amadeus database (a database of comparable financial information for public and private companies across Europe). They were sent a link to an online questionnaire created in the Lime Survey tool. In total, questionnaires were sent to 820 companies. The questionnaire was completed by 88 companies in total, 33 of them from CZ-NACE 20 and CZ-NACE 24 and 55 from CZ-NACE 26 and CZ-NACE 27. Unfortunately, the number of respondents from four

selected industries was not high, but due to the unfavourable situation (the period after the first COVID-19 wave and at the beginning of the second one), it was still regarded as a success. The software package SPSS, Version 17, was used for data analysis. Fisher's exact test was used.

3. Research results

The contingency tables below (only the main tables are mentioned in the following chapter and the Appendix) show the differences between CZ-NACE 20, CZ-NACE 24, CZ-NACE 26 and CZ-NACE 27 in terms of the negative effects on logistics and the conclusion of service contracts, differences in the interest to offer smart services, increased interest in engaging with suppliers and increased need for training of smart service technicians. All tables have four fields. The mutual relationships were tested by Fisher's exact test because the conditions of good approximation for Pearson's chi-square test are not met. This test does not provide the value of the test criterion; it directly calculates the p-value. The scale "Disagree – Agree" is rather grouped into two. The answer "I do not know" is omitted. The answers "I agree" and "I rather agree" are joined, just as "I disagree" and "I rather disagree". The findings are divided into two parts: the findings related to CZ-NACE, the number of employees and predominant customers and the findings related to the type of provided services.

3.1. Findings related to CZ-NACE, the number of employees and predominant customers

The proportion of agreement with statements, processed according to CZ-NACE respondents where, for example, 90 % of respondents from CZ-NACE 24 and 78.6 % of respondents from CZ-NACE 26 agreed with the statement "COVID-19 has a negative impact on the logistics of spare parts supply" is shown in Table 1. On the other hand, only 14.8 % of respondents from CZ-NACE 27 agree with the statement, "COVID-19 has increased our interest in offering smart services to our customers".

None of the statements showed a statistically significant difference between CZ-NACE ($p > 0.05$).

The proportion of respondents' consent by the number of employees is shown in Table 3, where, for example, 82.1 % of respondents with up to 50 employees agree with the statement, "COVID-19 has a negative impact on the logistics of spare parts supply". Conversely, only 14.3 % agree with the statement, "COVID-19 has increased our interest in offering smart services to our customers". The biggest difference is between respondents with up to 50 and more than 50 employees in two statements, "COVID-19 has a negative impact on the logistics of spare parts supply" and "COVID-19 has increased our interest in offering smart services to our customers". Remarkably similar results in this category were obtained for the statement, "COVID-19 has a negative impact on concluding service contracts with customers about the type/offer of services provided".

None of the statements showed a statistically significant difference between companies with a maximum of 50 employees and companies with more than 50 employees.

The share of agreement with statements processed by predominant customers among respondents is shown in Table 4, where, for example, 73.8 % of respondents with predominant B2B customers and 66.7 % of respondents with predominant B2C customers agreed to the statement, "COVID-19 has a negative impact on the logistics of spare parts supply". Also, 16.7 % of respondents with predominant B2C customers agreed with the statement, "COVID-

Tab. 1. Proportion of agreement with statements, processed according to CZ-NACE respondents

Statements	CZ-NACE 26	CZ-NACE 27	CZ-NACE 20	CZ-NACE 24
COVID-19 has a negative impact on the logistics of spare parts supply	78.6 %	56.3 %	64.3 %	90.0 %
COVID-19 has a negative impact on concluding service contracts with customers about the type/offer of services provided	64.3 %	50.0 %	61.5 %	61.5 %
COVID-19 has increased our interest in offering smart services to our customers	36.4 %	14.8 %	45.5 %	42.9 %
COVID-19 has increased our interest in engaging with our suppliers in the field of smart services	46.2 %	20.0 %	41.7 %	37.5 %
COVID-19 has increased the need to train our technicians to provide smart services to our customers	38.5 %	21.4 %	40.0 %	42.9 %

Tab. 2. Results of Fisher's exact test for pairs according to the prevailing CZ-NACE

Statements	p-value					
	26/27	26/20	26/24	20/27	24/27	20/24
COVID-19 has a negative impact on the logistics of spare parts supply	0.195	0.678	0.615	0.749	0.068	0.341
COVID-19 has a negative impact on concluding service contracts with customers about the type/offer of services provided	0.751	1	1	0.526	0.499	1
COVID-19 has increased our interest in offering smart services to our customers	0.519	1	1	0.088	0.135	1
COVID-19 has increased our interest in engaging with our suppliers in the field of smart services	0.135	1	1	0.240	0.366	1
COVID-19 has increased the need to train our technicians to provide smart services to our customers	0.280	1	1	0.404	0.340	1

Tab. 3. Proportion of agreement with statements processed according to the number of employees

Statements	Employees up to 50	More than 50 employees	p-value
COVID-19 has a negative impact on the logistics of spare parts supply	82.1 %	54.5 %	p = 0.300
COVID-19 has a negative impact on concluding service contracts with customers about the type/offer of services provided	57.1 %	56.3 %	p = 1.000
COVID-19 has increased our interest in offering smart services to our customers	14.3 %	41.4 %	p = 0.061
COVID-19 has increased our interest in engaging with our suppliers in the field of smart services	24.0 %	42.3 %	p = 0.237
COVID-19 has increased the need to train our technicians to provide smart services to our customers	18.2 %	41.4 %	p = 0.127

Tab. 4. Proportion of agreement with statements processed according to predominant customers among respondents

Statements	B2C	B2B (manufacturers)	B2B (distributors)
COVID-19 has a negative impact on the logistics of spare parts supply	66.7 %	73.8 %	46.2 %
COVID-19 has a negative impact on concluding service contracts with customers about the type/offer of services provided	46.7 %	62.5 %	53.8 %
COVID-19 has increased our interest in offering smart services to our customers	21.4 %	31.0 %	30.8 %
COVID-19 has increased our interest in engaging with our suppliers in the field of smart services	16.7 %	32.3 %	46.7 %
COVID-19 has increased the need to train our technicians to provide smart services to our customers	21.4 %	26.7 %	50.0 %

Tab. 5. Results of Fisher's exact test for pairs according to the predominant customers

Statements	p-values		
	B2C/B2B (manuf)	B2C/B2B (distrib)	B2B (manuf)/ B2B(distrib)
COVID-19 has a negative impact on the logistics of spare parts supply	0.739	0.445	0.092
COVID-19 has a negative impact on concluding service contracts with customers about the type/offer of services provided	0.363	1	0.746
COVID-19 has increased our interest in offering smart services to our customers	0.720	0.678	1
COVID-19 has increased our interest in engaging with our suppliers in the field of smart services	0.456	0.217	0.516
COVID-19 has increased the need to train our technicians to provide smart services to our customers	1	0.236	0.177

Tab. 6. Proportion of agreement with statements processed according to services provided

Statements	Basic services	Advanced services	p-value
COVID-19 has a negative impact on the logistics of spare parts supply	66.7 %	62.5 %	p = 1
COVID-19 has a negative impact on concluding service contracts with customers about the type/offer of services provided	50.0 %	55.3 %	p = 1
COVID-19 has increased our interest in offering smart services to our customers	0.0 %	24.2 %	p = 0.557
COVID-19 has increased our interest in engaging with our suppliers in the field of smart services	0.0 %	33.3 %	p = 0.296
COVID-19 has increased the need to train our technicians to provide smart services to our customers	0.0 %	29.7 %	p = 0.548

Tab. 7. Table of p-values of Fisher's exact test

Statements	p-values			
	Do you provide basic accompanying services for your products?	Do you provide advanced accompanying services for your products?	Do you provide complex solutions for your products?	Do you provide smart accompanying services for your products?
COVID-19 has a negative impact on the logistics of spare parts supply	1	0.759	1	0.276
COVID-19 has a negative impact on concluding service contracts with customers about the type/offer of services provided	0.504	0.763	0.453	0.785
COVID-19 has increased our interest in offering smart services to our customers	1	0.707	0.07	0.761
COVID-19 has increased our interest in engaging with our suppliers in the field of smart services	1	1	***0.022***	***0.076***
COVID-19 has increased the need to train our technicians to provide smart services to our customers	1	0.438	0.162	0.249

Tab. 8. Contingency frequency table

Statements			Do you provide your customers with complete solutions?		Total
			YES	NO	
COVID-19 has increased our interest in engaging with our suppliers in the field of smart services	I don't agree	Absolute frequency	10	29	39
		Relative frequency	47.6 %	78.4 %	67.2 %
	I agree	Absolute frequency	11	8	19
		Relative frequency	52.4 %	21.6 %	32.8 %
TOTAL		Absolute frequency	21	37	58
Relative frequency		100.0 %	100.0 %	100.0 %	

19 has increased our interest in engaging with our suppliers in the field of smart services".

The results of Fisher's exact test for pairs according to predominant customers are shown in Table 5.

None of the statements showed a statistically significant difference for pairs of predominant customers.

3.2. Findings related to the type of provided services

The Appendix provides elaborate tables, which are summarised in Table 6 below. The share of agreement with the statements according to the type of services provided by the respondents is shown in

Table 6. First, there is a testing of companies that have only basic services and companies that also have one of the advanced services or only advanced accompanying services. For example, 66.7 % of respondents who provide basic services and 62.5 % of respondents agreed with the statement, "COVID-19 has a negative impact on the logistics of spare parts supply". A very similar result was with the statement, "COVID-19 has a negative impact on concluding service contracts with customers about the type/offer of services provided", where 50 % of basic service providers and 55.3 % of advanced service providers agreed.

Table 7 provides test results by service type. Only p-values are given for simplicity.

A statistically significant difference was found in the increase in interest in engaging in cooperation with suppliers in the field of smart services, namely, in complex solutions and accompanying services using smart technologies. For the rest of the items, no links were found, which does not mean that there is no relationship but rather not knowing whether it was "yes" or "no".

The contingency frequency table (Table 8) for the statistically significant result for the statements, "Do you provide comprehensive services to customers?" and "COVID-19 has increased our interest in engaging with our smart service providers". More than two-thirds of respondents (67.2 %) did not agree with the statement, "COVID-19 has increased our interest in engaging with our suppliers in the field of smart services". Almost 80 % of them did not provide complete solutions to their customers.

4. Discussion of the results

All countries are still dealing with the COVID-19 outbreak, but its multiple implications have not been fully unfolded. What is known, especially during the lockdown, is that digital technologies have made our lives easier and, at the same time, permitted businesses to maintain a certain level of activity. The COVID-19 pandemic is expected to impact everyone, including manufacturing companies. As Ivanov and Dolgui (2020) stated, certain technologies, such as robots, digital twins, blockchain and additive manufacturing, have received attention from manufacturers during the pandemic. Kitukutha et al. (2021) stated that the spread of COVID-19 has disrupted every country's transport and supply chain due to the total ban and movement restrictions. However, the effect of the pandemic was not the same for every business as some profited from COVID-19, mostly due to the type of products offered, some of which were necessary and, thus, in high demand during the pandemic (Kaźmierska-Jóźwiak, 2021).

