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# INFLUENCE OF CEO CHARACTERISTICS ON INTERNATIONALISATION OF SCIENCE AND TECHNOLOGY PARKS: EVIDENCE FROM POLAND

## ABSTRACT

**Purpose:** Evaluation of the influence of some characteristics describing chief executive officers who manage science and technology parks in Poland on internationalisation of these units.

**Methodology/approach:** The study was carried out in 2022 among 18 from 33 of all science and technology parks (STP) in Poland using a survey method and original questionnaire. In order to examine the internal consistency of the variables describing the factors involved in the internationalisation, the Cronbach's Alpha reliability coeffi-

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cient was calculated. The value of this coefficient was $\alpha$=0.829; the factors selected for the analysis were than consistent. The $\tau$ Kendall's test was employed to determine the strength and direction of relationships between: benefits versus the internationalisation index values, obstacles versus the internationalisation index values, characteristics of the park managers and the internationalisation index values.

**Findings:** The study failed to demonstrate a statistically significant relationship between the assessment of benefits and the value of the internationalisation index, but the parks' managers mainly pointed to the high and very high importance of several benefits. Among the obstacles, shortage of own funds to start/continue activities is of the highest importance. The analysis confirmed a statistically significant dependence between the evaluation of obstacles by managers and the value of the internationalisation index for: lack of external funds to undertake and continue activities in this area, shortage of own funds that could be allocated to such activities, and the lack of knowledge of regulations governing business activities abroad. The study verified a statistically significant relationship between the level of internationalisation and some personal characteristics of the people who manage these parks (age, education, experience working).

**Originality/value:** Considering the importance and complexity of internationalisation suggests that STPs should be offered encouragement and support in this process. Of particular importance is the help to diagnose the formal and legal background of internationalisation efforts. Managers often acquire knowledge about the actual conditions underlying internationalisation only after the process has been launched.

**Keywords***:* science & technology parks, internationalisation, CEO characteristics

## 1. INTRODUCTION

A changeable and dynamic environment is one of the challenges faced by managerial personnel in organisations in which the elaboration of a development strategy requires key managers to set goals that will identify new areas of development for their organisation, and, subsequently, to strive and achieve these goals. The process of internationalisation of an organisation is understood variously, but it can be initiated and pursued even by an organisation operating on the domestic market, although it needs to be intentionally focused on activities of an international character (Pluta-Olearnik, 2012).

The literature dealing with internationalisation provides several approaches to this subject, e.g. evolution, innovation, non-conventional internationalisation or networking models. As highlighted by Klimek (2010), these models basically correspond well to the specific levels of organisations, and how the process of internationalisation in an organisation can proceed. However, when making an attempt to explore internationalisation at the level of an entire organisation, these models are less adequate, with the exception of the network approach. In the network approach, internationalisation means joining a network and strengthening one's engagement in particular networks.

Networking is now becoming increasingly common in the sphere of services, where interorganisational networks are created for service-oriented cooperation between at least two independent entities, which remain mutually dependent in terms of economics and business (Powell et al., 1996).

Internationalisation of a service-providing business is usually considered in the context of characteristics of products and corresponding models of presence on foreign markets (Vandermerwe & Chadwick, 1986). One of specific types of services offered by organisations in the process of internationalisation are consulting services, typical for science and technology parks (Sobol et al., 2024).

In terms of organisation and concept, science and technology parks[1] (STPs) are the most developed type of centres of innovation and entrepreneurship (Allen, 2007; Albahari et al., 2022; Amoroso & Hervàs Soriano, 2019; EARTO, 2015; Lai & Shyu, 2005; Martínez-Vela, 2016; Sanz et al., 2023; Squicciarini, 2008; Unlü, 2022). According to the definition coined by the IASP, a science and technology park is "an organisation managed by specialised professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions". Of importance is the fact that all parks have a managerial team whose task is to implement a strategy conducive to the growth of innovative activities[2]. The chief executive officers (CEO) of a science park play a significant role in this area. In such organisations as science and technology parks, management is more concentrated; hence, the decision-making process often lies in the hands of one person – the chief executive officer. Moreover, the characteristics describing people who manage an organisation successfully operating on a domestic market do not necessarily ensure chances to succeed on foreign markets, which may present completely different requirements and challenges.

The purpose of this article is to evaluate the influence of some characteristics describing chief executive officers who manage science and technology parks in Poland on internationalisation of these STPs.

In pursuit of the main objective of the research in the empirical layer, the following research hypotheses were formulated:

1. There is a monotonic relationship between the evaluation of benefits and the value of the internationalisation index.
2. There is a monotonic relationship between the evaluation of obstacles and the value of the internationalisation index.
3. There is a monotonic relationship between the characteristics of representatives of parks' management and the level of the internationalisation index.

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[1] In different countries and regions across the world, these are known under different names, e.g. technology parks, technopoles, research parks, and science parks (Link & Scott, 2018). For the purpose of this article, the definition proposed by the IASP was adopted, which refers to all the above organisations, while the acronym STP is used as corresponding to all these names. The article does not deal with technology and industrial or industrial parks.

[2] International Association of Science Parks and Areas of Innovation (IASP) from https://www.iasp.ws/our-industry/Definitions (1.05.2024).

The basic research to achieve the purpose of the article and to verify the research hypotheses was carried out using the diagnostic survey method, and the research questionnaire technique was used to collect data. From the subject perspective, the study covered the management of science and technology parks in Poland. In order to interpret the strength and direction of existing relationships between the analysed variables, the results of Kendall's Tau correlation analysis were presented.

## 2. LITERATURE REVIEW

Although internationalisation does not have to be a priority goal in all science parks (Bengtsson & Löwegren, 2001; Lizińska & Sobol, 2023; Zacharewicz et al., 2017), nowadays hardly any STP is exclusively "domestic", completely ignoring the international dimension in its strategies and activities (Lund, 2019). Managers of new and less experienced parks often find inspiration in the operations of other parks, including foreign ones, so as to adjust their projects to the potential of their environment.

It is worth underlying that a strategic decision to internationalise an organisation and the resulting activities to achieve this aim as well as their effectiveness depend on a variety of external factors, for example, the support from business-environment institutions and the properties of the organisation, such as the management model, structure of ownership, phase in the life cycle of the park, and specific characteristics of tenant enterprises (Bigliardi et al., 2006; Cruz-Castro et al., 2015; Guadix et al., 2016; Lizińska et al., 2024; Tomelin et al., 2018).

Proponents of sequential and non-conventional internationalisation models, including the classic Uppsala model and its further developments (Johanson & Wiedersheim-Paul, 1975; Johanson & Vahlne, 1977), as well as other gradual internationalisation models (cf. Bilkey & Tesar, 1977; Cavusgil, 1984; Czinkota et al., 2004; Reid, 1981, etc.), keep the focus of attention on the decision-making process. They also emphasise that all consecutive steps in an organisation's international expansion depend on factors inherent to the organisation itself (especially the knowledge resources and learning capacity in the organisation) and on the personal characteristics of the strategic decision-maker (Reid, 1981).

The evolutionary character of the Uppsala model also applies to a decision to choose new markets in the course of internationalisation. Johanson and Wiedersheim-Paul (1975) attribute this aspect to the occurrence of psychological distance[3], understood as a complex of factors hindering the flow of information between the home market and foreign expansion markets. The main reasons for the distance are: linguistic barriers, cultural and educational differences, different business practices, and the level of development of particular markets (Bradley, 2005; Dow, 2000; Håkanson & Ambos, 2010). The perception of these differences by a strategic decision-maker determines the order of entry on foreign markets, i.e. first the most proximate ones, and

[3] The notion of psychological distance was first proposed by W. Beckermann (1956), and later popularised by the authors of the Uppsala internationalisation model.

then ones further away in terms of both psychic and geographical distance (Beugelsdijk et al., 2017; Conway & Swift, 2000; Dow, 2000; Karaszewski, 2004; Williams & Grégoire, 2015). In this approach, the key variable clarifying the process of international expansion is the "experiential market knowledge" of the decision-maker (Johanson & Vahlne, 1977; Manolova et al., 2002; Reid, 1981).