The research findings show no statistically significant differences based on CZ-NACE, the number of employees, the type of customers and the type of services provided to products (a statistical significance appeared only in one statement) in the perception of the impacts of COVID-19 on various areas of service operation in manufacturing companies. To summarise the findings, the impact of COVID-19 on service operations has not been demonstrated by different respondent categories in the research. It can also be considered that the companies were hit by the COVID-19 very similarly. This result likely corresponds to the actual situation, and producers are affected in the same way.

The research findings show no statistically significant differences based on NACE, the number of employees and the predominant customers where Fisher's test was used, and no statistically significant difference was demonstrated anywhere, indicating that COVID-19 had no impact on service operations. It can also be considered that the companies were hit by the COVID-19 very similarly. The result likely corresponds to the actual situation, and producers are affected in the same way. However, this result can also be explained by the small number of respondents participating in the research. On the other hand, the p-values in the research are so high that it probably would not be proven even with a higher number. This result contradicts Durst and Henschel (2021), where smaller companies, compared to big ones, seemed to have some advantages for dealing with the pandemic, e.g., being flexible and agile, used to working under uncertainty and cohesion between owners/founders and employees. Also, Shafi and Ren (2020) stated that major victims of the COVID-19 outbreak were micro, small, and medium-sized enterprises. Nevertheless, the biggest difference was between respondents with up to 50 employees and respondents with more than 50 in two statements, "COVID-19 has a negative impact on the logistics of spare parts supply" and "COVID-19 has increased our interest in offering smart services to our customers". According to Wu et al. (2021), COVID-19 also had a major impact on the service sector, dominated by the consumer industry. Smaller labour-intensive industries and certain downstream industries, such as textiles and clothing production, car production and electronics production. Also, Nayak et al. (2022) reported on the epi-

demic's impact on six industrial sectors: automobile, energy and power, agriculture, education, travel and tourism and consumer electronics, where differences among industries were also found. The electrical engineering industry (CZ-NACE 26 and 27) also emerged in this paper.

Tables 1, 3, 4 and 6 show that most respondents confirmed that COVID-19 had a negative impact on the logistics of spare parts supply, which was similar to research results by Rapaccini et al. (2020), where the respondents said they experienced high or very high negative impacts on spare parts logistics. The situation was similar with service level agreements, where the respondents of this research perceived the negative effects of COVID-19. Also, 66 % of respondents made considerable alterations to their processes, while 43 % noted significant barriers when attempting to meet service level agreements (Rapaccini et al., 2020). The COVID-19 pandemic has affected supply chain relationship management. The study by Baveja et al. (2020) described the limited extent of social interactions between supply chain partners, where this decrease in interactions was due to incomplete information. This incompleteness of information can lead to ambiguity of information and a lack of clarity and precision (Gunessee & Subramanian, 2020). This has also led to a reduction in supplier engagement, which has made it harder for companies to develop a collaborative approach involving all stakeholders (Remko, 2020).

Secondly, in the findings, according to the type of services provided, a statistically significant difference was found in the increased interest in engaging in cooperation with suppliers in the field of smart services for complex solutions and accompanying services using smart technologies. Remote support and performance advisory services, such as helpdesks, remote support for breakdowns, and digital installations, provide obvious solutions in an age of social distancing, remote working, and lockdowns (The Conversation, 2020). Those companies that provide comprehensive solutions or accompanying services using smart technologies significantly more often disagreed that COVID-19 increased their interest in engaging in cooperation with their suppliers in the field of smart services. Possibly these companies already provide comprehensive services and smart services, so COVID-19 did not increase their interest in cooperation. Rapaccini et al. (2020) stated that innovative companies should consider the full spectrum of service growth opportunities. For the rest of the items, no links were found, which does not mean that there is no relationship but rather not knowing whether it was "yes" or "no". Manufacturers should increase their collaboration with the companies which have customers or distribution resources to improve efficiency and profitability (Obal & Gao, 2020). However, manufacturers should use more opportunities from smart services because service growth could be less impacted by this kind of crisis (Rapaccini et al., 2020), which was also confirmed by Paschou et al. (2020).

Conclusions

The outbreak and the prompt spread of COVID-19 have caused multiple problems and great challenges for B2B companies. Recent studies have explained the pandemic's effect on manufacturers and showed how companies recovered from the pandemic using marketing innovations (Wang et al., 2020), B2B relationship management (Obal & Gao, 2020) or sales force management (Sharma et al., 2020). This paper contributes to the literature on marketing responses to COVID-19 by aligning its impact on various areas of service operations at manufacturers. As Alsmairat (2021) stated, COVID-19 was "felt globally across manufacturing and operations in ways that challenge companies' abilities to develop effective response mechanisms". The authors of this paper assumed that COVID-19 affected various service operation areas in manufacturing companies. However, the research did not reveal any statistically significant difference, except in processing results according to the type of services, and in this case, only in increasing interest in engaging in cooperation with suppliers in the field of smart services. To sum up, hypothesis H ("H. The COVID-19 impacts on various service operation areas in manufacturing companies do not differ statistically significantly based on their CZ-NACE, the number of employees, the type of customers and the type of services provided to products") was confirmed in most of the results. However, it was not confirmed only in processing results according to the type of services, and in this case, only in increasing interest in engaging in cooperation with our suppliers in the field of smart services.

The theoretical implication contributes to understanding the COVID-19 impact on the manufacturers in the various service operation areas. According to certain estimates, the impact on manufacturers was also expected in providing accompanying ser-

vices and the access to them also in the areas of service operation. However, the research did not reveal any statistically significant difference in manufacturing companies sorted based on their CZ-NACE, the number of employees and the predominant customers in the areas of service operation. This research revealed statistically significant differences in processing results according to the type of services, and in this case, only in increasing interest in engaging in cooperation with suppliers in the field of smart services.

The findings can have practical implications in several areas. From the managerial viewpoint, this paper contributes to the field of COVID-19 impacts on service operation areas in manufacturing companies. This part of the provision of services is not much described, and, in addition, there is an important research contribution for manufacturers in the field of COVID-19 impact. One statistically significant difference was found in the statement related to the increasing interest in engaging in cooperation with suppliers in the field of smart services. For manufacturers who already provided comprehensive services and smart services, COVID-19 did not increase their interest in cooperation, as they have probably already functioned in this area to some extent.

Given the current changes, the economic potential of services is becoming more visible. Due to COVID-19, remote support and performance advisory services are gaining importance and becoming crucial. However, companies that have already been targeting such services did not see significant differences in their provision before, after or during COVID-19. Experience in providing customer support through digital technologies for weeks could greatly contribute to overcoming the last barriers that prevent the adoption of digital technologies; in other words, customer concerns about privacy, cybersecurity, and possible data breaches can now be addressed. The managers agreed that the post-COVID-19 era could finally see the massive adoption of industrial Internet, condition monitoring, predictive maintenance, digital rooms, augmented and virtual reality, and digital twins in services and solutions (Rapaccini et al., 2020). Companies must facilitate fortitude in terms of their ability to weather problems of any type. Those in the industrial sector must continue introducing service-led strategies and digital product services while at the same time keeping their industrial know-how and market position granted by many years in their field. Digital servitisation can be regarded as a strategic means to gauge the development and use of radical shifts and further (digital) resources, which could be less affected by crises (Rapaccini et al., 2020).

The research was conducted in September 2020, when after a relatively optimistic summer, the numbers of COVID-19 cases were slowly beginning to rise again. This was followed by a very demanding period of 7–10 months (depending on the country, industry, and specific situation), when the situation continued to evolve and could change in different areas of service operations, including a complex perception of accompanying services provided by manufacturers. The limitation of the article is a small range of respondents from four selected industries, but due to the unfavourable situation, the number of obtained respondents was still a success. Another limit, however, is the unexpected and long continuation of the pandemic, which, in turn, changed the whole situation. Therefore, after the pandemic, it would be appropriate to repeat part of the research and find out how various areas of service operation have evolved over time.

When the covid situation mirrors that of Britain (since 19 July) and Northern Ireland (from 26 July), what will this mean for manufacturers? Will companies be able to replicate their success of pre-pandemic days? (The Conversation, 2021). Further developments are yet to be seen, and manufacturers will require support. Gaining competitiveness is an important topic attached to business success for many companies at present (Zadykowicz et al., 2020). To remain competitive, businesses must face the main challenges, i.e., flexible manufacturing, quality production, procurement costs optimisation, and inventory management.

Based on Okorie et al. (2020), building a flexible and resilient manufacturing environment could help management consider enablers and barriers. Also, cooperation is crucial. Prokop et al. (2021) advised focusing on the innovative collaboration of manufacturing industry firms with government, public, or private research institutes. Also, Pekarcikova et al. (2021) stated that businesses with an innovative approach and modern machinery and equipment were always more likely to continue operating. This conclusion is crucial for the post-pandemic period. Commercial businesses are interested in monitoring product acquisition prices, focusing on logistic and customer service costs. Thus, these types of firms are challenged by product purchase optimisation, customer service during and after the buying process, as well as prompt delivery of goods (Soto-Acosta, 2020),

including smart services as an important part of a service offering.

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APPENDIX

The tables below elaborate the information summarised in the paper's chapter Research results.

			TYPE OF SERVICE		TOTAL
			BASIC ACCOMP. SERVICES	ADVANCED ACCOMP. SERVICES	
COVID-19 has a negative impact on the logistics of spare parts supply.	I don't agree	Absolute frequency	2	15	17
		Relative frequency	33.3 %	37.5 %	37.0 %
	I agree	Absolute frequency	4	25	29
		Relative frequency	66.7 %	62.5 %	63.0 %
TOTAL		Absolute frequency	6	40	46
		Relative frequency	100.0 %	100.0 %	100.0 %

p = 1

			TYPE OF SERVICE		TOTAL
			BASIC ACCOMP. SERVICES	ADVANCED ACCOMP. SERVICES	
COVID-19 has a negative impact on concluding service contracts with customers about the type/offer of services provided	I don't agree	Absolute frequency	3	17	20
		Relative frequency	50.0 %	44.7 %	45.5 %
	I agree	Absolute frequency	3	21	24
		Relative frequency	50.0 %	55.3 %	54.5 %
TOTAL		Absolute frequency	6	38	44
		Relative frequency	100.0 %	100.0 %	100,0 %

p = 1

			TYPE OF SERVICE		TOTAL
			BASIC ACCOMP. SERVICES	ADVANCED ACCOMP. SERVICES	
COVID-19 has increased our interest in offering smart services to our customers.	I don't agree	Absolute frequency	4	25	29
		Relative frequency	100.0 %	75.8 %	78.4 %
	I agree	Absolute frequency	0	8	8
		Relative frequency	0.0 %	24.2 %	21.6 %
TOTAL		Absolute frequency	4	33	37
		Relative frequency	100.0 %	100.0 %	100.0 %

p = 0.557

			TYPE OF SERVICE		TOTAL
			BASIC ACCOMP. SERVICES	ADVANCED ACCOMP. SERVICES	
COVID-19 has increased our interest in engaging with our suppliers in the field of smart services.	I don't agree	Absolute frequency	4	22	26
		Relative frequency	100.0 %	66.7 %	70.3 %
	I agree	Absolute frequency	0	11	11
		Relative frequency	0.0 %	33.3 %	29.7 %
TOTAL		Absolute frequency	4	33	37
		Relative frequency	100.0 %	100.0 %	100.0 %

p = 0.296

			TYPE OF SERVICE		TOTAL
			BASIC ACCOMP. SERVICES	ADVANCED ACCOMP. SERVICES	
COVID-19 has increased the need to train our technicians to provide smart services to our customers.	I don't agree	Absolute frequency	3	26	29
		Relative frequency	100.0 %	70.3 %	72.5 %
	I agree	Absolute frequency	0	11	11
		Relative frequency	0.0 %	29.7 %	27.5 %
TOTAL		Absolute frequency	3	37	40
		Relative frequency	100.0 %	100.0 %	100.0 %

p = 0.548

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Why does environmental uncertainty have a moderating effect on marketing performance? A comparative analysis of Indonesian and Thai service industries

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ABSTRACT
This study examined CRM's effect on marketing performance and customer focus strategies. It also investigates the moderating role of environmental uncertainty in the relationship between CRM and customer focus on marketing performance. A quantitative research approach was used with a sample of the service industry in two countries, Indonesia and Thailand. The analysis unit was the manager responsible for customer relations. The number of examined surveys amounted to 406, with a distribution of 200 respondents from Thailand and 206 — from Indonesia. The purposive sampling approach was used. The study results indicated that CRM had a positive effect on marketing performance and customer focus. The latter positively affected marketing performance. The study also found that environmental uncertainty strengthened the relationship between CRM and the customer focus on marketing.