Meanwhile, attention is drawn to a certain paradox, arising from the ambiguity of answers to the question whether psychological distance does facilitate transborder activity (Chen et al., 2020; Liu et al., 2021; O'Grady & Lane, 1996). For this reason, it is recommended to conduct more in-depth research in order to determine what effect psychological distance has on decisions about internationalisation, and to evaluate the effectiveness of ways in which strategic decision-makers can mitigate the challenges related to psychological distance (Child et al., 2009; Egwuonwu et al., 2020; Kontinen & Ojala, 2010; Liu et al., 2021; Safari & Chetty, 2019; Tihanyi et al., 2005; Yamin & Sinkovics, 2006; Yan et al., 2020).

Internationalisation from the network perspective underlines the role of formal and informal relationships within national and international business settings (networks), and points to the accelerating role of a network (Agndal & Chetty, 2007; Amal & Filho, 2010; Chetty & Stangl, 2010; Coviello & Munro, 1997; Manolova et al., 2010; Lin & Chaney, 2007; Liu et al., 2021; Santos et al., 2021; Sedziniauskiene et al., 2019; Zahoor & Al-Tabbaa, 2021).

In this approach, the ability of a person representing a given organisation to make and maintain relationships with partner entities significantly enhances the organisation's possibilities of establishing cooperation and adds dynamics to international development (Golonka, 2013; Johanson & Mattsson, 1987; 1988, as cited in Kuzel, 2018; Johanson & Vahlne, 1990; Kyvik et al., 2013; Masiello & Izzo, 2019; Musteen et al., 2014; Peces & Trillo, 2023).

The few empirical studies carried out in science and technology parks in Europe provide evidence for benefits gained by these parks in general owing to international activities they undertake, which can be reflected at regional and institutional levels and in tenant companies (Albahari et al., 2017; Albahari et al., 2019; Albahari et al., 2022; Błaszczyk et al., 2018; Cruz-Castro et al., 2015; Edler, 2008; Edler & Ebersberger, 2009; Engelman et al., 2015; Franco et al., 2020; Guadix et al., 2016; IASP, 2024; İmer et al., 2021; Sobol et al., 2023; Tomelin et al., 2018; Zieliński et al., 2014), although the internationalisation process in any science and technology park is not free from certain obstacles and limitations (Berger & Hofer, 2011; Błaszczyk et al., 2018; Charles & Ciampi Stancova, 2015; Cruz-Castro et al., 2015; Edler & Plot, 2007; Edler, 2008; Zacharewicz et al., 2017). At the same time, there are differences among STPs in this area. First of all, internationalisation is not a feature shared by all science and technology parks (Błaszczyk et al., 2023; Lizińska et al., 2024; Lizińska & Sobol, 2023; Lund, 2019; Sobol et al., 2023; Zacharewicz et al., 2017), and the knowledge about determinants of the internationalisation process is still rather poor.

From the perspective of international entrepreneurship, special attention is paid to the role of an entrepreneur-manager in the process of internationalisation. Proponents of this approach highlight "the extraordinary competence constellation" (McDougall

et al., 1994, p. 475) that facilitates the implementation of an internationalisation strategy. The characteristics of CEOs, and more specifically their personality, attitude, skills and abilities, significantly condition the shape and dynamics of an internationalisation process and its outcomes (Wach, 2014).

As the research on internationalisation of organisations gains momentum, and in view of the conditions and success factors of internationalisation processes, studies aiming at identifying the impact of personality traits of top management team (TMT) representatives on internationalisation have gained a rationale. Referring to the higher echelon theory (Hambrick & Mason, 1984), decisions made by key managers to some extent reflect their personalities, attitudes and experience (Harveston et al., 2000; Li, 2016; Peyrefitte et al., 2002).

Basically, the personal traits displayed by managers that can determine the process and outcome of the internationalisation of an organisation fall into:[4]

- objective factors, such as age (Herrmann & Datta, 2005; Saeed & Ziaulhaq, 2019; Tihanyi et al., 2000), sex (Song et al., 2020; Anh Tu et al., 2021), nationality (Vallone et al., 2019); education (Felício et al., 2012; Herrmann & Datta, 2005; Neubert & Van der Krogt, 2017; Saeed & Ziaulhaq, 2019; Tihanyi et al., 2000; Vallone et al., 2019), knowledge of foreign languages (Leonidou et al., 1997; Manolova et al., 2002), international experience and work experience abroad or in organisations dealing with foreign exchange (Bruneel et al., 2010; Cui et al., 2015; Harveston et al., 2000; Hsu et al., 2013; Nielsen, 2010; Lobo, 2019; Roecker & Floriani, 2022; Anh Tu et al., 2021; Vallone et al., 2019);
- subjective factors, such as a manager's perception and beliefs about the gains to be had and obstacles to internationalisation, and risk tolerance (Leonidou et al., 1997; Manolova et al., 2002; Saiyed & Ricard, 2021).

Further, Manolova and co-authors (2002) operationalised the concept of human capital and CEO's characteristics in relation to the internationalisation of organisations according to the following metrics: international business experience, international orientation[5], perception of the environment, and certain demographic metrics, such as age, sex and education of a CEO.

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[4] Based on a thorough review of international subject literature dealing with the relationship between characteristics of CEOs and export activities of companies, C. Leonidou et al. (1997) proposed a division of characteristics of CEOs into objective ones, i.e. these characteristics of managers which are easily observable and quantifiable, and subjective ones, i.e. psychological traits, which are much harder to analyse and measure. The authors add to their classification another dimension, namely general and specific characteristics. General characteristics can have an impact on a manager's activities in both domestic and international environments (e.g. education, risk tolerance). Specific characteristics are related to the requirements met when operating on a foreign market (e.g. knowledge of a foreign language, perception of gains and costs).

[5] This construct brings together the chosen objective and subjective factors relating to strategic decision-makers, such as psychological distance, level of knowledge of foreign languages, willingness to make foreign business trips, and risk tolerance (Dichtl et al., 1990, as cited in Manolova et al., 2002).

Recapitulating, although the importance of personal characteristics of strategic decision-makers is the subject of studies dealing with internationalisation of enterprises, there is a lack of similar investigations aiming to explore the significance of such factors on internationalisation of organisations of a special type, namely science and technology parks, which are now facing the challenge of becoming more international.

## 3. RESEARCH METHOD AND CHARACTERISTICS OF RESPONDENTS

This study was carried out from June to September 2022 and included all science and technology parks (STP) in Poland, according to the database of science parks made available by the Association of Innovation and Entrepreneurship Centres in Poland (*Stowarzyszenie Ośrodków Innowacji i Przedsiębiorczości w Polsce*, SOOIPP). Eighteen copies of a survey questionnaire were filled in and returned, which corresponded to 54.5% of the total number of STPs in Poland. In one case, our request was turned down due to some ongoing organisational matters in the park in question. As answers regarding the internationalisation were not provided by park number 13, the park was not accounted for in the final analysis.

A survey method was employed, and the research technique it relied on was an interview according to a research tool developed by the authors (a direct survey technique).

The survey was addressed to persons (representatives of the management staff in the parks), who have participated in the management process in their organisations, as this choice limits the risk of making mistakes. In order to reduce the measurement error, the respondents chosen for the study had sufficient expert knowledge to ensure that while answering the survey questions, they would not be misguided by any unknown concepts (MacKenzie & Podsakoff, 2012).

The analysed sample of parks' managers was dominated by people aged 35–44 years, who had higher education (Table 1).