KEY WORDS
CRM, customer focus, marketing performance, environmental uncertainty

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Introduction

Marketing researchers state that customer relationship management (CRM) is a set of strategies used by the company to interact and manage the closeness of relationships with its customers through activities and behaviours typical of the company (Kohli & Jaworski, 1990). CRM is a superior resource (Morgan & Hunt, 1994), which can be implemented by improving the quality of customer service to impact business performance (Lebdaoui & Chetioui,

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Diffley, McCole, and Carvajal-Trujillo (2018) developed key factors arising from the CRM process and explained that it led to superior performance. Another study found that the CRM application positively affected organisational performance from a business-to-customer (B2C) perspective in the banking sector (Ullah, Iqbal, & Shams, 2020). Customer satisfaction achieved through applying the CRM concept promoted better organisational performance in a B2C-oriented organisation. Wang and Feng (2012) confirmed that customer relationship management was integral to the internal organisational capabilities to achieve superior business performance.

According to Gomes, Yasin, and Lisboa (2009), complexity in the era of organisational competition is essential for companies to determine their strategy choices and create a business strategy model. A dynamic environment requires considering globalisation, technology-based and customer-driven competition, innovation strategy (Lestari et al., 2020), marketing capability under the uncertainty of competition, and high technological uncertainty (Parnell, 2018). Therefore, companies must be able to adapt and choose competitive customer-oriented methods to ensure their survival and develop the IT infrastructure corresponding to environmental conditions (Xue, Ray, & Gu, 2011).

Several studies on customer relationship management and business performance have been conducted since the turn of the century (Day & Van den Bulte, 2002). Changing environmental conditions affect performance in a business that is uncertain about its existence (Sofi et al., 2020). The study by W. Yu, Ramanathan, and Xingyu Wang (2018) showed that business operations capabilities were considered an important dynamic capability, positively affecting business performance.

Empirical research efforts explained how several variables reinforced CRM and improved business performance (Lebdaoui & Chetioui, 2020; Rafiki, Hidayat, & Al Abdul Razzaq, 2019). Generally, empirical research regarding the influence of CRM shows that the use of intervening variables to measure marketing performance tends to mediate its relationship with CRM and has a positive effect.

Morgan and Hunt (1994) developed the commitment–trust theory and underlined a crucial need for organisations to build harmonious relationships with customers. The theory confirmed that inter-organisational cooperation must be based on mutual trust/belief, relational commitment, and the desire to cooperate in the long run. The current study aimed to provide empirical evidence of the vital role played by mediating environmental uncertainty in CRM and driving marketing performance improvement. It was expected to explain the customer mediation variable that can drive increased marketing performance, which has not yet been viewed by other researchers.

1. Literature review

1.1. Customer relationship management

Customer relationship management is an approach used by companies to acquire customers and analyse and interpret the related data to make management decisions (Ernst et al., 2010). For this purpose, a company needs to shift from product to customer orientation (Nuryakin, Widowati, & Fatmawati, 2018). Customer orientation boosts the potential to create new products and can improve the company's new product launch performance.

The CRM concept applies to various aspects of the organisation. Mohammed and Rashid (2012) describe CRM as an organisational strategy approach to utilising its internal resources, such as technology, people, and processes, for managing customer relations in the organisational development cycle to achieve competitive advantage and organisational performance. CRM dimensions have been defined as customer orientation, CRM organisation, knowledge management, and technology-based CRM.

Several authors underlined the insufficient research on CRM as a concept. However, recent technology and information developments promoted more efforts which focused on SME and technological scope and social media (Hassan, Mohamed Haniba, & Ahmad, 2019; Rodriguez, Ajjan, & Peterson, 2014; Zablah et al., 2012).

CRM is a technology-based organisational approach to managing customers under conditions of competition and global market pressure (Zablah, Bellenger, & Johnston, 2004). The adoption of the approach requires substantial financial investments in technologies. The success in building customer relations can be measured by improved marketing performance and profit growth.

Harrigan, Ramsey, and Ibbotson (2008) demonstrated that CRM is important for service-providing

companies and other SMEs as it essentially helps improve organisational performance. Relationship marketing-based SMEs may opt for the eCRM model, which provides all standard functions on the Internet. This technology includes web-based business support and uses email to manage customer contacts. Therefore, the eCRM concept is referred to as the use of Internet technology to provide and manage relationships with customers.

This study focuses on investigating the relationship between several CRM activities on marketing performance by looking at the business environment uncertainty in small- and medium-scale service industries of two countries, Indonesia and Thailand. Business activities under full uncertainty shape CRM strategies and impact business risks (K. Yu, Cadeaux, Luo, Qian, & Chen, 2018). However, it is not enough for companies to implement CRM systems as they should also consider the interaction between people and processes, which represents the extent of CRM's acceptance among the management and employees and their support for its implementation to address business issues (Bull, 2003).

In the era of globalisation, CRM adoption among companies has experienced significant growth (Kennedy et al., 2006). CRM is defined as a method for understanding customer behaviour through intensive communication to improve performance, which is reflected in attracting customers, increasing their loyalty, and business profitability.

1.2. Environmental uncertainty

Environmental uncertainty has long been studied in strategic management and organisational literature. The most significant contribution was made by Dess and Beard (1984), who explored three dimensions of environmental dynamics, dynamism, munificence, and complexity, in environmental change. Dynamics refers to the volatility and uncertainty in the business environment handled by the company (Keats & Hitt, 1988). An industry with high uncertainty consequently has a more dynamic corporate strategy. Munificence implies growth opportunities in an industry (Dess & Beard, 1984) and complexity means the heterogeneity of environmental elements that a company has to handle. The greater the number of elements, the more significant the heterogeneity of corporate entities (e.g., competitors). The three dimensions represent uncertainty in the company's environment.

The environmental uncertainty in the market and rapidly changing customer needs are also dimensions of uncertainty. According to D. Zhang, Linderman, and Schroeder (2012), three main sources of market-related uncertainty include customer needs (change in demand), product/process change, and competition. When organisations operate in an environment with low market uncertainty, exploitative activities that emphasise the refinement of existing competencies lead to higher performance.

This study adds environmental uncertainty as a moderating variable in the link between CRM and marketing performance. Customer focus becomes an intervening variable. According to Zimmermann, Ferreira, and Moreira (2020), uncertainty is a strategy helping organisations achieve excellence and innovation. Kafetzopoulos, Psomas, and Skalkos (2019) added that innovation performance in organisations has three dimensions that directly contribute to business performance affected by environmental uncertainty. Environmental uncertainty cannot guarantee the success of organisational performance.

Environmental uncertainty is often driven by intense competition and unpredictability when technological advances occur. Under such environmental conditions, innovation and technologies related to the company's capabilities are more desirable and drive investments (Q. Zhang & Ma, 2021; Y. Zhang, Sun, Yang, & Wang, 2020). Constantly changing markets require companies to understand market trends and the conditions for new products and increase dynamic capabilities (Vicente, Ferasso, & May, 2018). In a fast-moving competitive environment, organisational innovation also plays an important role in achieving and maintaining a competitive advantage (Abou-Moghli, Abdallah, & Muala, 2012).

The environmental uncertainty also relates to market conditions. Market instability is characterised by rapidly changing customer needs (Wang & Feng, 2012). Several studies explain different types of environmental uncertainty, such as technological or market uncertainties, and their impact on innovation. Market uncertainty indicates changes in the composition of customer preferences. Synergy and information technology adoption make it hard to anticipate, understand and predict future market directions and competitor actions (Salojärvi et al., 2015). This study examined environmental uncertainty from a market perspective and viewed customer-related responses using a customer database.

2. Hypotheses development and empirical research model

2.1. Effect of customer relationship management on marketing performance

Management of corporate relationships with customers has a strategic role in improving organisational performance (Bull & Adam, 2009; Harrigan et al., 2008; Soliman, 2011). Some research results have proven a strong interdependence between CRM and marketing performance, while others did not support the finding (Fatmawati, Nuryakin, & Siriyota, 2021). Ata and Toker (2012) showed that CRM adoption had a significant positive effect on organisational satisfaction and performance in establishing business-to-business relationships. CRM adoption was also found to affect organisational marketing performance significantly but not financial performance. This study also showed that improved customer satisfaction led to better organisational performance in B2B enterprises.

Mohammad et al. (2013) tested CRM dimensions — customer orientation, CRM organisation, knowledge management, and CRM-based technology — against research results. Customer orientation, CRM organisation, and knowledge management positively affected organisational performance from various financial perspectives and had a beneficial effect on customers and internal processes. Meanwhile, Nejatian, Sentosa, and Piaralal (2011) revealed that customer knowledge as an exogenous variable influenced CRM performance as an endogenous variable and, ultimately, improved company performance. In general, performance can be measured by financial performance using such indicators as profit growth, assets, working capital, sales growth and sales flow (Hindasah & Nuryakin, 2020).

CRM has become an essential concept in improving the hospitality industry's performance (Mohammed & Rashid, 2012). The concept has become essential and prevalent for academics and business practitioners. This study found that the CRM concept is an essential part of improving business performance in the hospitality industry.

It also explained the vital role of marketing capabilities in mediating the relationship between CRM and performance. Becker, Greve, and Albers (2009) found that if supported by stakeholders, the CRM implementation impacts performance.

Based on the empirical research results, a hypothesis can be formulated as follows: Hypothesis 1: CRM has a positive effect on marketing performance.

2.2. Effect of customer relationship management on customer focus

Information technology diffusion concepts, such as CRM systems and social media, can create and enhance the managers' understanding of interacting with customers in the digital age (Lipiainen, 2015). Sales performance can be affected by social media presence and customer orientation. Mohammad et al. (2013) scrutinised the impact of CRM dimensions — customer orientation, CRM organisation, knowledge management, and CRM-based technology — on organisational performance from various perspectives, including finance, customers, internal processes, learning, and organisational growth. The results indicated that customer orientation, CRM organisation, and knowledge management had a positive effect on organisational performance from various financial perspectives and had a beneficial effect on customers and internal processes.

The CRM concept was also indicated as fundamental in the assessment of India's banking performance, measured by customer satisfaction (Fatma, 2012). CRM implementation is critical for banking supervisors to understand customers and foster long-term relationships under increasingly fierce competition in India's banking industry. CRM can be used as a corporate strategy to communicate and interact with customers and analyse a company's customer orientation (Nuryakin & Sugiyarti, 2018).

Based on the empirical research results, a hypothesis can be formulated as follows: Hypothesis 2: CRM has a positive effect on customer orientation.

2.3. Effect of customer orientation on marketing performance

Customer orientation enhances performance (Sampaio, Hernández-Mogollón, & Rodrigues, 2019). CRM adoption demonstrates a significant influence on marketing performance (Ullah et al., 2020). It is important for companies that build business interaction patterns to manage customer satisfaction (Theopilus et al., 2021). Financial sector companies, such as banks, consider CRM — customer orientation, organisational efficiency, and customer knowledge

management — to have a strategic role (Soliman, 2011). According to Soliman (2011), there is a positive relationship between CRM and marketing performance.

Hormiga, Batista-Canino, and Sánchez-Medina (2011) explored the effect of customers and suppliers, the informal network, and the company's reputation on the success of the company's performance. Businesses can use networking and build relationships to enhance performance (Farida & Nuryakin, 2021). The relational capital and its customer and supplier relation dimensions significantly correlate with the success of the company's performance.

Based on the empirical research results, a hypothesis can be formulated as follows: Hypothesis 3: Customer orientation has a positive effect on marketing performance.

2.4. Environmental uncertainty as a moderating factor in the interdependence of CRM and marketing performance

The dynamic business environment requires companies to switch their orientation from products to customers (Nejatian et al., 2011). CRM is a way to do so. Nejatian et al. (2011) confirmed that customer knowledge as an exogenous variable influenced CRM performance as an endogenous variable and, ultimately, improved company performance.

CRM has become an essential concept in improving the hospitality industry's performance (Mohammed & Rashid, 2012). The concept has become essential and prevalent for academics and business practitioners. This study also found that CRM plays an important part in improving business performance in the hospitality industry. It also explained the vital role of marketing capabilities in mediating the interdependence between CRM and performance.

CRM is an approach used by companies to acquire customers and analyse and interpret related data to make management decisions (Ernst et al., 2010). The approach requires a company to shift its orientation from products to customers. Customer orientation boosts the potential to create new products and can improve the company's new product launch performance.

Based on the empirical research results, hypotheses can be formulated as follows:

Hypothesis 4a: Environmental uncertainty moderates the CRM's impact on marketing performance.

Hypothesis 4b: Environmental uncertainty moderates the customer orientation impact on marketing performance.

The hypotheses can be presented as an empirical research model (Fig. 1).

3. Research methods

The used study design was developed to build an empirical model based on an in-depth theoretical study related to the influence of CRM and customer orientation and their ability to improve marketing performance. The research described in this paper could be classified as basic (fundamental) research.

3.1. Research samples

The study findings were tested in the service industries of two countries, Indonesia and Thailand. The sector was chosen because of various characteris-

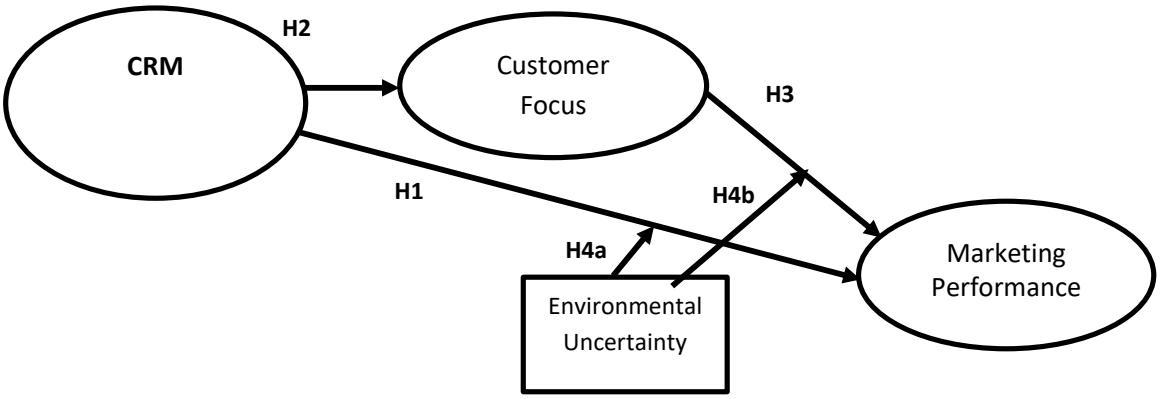

Fig. 1. Empirical research model

tics that fit the theme of this study theoretically and empirically. These particular service industries are characteristic of close relationships with customers. The study sample included 412 Indonesian and Thai enterprises, including hotels and retail businesses, travel agents, spas, massage and beauty salons, private universities, banks, hospitals and health service providers, insurance companies, communication and transport service providers, and logistics operators.

The technique used was purposive sampling, based on specific objectives. Using this technique, not all study populations had the same opportunity as the study sample.

3.2. Operational variables and measurement scale

This study used four variables: customer relationship management, customer orientation, marketing performance, and environmental uncertainty. Table 2 explains the research construct measurement and item adoption.

CRM is an organisational strategy for utilising internal resources, such as technology, people, and processes, to manage customer relations in the cycle of organisational development to achieve competitive advantage and organisational performance. Marketing performance measures the company's results achieved by marketing activities or other company operations.

Customer orientation refers to the company's efforts to deal with dynamic customer demands and respond to them quickly. Meanwhile, environmental dynamics concerns changes in environmental conditions resulting from increasingly uncertain external factors. The construct was measured using a five-point Likert scale (1 — strongly disagree to 5 — strongly agree).

3.3. Research design and unit analysis

This study used a quantitative approach and examined the causality of exogenous and endogenous constructs. The sample included different companies from Indonesia and Thailand, including:

- Hospitality businesses,
- Trade and retail enterprises,
- Travel agents,
- Spas, massage and beauty salons,
- Banks,
- Private universities,
- Hospital and health service providers,
- Insurance companies,
- Communication and services providers,
- Logistics and transportation service providers.

The sample of 406 respondents was collected using a questionnaire directly supplied to respondents from Indonesia (206) and Thailand (200).

The screening and trimming results showed that only 347 samples met the study qualifications. The

Tab. 1. Research construct measurement and items

Construct	Indicator/item	Authors
CRM	• Use an information system to collect data from customers (CRM1), • Technology infrastructure for acquiring data from customers (CRM2), • Technical ability to quickly adopt new methods and information (CRM3), • The ability to integrate customer data (CRM4)	Sin, Tse, and Yim (2005); Mohammed and Rashid (2012); Reinartz, Krafft, and Hoyer (2004)
Customer orientation	• Focus on customer satisfaction (CO1), • Understanding the customer characteristics (CO2), • Commitment to fulfilling varied customer demands (CO3), • Maintaining customer trust (CO4)	Thoumrungroje (2010); Kim, Park, and Dubinsky (2012); Hong-kit Yim, Anderson, and Swaminathan (2004)
Environmental uncertainly	• Market conditions are uncertain (EU1), • Current information technologies must be able to adapt quickly (EU2), • Competition promotes integrated information systems (EU3), • Competition promotes response to customer complaints (EU4)	Parnell, Lester, and Long (2012); Keats and Hitt (1988); Parnell, Long, and Lester (2015); K. Yu et al. (2018)
Marketing performance	• Increase in company income over the past three years (MP1), • Increase in the number of customers over the past three years (MP2), • Increase in the market share over the past three years (MP3), • Decrease in the number of customer complaints over the past three years (MP4)	Sin et al. (2006); Lamprinopoulou and Tregear (2011); Nuryakin and Ardyan (2018)

sampling technique was conducted using purposive sampling.

4. Research results

4.1. Validity and reliability testing

The instrument's validity and reliability were tested using SPSS by looking at loading factor values on each instrument's rotated component matrix. The validity test results showed that each value had a loading factor > 0.6, indicating statistical validity. The reliability test results are given in Table 2.

Hypotheses were tested using statistical testing with a structural equation modelling approach. The moderating regression testing used the SPSS program. The regression moderation tested is explained in Table 3. The results of hypothesis testing can be explained as provided in Fig. 2.

Tab. 2. Scale item for measures

Construct	Items	Standardised factor loading	Cronbach's alpha
CRM	CRM1 CRM1 CRM1 CRM1	0.850 0.851 0.794 0.830	0.899
Customer orientation	CF1 CF2 CF3 CF4	0.750 0.783 0.839 0.830	0.872
Environment uncertainly	EU1 EU2 EU3 EU4	0.689 0.775 0.790 0.660	0.872
Marketing performance	MP1 MP2 MP3 MP4	0.900 0.882 0.770 0.690	0.886

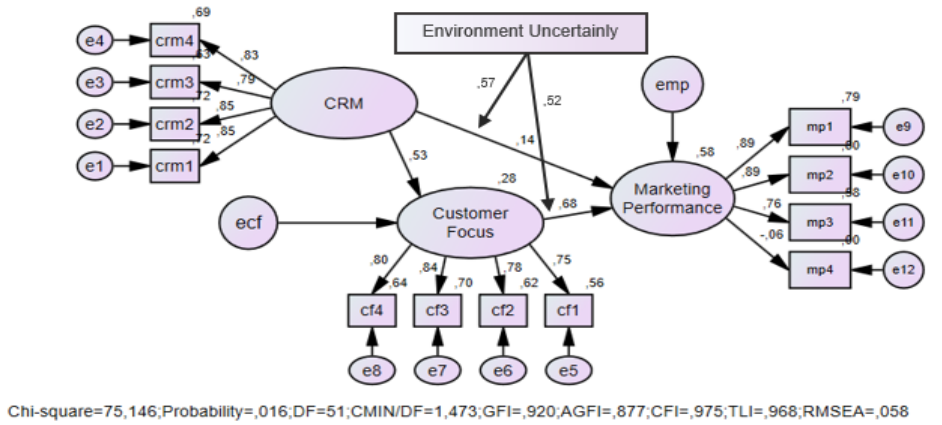

Fig. 2. Full model hypothesis testing using the Structural Equation Modelling (SEM)

Tab. 3. SEM test results and moderating variables for CRM's effect on marketing performance

Hypothesis		Standardised path coefficients	t value	Prob.	Result
H1	CRM → marketing performance	0.156	1.832	0.067	Significant
H2	CRM → customer orientation	0.440	5.432	0.000	Significant
H3	Customer orientation → marketing performance	0.788	6.489	0.000	Significant
H4a Moderating	CRM *environment uncertainly → marketing performance	0.586	8.505	0.000	Significant
H4b Moderating	Customer focus *environment uncertainly → marketing performance	0.530	7.350	0.000	Significant

Notes: * p, 0.10, ** p , 0.05 and *** p , 0.01; the standardised coefficients are reported with the t-values in parentheses

Table 3 provides statistical test results for Hypothesis 1 that tested the CRM's effect on marketing performance. It shows the results for the regression coefficient value of the CRM's effect on marketing performance, as indicated by the value t = 1.832>1.66, with a significance value of 0.067< 0.10. These results indicate that CRM had a positive effect on marketing performance. Hypothesis 1 was accepted.