**Table 1**
*Characteristics of respondents*

| Characteristics | Number of indications |
|---|---|
| **Age** | |
| 25–34 years | 2 |
| 35–44 years | 20 |
| 45–54 years | 8 |
| 55 and above | 2 |

**Table 2** (continued)

| **Characteristics** | **Number of indications** | | |
|---|---|---|---|
| **Sex** | | | |
| woman | 7 | | |
| man | 10 | | |
| Education | **in Poland** | **abroad** | |
| first-cycle higher education studies | 5 | | |
| second-cycle higher education studies | 13 | | |
| cycle higher education studies | 3 | | |
| Master of Business Administration studies | 6 | | |
| postgraduate studies | 12 | | |
| specialised training and workshops | 14 | 2 | |
| internships and study visits | 13 | 4 | |
| language courses | 10 | 1 | |
| **Level of the knowledge of a foreign language** | | | |
| beginner, pre-intermediate (A1–A2) | 2 | | |
| intermediate, upper-intermediate (B1–B2) | 13 | | |
| advanced, proficient (C1–C2) | 2 | | |
| **Work experience in a managerial position** | **up to 1 year** | **from 1 to 5 years** | **above 5 years** |
| in the current science and technology park | 2 | 6 | 6 |
| in another science and technology park | | 2 | |
| in a public organisation (other than STP) | 1 | 2 | 7 |
| in an international organisation in Poland | | | |
| in an international organisation abroad | | | 1 |
| in a company with foreign capital in Poland | | 1 | |
| in a company abroad | | 1 | |

*Source:* own preparation based on Authors' research.

The survey questionnaire comprised 10 statements regarding the benefits from and obstacles to internationalisation of science and technology parks, which were based on a review of the relevant literature (Błaszczyk et al., 2018; Cruz-Castro et al., 2015; Edler, 2008; Edler & Ebersberger, 2009; Zieliński et al., 2014). The following benefits were identified:

B1 – transferring good practice in order to improve the services offered by the park;
B2 – creating partnerships in order to raise the park's potential;
B3 – creating partnerships in order to raise the potential of tenant companies;
B4 – acquiring funds, for example, by conducting projects together;
B5 – supporting tenant companies in gaining new markets, clients, etc.;
B6 – encouraging companies with foreign capital to set up a branch or affiliated company in the park;
B7 – strengthening the park's brand.

The following issues were included in the analysis of obstacles to the process of internationalisation (based on: Berger & Hofer, 2011; Błaszczyk et al., 2018; Charles & Ciampi Stancova, 2015; Cruz-Castro et al., 2015; Edler & Plot, 2007; Edler, 2008; Zacharewicz et al., 2017):

O1 – lack of financing from external sources to undertake and pursue activities in this area;
O2 – shortage of own funds to undertake/pursue activities in this area;
O3 – the need to redesign the current model of the park's operations;
O4 – the lack of solutions implemented in the international marketing area;
O5 – unwillingness of foreign entities to start cooperation;
O6 – lack of employees with competences necessary in the process of internationalisation of the park;
O7 – lack of knowledge of foreign languages;
O8 – lack of professional experience in international organisations;
O9 – lack of abilities to establish and maintain international business relationships;
O10 – lack of knowledge of the specifics of foreign business culture;
O11 – lack of knowledge of regulations governing conducting business in other countries;
O12 – unwillingness to go on business trips abroad;
O13 – unwillingness to make changes.

The contribution of the above factors was assessed on a scale where the following scores were assigned these values: 1 – very low; 2 – low; 3 – medium; 4 – high; and 5 – very high intensity of a given factor.

One's qualifications and experience in the management of science and technology parks can also have some influence on the perception of factors significant in internationalisation (Bruneel et al., 2010; Cui et al., 2015; Felício et al., 2012; Harveston et al., 2000; Herrmann & Datta, 2005; Hsu et al., 2013; Lobo, 2019; Neubert & Van der Krogt, 2017; Nielsen, 2010; Saeed & Ziaulhaq, 2019; Song et al., 2020;

Tihanyi et al., 2000; Anh Tu et al., 2021; Vallone et al., 2019). The following characteristics of park managers were submitted to the analysis:

C1 – age;
C2 – sex;
C3 – education;
C4 – Master of Business Association (MBA) degree;
C5 – other post-graduate studies;
C6 – expert trainings and workshops;
C7 – internships and study visits;
C8 – language courses;
C9 – level of the knowledge of a foreign language;
C10 – working experience in the park which is one's current place of employment;
C11 – previous working experience in another science park;
C12 – experience in a public organisation (other than a science and technology park);
C13 – experience in a company with foreign capital in Poland;
C14 – experience in a company abroad.