Table 2 gives test results for Hypothesis 2, which investigated the relationship between CRM and customer orientation. It presents the results for the regression coefficient value of the relationship between CRM and customer orientation, as indicated by the value t = 5.432>1.66, with a significance value of 0.000<0.10. These results indicate that CRM had a positive effect on customer orientation. Hypothesis 2 was accepted.

Table 2 also gives test results for Hypothesis 3, which examined the effect of customer orientation on marketing performance. It shows the results for the regression coefficient value of the relationship between customer orientation on marketing performance, as indicated by the value t = 6.489>1.66, with a significance value of 0.000<0.10. These results indicate that customer orientation had a positive effect on marketing performance. Hypothesis 3 was accepted.

Hypothesis 4a explained the CRM's effect on marketing performance with environmental uncertainty as a moderating variable. The result of regression moderation testing of the CRM's effect on marketing performance with environmental uncertainty revealed a value t = 8.505>1.66, with a significance value of 0.000<0.10. These results suggest that environmental uncertainty strengthened the CRM's effect on marketing performance. Hypothesis 4a was accepted.

Hypothesis 4b explained the relationship between customer orientation and marketing performance with environmental uncertainty as a moderating variable. The result of regression moderation testing of the relationship between customer orientation and marketing performance with environmental uncertainty disclosed a value t = 7.350>1.66, with a significance value of 0.000<0.10. Based on the results, environmental uncertainty strengthened the relationship between customer orientation and marketing performance. Hypothesis 4b was accepted.

5. Discussion

The research indicated that CRM had a positive effect on marketing performance. These results correspond to findings by Mohammad et al. (2013) that customer orientation, CRM organisation, knowledge management, and CRM-based technology had a positive effect on performance. Nejatian et al. (2011) also confirmed a positive CRM's influence on company performance. This study's results are also consistent with research that found the relationship between customer satisfaction and performance (Lebdaoui & Chetioui, 2020; Yang & Yen, 2018) and in line with research findings regarding a strategic role played by CRM through customer orientation, organisational efficiency, and customer knowledge management (Soliman, 2011).

Based on the current study results, CRM has a positive effect on customer orientation, which is in line with findings by Mohammad et al. (2013), stating that customer orientation and CRM-based technology have a positive effect on organisational performance. This study also found that customer orientation has a positive effect on marketing performance, which is also in line with the study by Zhu and Nakata (2007) explaining the importance of customer orientation and the findings by Soliman (2011).

The study results also support findings by Nejatian et al. (2011), claiming the influence of customer knowledge as an exogenous variable on CRM performance. In a dynamic environment, businesses are required to produce product innovations and shift to customer orientation (Nejatian et al., 2011). Customer relationship management is an approach that helps companies in their relations with customers and gathering of related information, analysing it and translating organisational knowledge into managerial decisions (Ernst et al., 2010).

Conclusion

This research empirically contributes to the CRM's influence on customer orientation and marketing performance. Also, it proves the mediating role of customer orientation in improving marketing performance and provides other empirical evidence on the concept of moderating environmental uncertainty variables and their role in strengthening the effect of CRM and customer orientation on marketing performance.

The study results explain that if an organisation develops long-term relations with customers, they enhance marketing performance. Therefore, organisations must seek to develop customer-focused strategies that lead to enhanced marketing performance.

Although the environment is uncertain, long-term relations with customers and customer-focused strategies are important factors for enhancing marketing performance.

Implications and recommendations

The results of this study provide practical implications and theoretical consequences. There are two managerial implications in this study. First, organisations should focus on building long-term relations with customers. Such relations result in customer loyalty and commitment under uncertain business conditions. Also, organisations need to shift to customer orientation through trust and commitment to customers. This strategy enhances organisational performance. Second, a customer-focused strategy becomes important in enhancing marketing performance. An organisation must emphasise customer satisfaction, focus on understanding customer characteristics and create a value-based relationship that offers a strong commitment to customers.

This study provides valuable recommendations for future research, including the need to develop a more comprehensive empirical research model on the characteristics of the service industry in the same scope, such as the trade sector, the retail sector, and the hospitality sector. It is recommended to be more selective in choosing respondents, given the characteristics of the respondents are very heterogeneous, to allow a biased response.

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Collective creativity in management science

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ABSTRACT
This paper aims to establish the current state of knowledge on collective creativity in management science based on a systematic literature review. A systematic review was performed based on the three-step SPL procedure proposed by Tranfield et al. (2003). Two databases (Scopus and Web of Science) were searched electronically until March 2022. Literature analysis and content analysis were performed based on the secondary data. Eighteen studies met the inclusion criteria following the systematic literature review procedure. The conducted descriptive and thematic analysis allowed establishing the state of knowledge in the analysed area and identifying the main thematic areas along with the future research directions. The research was the first to conduct a systematic literature review (SLR) on collective creativity in management science. The main contribution of this paper is its exclusive focus on analysing existing research in the collective creativity field, limited to management science. SLR allowed determining that research in the analysed area was still at a fairly early stage. Although the existing literature sheds some light on collective creativity, studies investigating the aspects of teamwork focused on problem-solving are required.

KEY WORDS
collective creativity, creativity, teamwork, innovation

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Introduction

In innovation management, collective creativity is a concept based on the psychological security required for team building (Arkko-Saukkonen et al., 2021). However, the assumptions of collective creativity originated in the arts. The term first appeared in the article by Musick (1976), who raised the issue of more effective art teaching. The meaning and use of collective creativity are constantly changing. Today, the perception of the term varies widely and is most

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popular in such fields as education, business, humanities, management, urbanisation, psychology, music, and computer science. From the viewpoint of management, the first articles appeared after 2002, focusing on time management (Hatch, 2002), and then only in 2006, in an article on problem-solving (Hargadon & Bechky, 2006).

The economy is currently moving from the information age, dominated by digitisation, to the artificial intelligence era. Companies and organisations have experienced enormous benefits in replacing repetitive processes with machines and using the collected metadata to analyse and predict future actions. The growing trend suggests that machines and information systems are beginning to replace humans in almost all areas, except those requiring human creativity and imagination. This is a turning point in research popularising the concept of group solutions, as human creativity is becoming one of the most desirable skills in the labour market. It will be the driving force behind organisational changes, which will have to reorganise the work system to remain innovative and development-oriented. Moreover, given the results of the knowledge management research, it is important to create a climate for creativity at the level of the organisation and, especially, teams (Stankiewicz & Moczulska, 2015). Thus, the most important skills will be team management, especially the ability and readiness to work in teams with great cultural and generational differences. This applies to teams operating within individual organisations and various forms of network cooperation developing under virtual reality conditions (Kraus et al., 2021).

Rapid economic changes related to digitisation and process automation will result in consequences for management as a field of science. The collective creativity concept seems to be a response to the increasingly popular trend of seeking innovation in companies by focusing on human capital and using teamwork to create it. Possibly, it will become the dominant management concept in the coming years.

However, a review of analyses and research conducted in this area indicated innovation management as a relatively new and undefined field. Research shows its positive effects on team management and creativity. Nevertheless, several studies indicated this field as developing and having a lot of room for further analysis. No literature review has been conducted in the field of collective creativity so far. The only found comparison of articles and works by various authors in the field of collective creativity was the meta-analysis of team creativity conducted under the leadership of Yingjie Yuan from the University of Groningen (Yuan et al., 2022).

Thus, this study is a response to the lack of an available review of the scientific literature regarding the collective creativity concept recognised in management science. Systematic studies of various issues in this area require an attempt to systematise knowledge to define further stages of this field's development. Therefore, this paper aims to provide a comprehensive review of scholarly research on collective creativity in management science to determine the area's state of the art. The research questions posed for this study were as follows:

RQ1: How has collective creativity in management science been approached so far?

RQ2: What are the main themes discussed in relation to collective creativity?

RQ3: What are prospective directions for future research?

The main aim and research questions defined in the paper are closely related to the systematic literature review (SLR) methodology, which is characterised by the particular rigour of collecting and synthesising prior scientific research, which allows for its replicability (Okoli, 2015). The paper fills the research gap through a study synthesising the scientific research on collective creativity conducted in management science in the last decade. It identifies the main topic areas, geographical coverage, industry focus, and research methods used in the existing scholarly research on collective creativity. It also provides a foundation for future research. The study may also be useful to practitioners in understanding the nature of collective creativity and its application to business practice.

The paper is structured as follows: Section 1 describes the SLR procedure, Section 2 presents the results of the descriptive and thematic analysis, and Sections 3 and 4 provide the discussion and conclusion with theoretical and practical implications.

1. Research methods

The literature describes various procedures for conducting a systematic literature review. According to Okoli (2015), SLR should consist of eight steps, including purpose identification, draft protocol and team training, practical screening application, literature search, data extraction, quality appraisal, synthesis of studies and review writing. The methodology

used by Palomino et al. (2018) is especially helpful in the screening phase as it explains simply and transparently how to perform each analysis step. It contains many sets of techniques and tools to conduct SLR that can enrich the analysis and especially make the visual part more attractive. To perform a more detailed SLR, the linguistic analysis proposed by Godwin (2016) could be applied. It can be easily transferred to the network map of words. The current paper used the three-step SPL procedure proposed by Tranfield et al. (2003): review planning, conducting, and reporting.

1.1. Review planning

The first stage — review planning — can be considered a "stand-alone literature review", aiming to diagnose and summarise the literature on the subject, identify research gaps and propose further development directions for the field in terms of scientific efforts. The work described in this article started with collecting key terms to filter articles in the databases. Further filters could be applied once as many publications as possible were collected using particularly general parameters and rejecting articles that did not meet the criteria. The final number of publications was subjected to further in-depth analysis. Fig. 1 provides a graphic representation of the implemented process with the given input and output data, used key words and the specificity of the filters for each screening phase.

1.2. Conducting the review

The study was prepared based on analysing articles in Scopus and Web of Science (WoS) databases. The analysed literature had to be in the form of journal articles, conference proceedings, books or book sections. In total, the term "collective creativity" was found in 542 articles; however, only 53 articles in the Scopus database (category: Business, Management and Accounting) and 59 articles in the WoS database (category: Management & Business) were related to management and business. After merging both databases and removing duplicates, 74 articles remained for analysis, which were subjected to further selection criteria. In the analysis, the main keywords "management" and "business" were combined with the keywords related to the purpose of the analysis for greater accuracy, i.e., "innovation", "collaboration", "open innovation", "crowdsourcing", "collective knowledge", "innovation management" and "problem solving". The selection of key terms was closely related to using collective creativity to manage the organisation and its innovation processes.

The selection process was divided into three phases that disqualified articles failing to meet certain criteria for further analysis. In the first phase, the selection criteria concerned the publishing language, compliance with the types of bibliography specified in the initial analysis phase, and the publication date. It was important for articles to be published in English for greater access to a wider audience.

The compliance criterion of key terms and types of the bibliography was defined so that the publications were focused on the broadly understood management in organisations with particular emphasis on innovation and team management. The last selection criterion was the publication date. The analysis accepted articles published after 2010, aiming to be as up-to-date as possible in relation to management trends. The application of filters resulted in 63 publications qualified for further analysis.

The second phase of the selection focused on publications concerned only with collective creativity in management. Each publication was analysed based on an abstract, title and keywords. The publications selected for further analysis not only mentioned management areas but also concerned them. The analysis resulted in 41 articles accepted for further selection.

The last selection phase concerned the articles' availability. The full analysis only selected articles with their full content published under the open access principle. 23 articles were excluded from further analysis, and 18 were selected for full analysis and constituted the basis for further work.

1.3. Reporting

After all the screening phases had been carried out, 18 articles were subjected to descriptive and thematic analysis. As the descriptive part, summaries in the form of tables and graphs have been prepared. Tables 1–5 present five sets of data: measurements of publications citations; measurements of journals; groupings of keywords appearing in the review's bibliography; industrial and geographical context; and an overview of the research design, approaches, and methods included in the review's bibliography.

As part of the thematic analysis of each article, a summary of the research focus and key findings of the review's literature was prepared in the form of a table (Table 6). From each publication, the purpose

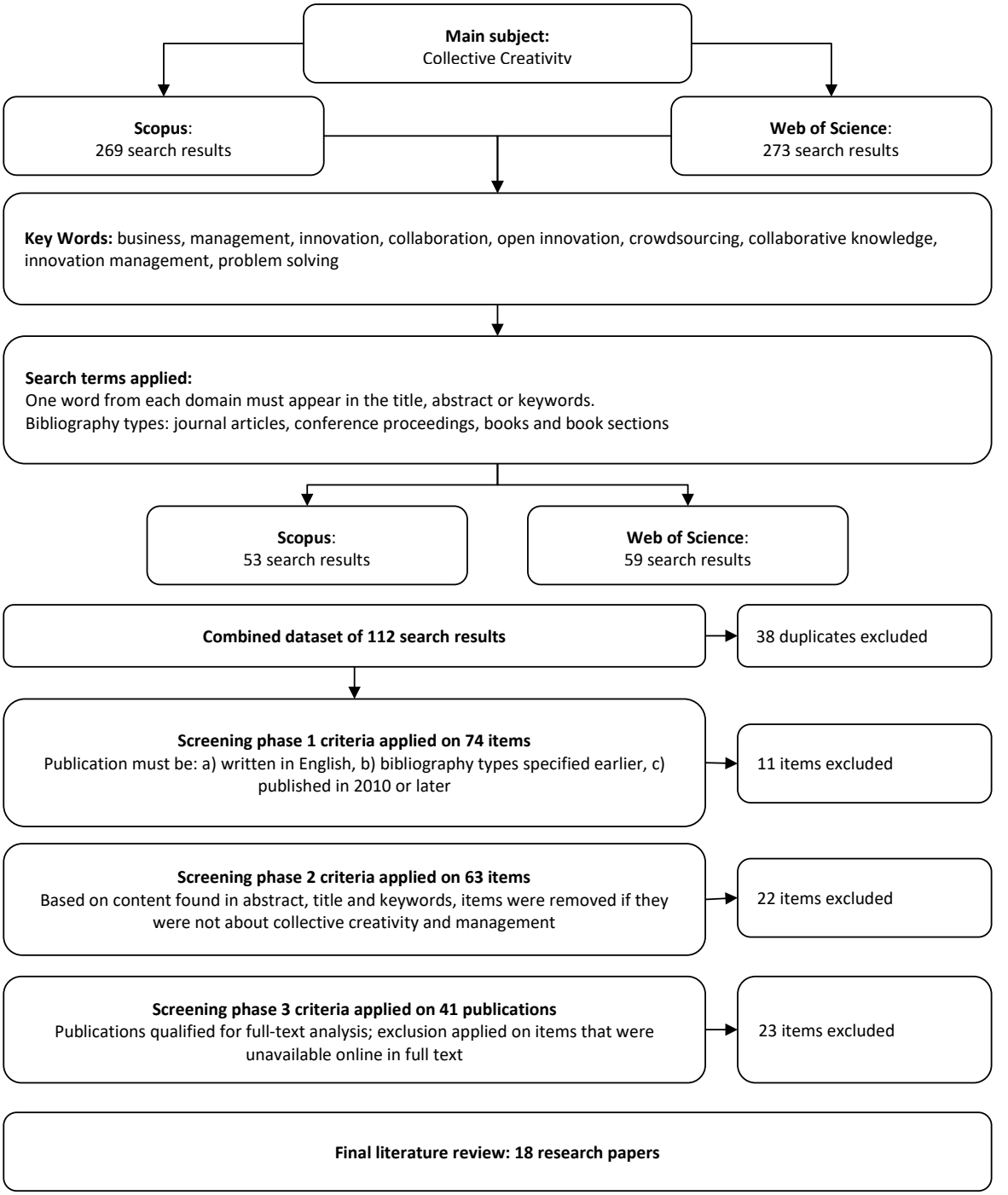

Fig. 1. Systematic literature review process

of the study and the most important conclusion concerning the conducted research were distinguished.

These analyses provided the basis for determining the limitations resulting from the conducted research and proposing future areas of research in this field.

2. Research results

2.1. Descriptive analysis

No clear growth trend could be detected (Fig. 2) in the collective creativity research during the analy-

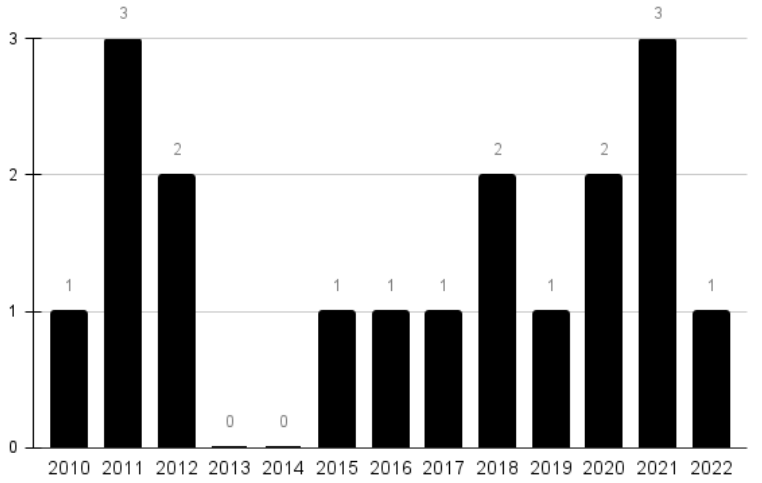

Fig. 2. Yearly publications from 2010 to 2022

Tab. 1. Measurements of publications citations

Author	Title	Venue of publication	All
Chanal and Caron-Fasan (2010)	The Difficulties Involved in Developing Business Models Open to Innovation Communities: the Case of a Crowdsourcing Platform	Management	51
Bissola and Imperatori (2011)	Organizing Individual and Collective Creativity: Flying in the Face of Creativity Cliches	Creativity and Innovation Management	41
Brown and Anthony (2011)	How P&G Tripled Its Innovation Success Rate	Harvard Business Review	38
Martins and Shalley (2011)	Creativity in Virtual Work: Effects of Demographic Differences	Small Group Research	34
Lee and van Dolen (2015)	Creative participation: Collective sentiment in online co-creation communities	Information & Management	24
Hurley et al. (2018)	Exploring the application of co-design to transformative service research	Journal of Services Marketing	23
Cirella et al. (2012)	A Process Model of Collaborative Management Research: The Study of Collective Creativity in the Luxury Industry	Systemic Practice and Action Research	15
Parjanen et al. (2012)	Brokerage functions in a virtual idea generation platform: Possibilities for collective creativity?	Innovation Organization & Management	14
Cerneviciute and Strazdas (2018)	Teamwork management in creative industries: Factors influencing productivity	Entrepreneurship and Sustainability Issues	11
Cirella (2016)	Organizational Variables for Developing Collective Creativity in Business: A Case from an Italian Fashion Design Company	Creativity and Innovation Management	11
Ehlen et al. (2017)	The Co-Creation-Wheel A four-dimensional model of collaborative, interorganisational innovation	European Journal of Training and Development	8
Astola et al. (2021)	Can Creativity Be a Collective Virtue? Insights for the Ethics of Innovation	Journal of Business Ethics	2
Bradford and Leberman (2019)	BeWeDo (R): A dynamic approach to leadership development for co-creation	Leadership	2
Vogelgsang (2020)	Transition rather than balance: Organizing constraints for collective creativity in pharmaceutical development	Creativity and Innovation Management	1
Yao et al. (2021)	The curvilinear relationship between team informational faultlines and creativity: moderating role of team humble leadership	Management Decisions	1
Bai and Li (2020)	The best configuration of collaborative knowledge innovation management from the perspective of artificial intelligence	Knowledge Management Research & Practice	0
Cirella (2021)	Managing collective creativity: Organizational variables to support creative teamwork	European Management Review	0
Yuan et al. (2022)	From individual creativity to team creativity: A meta-analytic test of task moderators	Journal of Occupational and Organizational Psychology	0

Citation details were retrieved on Feb. 19, 2022.

sis period of 2010–2022. The end of 2020 shows the trend of published articles remaining at the level of 2–3 per year. 2013–2014 saw a break in articles on collective creativity, and the number of publications after this break was lower than in 2010–2012.

Among all analysed articles, "The Difficulties involved in Developing Business Models open to Innovation Communities: the Case of a Crowdsourcing Platform" by Chanal and Caron-Fasan (2010) had 51 citations, which is the highest number. Among the 18 articles included in the analysis, three latest papers from 2020, 2021 and 2022 had no citations. There is a clear trend regarding the time of publication. Articles from 2010–2015 were cited on average 31 times, while articles from 2016–2022 only had an average of five citations. Collective creativity is a new and niche field of management science, considering the development of a management culture towards the use of creativity and human potential in the organisation. This field has a chance for dynamic development in the coming years. The obstacle is the lack of breakthrough research that would tangibly direct the focus of scientists and managers toward it. An opportunity for the development of this field is the progressive technological development, in particular artificial intelligence, which will replace manual and repetitive activities from the organisation and will focus the work of leaders on using human creativity and innovation, which machines and computer systems are not able to provide so far.

Noteworthy is the especially wide variety of journals in which the identified publications were published. The authors of the analysed articles published their publications in 16 different scientific journals. Of these, one turned out to be the most popular — Creativity and Innovation Management — in which three articles were published. Only three publications appeared in journals ranked above 150 h-index points: Astola et al. (2021) in the Journal of Business Ethics, Brown and Anthony (2011) in the Harvard Business Review and Lee and van Dolen (2015) in the Information & Management. The average number of h-index points was 74.

Nevertheless, as many as 12 out of 18 publications were published in journals with a lower index. Of the 18 journals, 16 had a management subject area, and two others related to psychology and marketing.

Tab. 2. Measurements of journals

Journal name	No of articles	Journal subject area	H-index in SJR
Journal of Business Ethics	1	Arts and Humanities; Business and International Management; Business, Management and Accounting; Economics and Econometrics; Law	187
Harvard Business Review	1	Business, Management and Accounting; Strategy and Management; Business and International Management; Management of Technology and Innovation; Economics and Econometrics; Medicine	179
Information & Management	1	Information Systems; Information Systems and Management; Management Information Systems	162
Journal of Occupational and Organizational Psychology	1	Applied Psychology; Organizational Behavior and Human Resource Management	114
Journal of Services Marketing	1	Marketing	102
Management Decisions	1	Business, Management and Accounting; Management Science and Operations Research	98
Small Group Research	1	Applied Psychology; Social Psychology	71
Creativity and Innovation Management	3	Business, Management and Accounting	60
European Journal of Training and Development	1	Business, Management and Accounting; Education; Organizational Behavior and Human Resource Management	57
Leadership	1	Sociology and Political Science; Strategy and Management	44
Knowledge Management Research & Practice	1	Business, Management and Accounting; Decision Science; Social Sciences	38
Systemic Practice and Action Research	1	Management of Technology and Innovation; Strategy and Management	33
European Management Review	1	Business and International Management; Strategy and Management	32
Entrepreneurship and Sustainability Issues	1	Business, Management and Accounting; Economics, Econometrics and Finance; Environmental Science	25
Management	1	Business, Management and Accounting; Strategy and Management	15
Innovation Organization & Management	1	unavailable	unavailable

Data retrieved from SJR on Feb. 20, 2022.

The analysed articles had 50 keywords, which were finally grouped into seven categories: management, innovation, creativity, team, ICT, leadership and other. The highest frequency of occurrence was in the management category, with as many as 13 different keywords. Mostly, they focused on cooperation and organisation management. The second most frequent category was innovation, which had nine different key phrases related to innovation in various development stages of a project and organisation. The third of the most dominant categories was creativity with eight keywords, which concerned both design and broadly understood idea generation. Less popular groups of keywords were team (7), ICT (6), and leadership (4). The main non-grouped keywords were Aikido, alcohol education and fashion textile design. The analysed articles had 50 keywords, which were finally grouped into seven categories: management, innovation, creativity, team, ICT, leadership and other.

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These articles were also reviewed in terms of their specificity. First, the industrial context and geographical distribution of each publication were established. Then, the focus was placed on the methodology. The form of the conducted research and its purpose were analysed and compared. In addition, data sources, data acquisition and analysis methods were found.

Teams of most analysed articles (12 out of 18) were composed of scientists from the same country. Six articles had scientists representing the USA and Italy, and the preparation of five articles involved scientists from the Netherlands and Great Britain. Chinese researchers were on teams of three articles, and two papers engaged scientists from New Zealand. Geographically, most articles were issued in Europe (8 countries), followed by Southeast Asia (China, Australia and New Zealand) and the USA. Half of the articles were related to a specific industry. The remaining 50 % were holistically related to creativity, innovation and team management in companies without identifying the dominant research industry. Table 4 presents detailed data relating to individual articles.

When it comes to research design, the majority of publications were directed at the exploratory design, and only one of them, by Brown and Anthony (2011), was focused on descriptive design (Table 5). Considering the research approach, the situation was much more diversified. Among the analysed articles, 16 of them focused on a qualitative approach, four of which combined two objectives, qualitative and quantitative. There was no study that focused solely on the quantitative approach, and articles by Chanal and Caron-Fasan (2010) and Cirella et al. (2012) were directed at the collaborative approach.

The analysis of data sources observed a uniform approach to research, i.e., the use of mixed primary and secondary sources. Two articles stood out: Brown and Anthony (2011) used only raw data, and Astola et al. (2021) used secondary data. Scientific publications differed in data-obtaining methods. Documents were used to collect data in all 18 analysed cases, and additional methods of data collection occurred in 16 cases. Only two publications used documents only. Ten publications used only two data sources, five used three sources, and one used as many as four data sources. Among the second-choice sources were questionnaires, which were used in eight publications, six articles used the interview, and one of them was a follow-up interview. Two articles used some form of an experiment to obtain data, while five publications used some form of group research, i.e., a case study (used in two articles), a co-design session, workshops, and a complex heuristic task. Desk research and online platform interactions were among the isolated forms of obtaining data for articles.

The analysed articles were characterised by a variety of methods of analysed data; nevertheless, all 18 publications used content analysis. At the same time, out of seven publications that used only one method of data analysis, it was a content analysis in all cases. Two methods of data analysis were used in six scientific articles, three methods were used in the next four publications, and one of them used as many as four data analysis methods. Inferential statistics was the second most popular analysis method used in the analysed sample in as many as seven publications. In addition to the two methods, the authors of scientific articles also used a systematic analysis (Chanal

Tab. 3. Groupings of keywords appearing in the review bibliography

Keyword group	Occurrence	Keywords appearing in the review bibliography
Management	13	Affective influence, brokerage functions, business model, collaborative management research, collective sentiment, constraint, HRD, interorganisational collaboration, optimal allocation, organisational change and development, organisational variables, process, professional learning
Innovation	9	Collaborative knowledge, collective creativity, innovation, innovation communities, innovation management, innovation network, open innovation, service innovation, transformative service research
Creativity	8	Co-creation, co-design, creative industries, creativity, crowdsourcing, design consultancy, efficiency in creativity, idea generation
Team	7	Collective virtue, demographic differences, team creativity, team informational faultlines, teamwork, virtual teams, virtue
ICT	6	Artificial intelligence, distance, online co-creation, user participation, user-driven, virtuality
Leadership	4	Humble leadership, leadership, leadership development, relational leadership
Other	3	Aikido, alcohol education, fashion textile design

Tab. 4. Industry and geographical context

Author(s)	Context		Geographical distribution	
Astola et al. (2021)	Multi-industry	Creative industry, movie production industry, IT industry	Single-country	The Netherlands
Bai and Li (2020)	Mono-industry	Technological industry	Single-country	China
Bissola and Imperatori (2011)	Multi-industry	Fashion and design industries	Single-country	Italy
Bradford and Leberman (2019)	Mono-industry	Sport industry	Single-country	New Zealand
Brown and Anthony (2011)	Mono-industry	Non-specified, the article is based on the experience of the P&G company	Single-country	USA
Cerneviciute and Strazdas (2018)	Mono-industry	Creative industry	Single-country	Lithuania
Chanal and Caron-Fasan (2010)	Mono-industry	Non-specified, article is based on a crowdsourcing platform	Single-country	France
Cirella et al. (2012)	Mono-industry	Luxury industry	Multi-country	Italy, USA
Cirella (2016)	Multi-industry	Fashion design industry	Single-country	UK
Cirella (2021)	Multi-industry	Fashion textile design and design consultancy industries	Multi-country	Italy, UK
Ehlen et al. (2017)	Mono-industry	Non-specified, article is based on the human resource sector	Single-country	The Netherlands
Hurley et al. (2018)	Mono-industry	Non-specified, article is based on the education sector	Multi-country	Australia, Sweden
Lee and van Dolen (2015)	Mono-industry	Non-specified, article is based on the online co-creation communities	Multi-country	The Netherlands, UK
Martins and Shalley (2011)	Multi-industry	Non-specified, article is based on a virtual field of work	Single-country	USA
Parjanen et al. (2012)	Multi-industry	Non-specified, article is based on a virtual idea generation Platform	Single-country	Finland
Vogelgsang (2020)	Mono-industry	Pharmaceutical industry	Single-country	Germany
Yao et al. (2021)	Multi-industry	Non-specified, article is based on the experience of the R&D companies	Single-country	China
Yuan et al. (2022)	Multi-industry	Non-specified, article is a review based on creative teams	Single-country	The Netherlands, USA

Tab. 5. Overview of the research design, approaches, and methods included in the review bibliography

Author(s)	Research design	Research approach	Data source	Data collection method	Data analysis
Astola et al. (2021)	Exploratory	Qualitative	Secondary	Documents	Content analysis
Bai and Li (2020)	Exploratory	Qualitative	Mixed	Documents, questionnaire	Content analysis
Bissola and Imperatori (2011)	Exploratory	Qualitative	Mixed	Documents, quasi-experiment	Content analysis, inferential statistics
Bradford and Leberman (2019)	Exploratory	Qualitative	Mixed	Documents, Interviews, experiment	Content analysis
Brown and Anthony (2011)	Descriptive	Qualitative	Primary	Documents, interviews	Content analysis
Cerneviciute and Strazdas (2018)	Exploratory	Qualitative	Mixed	Documents, questionnaire	Content analysis
Chanal and Caron-Fasan (2010)	Exploratory	Collaborative	Mixed	Documents, workshops	Systematic analysis, content analysis
Cirella et al. (2012)	Exploratory	Collaborative	Mixed	Documents, interviews	Reflective analysis, content analysis, data-driven analysis, co-evaluation
Cirella (2016)	Exploratory	Qualitative	Mixed	Documents, case study, interviews	Content analysis, iterative analysis, inductive analysis
Cirella (2021)	Exploratory	Qualitative, Quantitative	Mixed	Documents, questionnaire	Content analysis, inferential statistics
Ehlen et al. (2017)	Exploratory	Qualitative, Quantitative	Mixed	Documents, questionnaire, interviews	Content analysis, inferential statistics
Hurley et al. (2018)	Exploratory	Qualitative	Mixed	Documents, co-design session	Content analysis, five-phase cycle
Lee and van Dolen (2015)	Exploratory	Qualitative, Quantitative	Mixed	Documents, online platform interactions	Content analysis, textual analysis, inferential statistics
Martins and Shalley (2011)	Exploratory	Qualitative, Quantitative	Mixed	Documents, questionnaire, complex heuristic task	Content analysis, inferential statistics
Parjanen et al. (2012)	Exploratory	Qualitative	Mixed	Documents, questionnaire, case study	Content analysis
Vogelgsang (2020)	Exploratory	Qualitative	Mixed	Documents, desk research, questionnaire, follow-up interviews	Content analysis
Yao et al. (2021)	Exploratory	Qualitative	Mixed	Documents, questionnaire	Linear regression analysis, inferential statistics, content analysis
Yuan et al. (2022)	Exploratory	Qualitative	Mixed	Documents	Inferential statistics, content analysis, Schmidt-Hunter psychometric meta-analysis

& Caron-Fasan, 2010), a reflective analysis, data-driven analysis and co-evaluation (Cirella et al., 2012); an inductive and iterative analysis (Cirella, 2016), the five-phase cycle (Hurley et al., 2018); textual analysis (Lee & van Dolen, 2015), a linear regression analysis (Yao et al., 2021); and the Schmidt-Hunter psychometric meta-analysis (Yuan et al., 2022).

2.2. Thematic analysis

The main thematic threads distinguished in the analysed articles showed various approaches and the use of collective creativity in management science. Leadership and team management were one of the leitmotifs in four publications by Yao et al. (2021),

Tab. 6. Summary of the research focus and key findings of the reviewed literature

Author	Research focus	Key findings
Astola et al. (2021)	Investigated creativity as a collective virtue in organisations that engage in product and service innovation	Creativity in the context of innovation can be a group virtue
Bai and Li (2020)	Examine the mode, influence, and necessity of collaborative knowledge innovation management under the background of artificial intelligence	Through the optimal allocation of resources, enterprises can develop into highly efficient organisations with strong cohesion, continuous development, and selfmanagement, and form the collective creativity of enterprises, which can better adapt to the complex and rapidly changing management environment in the new era
Bissola and Imperatori (2011)	Presented an exploration of the evidence which can inform the design of collective creative projects within organisations, flying in the face of some managerial clichés	Creativity is not only about creative genius, and design for creativity is not a matter of linear correlation but implies a more sophisticated and integrative approach according to which individual creative skills, team dynamics and organisational solutions interact with each other to produce a collective creative performance
Bradford and Leberman (2019)	Investigated the movement practices of the Japanese martial art Aikido to facilitate leadership development and a relational perspective for co-creation	The research is the first to connect how Aikido movement practices generate relational leadership for leadership development to contribute to leadership studies
Brown and Anthony (2011)	Examined how P&G tripled its innovation success rate	Collective creativity can be managed and can generate sustainable sources of revenue growth no matter how big a company becomes
Cerneviciute and Strazdas (2018)	Aimed at the identification of the most important factors for the productivity of teamwork	To achieve higher productivity of a creative team, the greatest attention must be given to the factors of higher hierarchical level
Chanal and Caron-Fasan (2010)	Investigated the main strategic difficulties encountered by firms whose business models rely on public web communities to create value	The “openness” of the business model to online communities leads to the development of a multi-level incentive model adapted to the different profiles of the various contributors
Cirella et al. (2012)	Analysed a hybrid model of the CMR research process in organisations	The proposed model represents actionable protocol and knowledge to be used for designing rigorous, reflective and relevant collaborative research projects with organisations
Cirella (2016)	Aimed at proposing a theoretical framework for collective creativity within an organisational design perspective and to help clarify this concept and how collective creativity can be purposefully managed	Collective creativity, more than individual creativity, has a positive impact on client satisfaction and economic results
Cirella (2021)	Examined collective creativity as vital in creative settings, relating to interactions, communication and mutual trust between members of groups and teams, which can be managerially supported	The results provide a new scientific understanding of collective creativity in organisations and suggest future research directions, with recommendations for creative companies seeking to support collective creativity
Ehlen et al. (2017)	Aimed to design and validate a conceptual and practical model of co-creation	The model is a welcome instrument to get hold of thecomplex and unpredictable co-creation processes and activities
Hurley et al. (2018)	Explored the application of co-design to transformative service research	A recruitment strategy that uses strong networks and sensitises users through generating awareness of the underlying issue can prevent the waste of valuable resources
Lee and van Dolen (2015)	Investigated the understanding of the role of sentiment in user co-creation	Management style can affect the success of co-creation communities
Martins and Shalley (2011)	Examined how demographic differences interacted with the nature of interaction processes and difference in technical experience, to affect creativity in short-term virtual work interactions	Differences in age interacted with the processes anddifferences in technical experience to affect creativity. Differences in nationality had a strong negative direct effect and interacted with differences in technical experience to affect creativity. Differences in sex and race did not significantly affect creativity

Parjanen et al. (2012)	Analysed how brokerage functions are able to create possibilities for collective creativity	The careful preparation of the collective creativity process, active participation of the brokers during the process and the use of the boundary objects and creativity methods are some of the ways of creating possibilities for collective creativity in virtual co-creation
Vogelgsang (2020)	Aimed to rethink this balancing proposition by asking how constraints unfold during collective creative processes	Organising constraints for collective creativity is a matter of transition rather than balance
Yao et al. (2021)	Examined the curvilinear relationship between team informational faultlines and team creativity and the moderating effects of team humble leadership on the relationship	The results indicate that the relationship between team informational faultlines and team creativity is inverted U-shaped, and such a relationship is stronger in teams with low levels of humble leadership
Yuan et al. (2022)	Investigated the development of moderating roles of task characteristics — task interdependence and task creativity requirements	Translating individual creativity into team creativity is a fundamental issue

Yuan et al. (2022), Cirella (2021), and Ehlen et al. (2017). Yao et al. (2021) compared the relationship between team informational faultlines and team creativity. This analysis was proposed in relation to the "humble leadership" concept. It was translated as other-centred leadership that is open to criticism while at the same time evaluating members' contributions to the organisation (Chui et al., 2016). The study verified a critical role of a moderator for informational faultlines effects, a greater correlation between informational faultlines and team creativity, and lower levels of humble leadership. While examining the dependencies and differences between individual and group creativity, Yuan et al. (2022) concluded that individual creativity was the basis for the development of group creativity. The analysis of 67 publications on management and creativity resulted in the formulation and verification of 12 hypotheses examining various factors of the relationship between individuality and teamwork in the organisation's lifecycle.

The team as a driving force behind organisational innovation was also analysed by Cirella (2021), who identified and analysed five factors supporting the process of collective creativity. However, the author admitted that further work on the developed factors should be a natural extension and deepening of this area's knowledge, especially when it comes to the research scale. In turn, Ehlen et al. (2017) analysed the proposed practical co-creation model — the Co-Creation Wheel. The authors analysed complex and unpredictable processes and activities in relation to the proposed model and confirmed that it was useful for this type of activity area.

Another group of articles focused on productivity, growth and development. In their description, Brown and Anthony (2011) looked for a correlation between the size of the company and the possibility of managing and growing the organisation with regard to collective creativity. Their publication describes P&G's success story and its ability to triple the innovation success rate. According to Bissol and Imperatori (2011), creativity does not depend solely on outstanding individuals and their creative abilities. Collective creativity performance depends on more complex correlations of factors, including individual skills, dynamics of teamwork and organisational solutions. In their publication, the authors dealt with the notion of creativity cliches. By contrast, Hurley et al. (2018) looked for appropriate methods and tools that used collaborative networks to prevent the loss of valuable resources.

Five analysed publications were based on experiences from specific industries and focused on research improving the quality of team cooperation, the level of innovation of the products created, the effectiveness and the overall development of the organisation. According to Cerneviciute and Strazdas (2018), greater attention should be paid to factors of higher hierarchical level to achieve greater teamwork productivity. The topic of leadership using the example of Japanese martial arts Aikido was described by Bradford and Leberman (2019). Cirella et al. (2012) focused on research on collective creativity in the luxury industry, Cirella (2016) — on the business perspective in the fashion design company, and Vogelgsang (2020) investigated group creativity for the development of the pharmaceutical industry.

A surprisingly large number of articles (5) considered the topic of collective creativity in Internet cooperation between individual team members, both organised and randomly selected at one time. Parjanen et al. (2012) discussed the topic of virtual co-creation, and Lee and van Dolen (2015) focused on creating co-creational communities working with each other online. Chanal and Caron-Fasan (2010) based their research on a study case of a crowdsourcing platform, while Martins and Shalley (2011) stud-

ied the impact of demographic differences on online creative work in a short period of time. Bai and Li (2020) offered a rather innovative thesis and concluded that an innovative company of our time should combine all processes, including creativity, with artificial intelligence. The article by Astola et al. (2021) should be considered a summary of all articles on product and process innovation as it focuses on the ethics of all related activities and raises questions about whether creativity could be treated as a collective virtue in organisations.

3. Discussion of the results and proposed future research avenues

The identified publications seem to be just starting the topic of research in collective creativity in the context of management science. They provide examples of certain solutions or models of group behaviour occurring in specific studied environments. The number of articles devoted to the topic of collective creativity is relatively low; however, their analysis method is becoming more complex.

Publications from simple insights and workshops are transformed into statistical analyses and the search for mathematical solutions. Scientific articles about creative cooperation between teams in a virtual environment are also a positive aspect. The barriers to the standard notion of cooperation are broken, and creativity is increasingly more often moved into environments that have nothing to do with artistic expressions.

Changing the paradigms of collaboration, collaboration in a virtual environment and the development of digitisation, and, in particular, artificial intelligence, the business environment invests and develops collaboration components that are based on creative problem-solving. Included below are the major themes identified from the SLR that may provide a starting point for future research in the field of management.

3.1. Measurability of creativity

In further research on the topic, it is worth considering the measurement of the collective creativity factor in, e.g., processes. How to measure which of the two competing teams was better in terms of group creativity? How is distributed the contribution of individual members' creativity? What process factors determined the final success of the project? How do individuals and their group roles affect team creativity? Currently, the team's effectiveness and its level of coping with difficulties are measured based on the speed of task completion or, e.g., the level of income that has been generated by the team. In none of these cases it depended solely on the creative abilities of a given team. The proposed research in this area is the isolation of the components of creativity in group problem-solving processes, an attempt to measure creativity in relation to the identified factors.

3.2. Conscious team management

Team management is mainly focused on managing people who are selected for the team based on the organisation's profile and not the problems they are to solve. It happens for task teams to have outstanding specialists or personalities incorrectly selected for group roles. This often causes conflicts in teams for the leader to handle. What if people were selected for teams in relation to the roles they are supposed to fulfil or the problems they would have to handle? What if teams not only need specialists but also people with appropriate soft skills that help the team overcome problems more effectively?

A research proposal in this area would focus on analysing the appropriate selection of teams by personality type to increase the effectiveness of group creation and finding the optimal team composition for the specific type of problems they must face.

3.3. Next step in achieving general Artificial Intelligence (AI)

Several questions require to be answered in terms of AI: Can AI be included in the process of analysing and evaluating a team's work in terms of creativity? Can AI systems be used to predict the team that will be able to solve a specific problem, and with what probability?

If future research identifies success factors in the creative process, scientists will be able to isolate and measure them, and each problem will be matched with a specific team's skills to ensure the optimal outcome of their work. Will it be possible to teach AI creativity?

This assumption is rather superficial, yet at the same time, it might be the lacking element in achieving intelligence that exceeds human ability.

Conclusions

The paper is a systematic presentation of scientific research on collective creativity in management science and its main themes. This study achieved its main purpose and answered research questions following the principles of a systematic literature review.

The research questions were answered based on descriptive and thematic analyses. The approach of scientists has been captured and defined in publications on collective creativity in management science.

The main contribution of this paper is the focus on the analysis of existing research in the field of collective creativity, limited to management science. The results of the conducted analysis can be greatly relevant to academic and business communities. In the case of academia, the paper develops the current state of knowledge on collective creativity in relation to management science by analysing the scientific papers in this field and identifying the main thematic areas along with future research directions. The article also has considerable practical value. The understanding of the processes involved in initiating and managing collective creativity can provide important support for leaders and team members in the process of creating and developing innovations and solving different problems.

However, the current study had some limitations. The main limitation was the systematic literature review procedure, which implies a very rigorous selection process that may have resulted in excluding some valuable publications on collective creativity. The second limitation was relying solely on academic publications as a reliable source of peer-reviewed academic knowledge without considering other publications (e.g., trade publications, company reports, etc.) that might have shed additional light on the issue of collective creativity.

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