In order to examine the internal consistency of the variables describing the factors involved in the internationalisation of science parks, the Cronbach's Alpha reliability coefficient was calculated. The value of this coefficient for the identified variables submitted to analysis was $\alpha$=0.829. This result proves that the factors selected for the analysis are consistent. The authors are aware that these factors are mutually correlated. However, this is the consequence of the fact that all these factors relate to the same phenomenon. The purpose of the study was not to indicate the relationships between these factors, but to identify their occurrence and to evaluate them in the context of internationalisation (Lizińska et al., 2024)[6]. The $\tau$ Kendall's test was employed to determine the strength and direction of relationships between:

- benefits versus the internationalisation index values of the surveyed parks;
- obstacles versus the internationalisation index values of the parks;
- characteristics of the park managers and the internationalisation index values of the parks.

The Kendall's coefficient value shows both the strength and direction of a relationship, where $\tau > 0$ stands for a positive correlation, $\tau < 0$ means a negative correlation between the analysed characteristics. The $\alpha = 0.050$ significance level was chosen for the research. The preliminary analysis of data was supported by a statistical tool available in Statistica 13 StatSoft Poland.

[6] Internationalisation index was calculated by taking into account three phases of the process and activities undertaken during each phase, including the time perspective: activities undertaken in the past, now or planned for the future – intended to be carried out in the nearest future. This approach allows one to separate the final result from the different number of activities pursued in each of the three phases of a park's internationalisation, and to express the calculated internationalisation index value in the same interval [0;3].

## 4. RESULTS AND DISCUSSION

The results obtained from the assessment of all statements presenting opinions of managers and concerning benefits from the internationalisation of science parks, taking into account the descriptive statistics, lead to the conclusion that the respondents most often indicated the score 4 (the median in six cases was Me = 4). With respect to such benefits as encouraging companies with foreign capital to set up a branch or affiliated business in the park (B6), the score chosen most often was 3 (Me = 3) (Table 2). In this case, too, the highest score given was 4 and the lowest one was 1. Regarding the other potential benefits, the answers given in the survey were more diverse. For example, the lowest value attributed to benefit B5 (supporting tenant companies in gaining new markets or new clients) was 3. The dominant score given by all respondents in relations to benefits (B1–B7) to be had from internationalisation was 4 (Mo = 4).

**Table 2**
*Descriptive statistics of the benefits of STP internationalisation*

| Specification | Median (Me) | Mode (Mo) | Minimum | Maximum |
|---|---|---|---|---|
| B1 – transferring good practice in order to improve the services offered by the park | 4,00 | 4,00 | 2,00 | 5,00 |
| B2 – creating partnerships in order to raise the park's potential | 4,00 | 4,00 | 2,00 | 5,00 |
| B3 – creating partnerships in order to raise the potential of tenant companies | 4,00 | 4,00 | 2,00 | 5,00 |
| B4 – acquiring funds, for example, by conducting projects together | 4,00 | 4,00 | 2,00 | 5,00 |
| B5 – supporting tenant companies in gaining new markets, clients, etc. | 4,00 | 4,00 | 3,00 | 5,00 |
| B6 – encouraging companies with foreign capital to set up a branch or affiliated company in the park | 3,00 | 4,00 | 1,00 | 4,00 |
| B7 – strengthening the park's brand | 4,00 | 4,00 | 1,00 | 5,00 |

*Source:* own preparation based on Authors' research.

In three cases (B4; B5; B7), the value of Kendall's τ coefficient scored below zero, which is why it can be assumed that there is a positive albeit non-significant correlation between individual factors included in the analysis (table 3). In the case of factors B1, B2, B3 and B6, the Kendall's τ coefficient value fell below zero; hence, it can be assumed that there is a negative correlation between the above factors, although again,

it is non-significant. A comparison between the value $p < 0.0001$ with the level of significance $\alpha = 0.050$ demonstrates the lack of a statistically significant monotonic relationship between the evaluation of benefits and the level of internationalisation. These findings allow us to verify positively hypothesis $H_0$ – there is no monotonic relationship between the evaluation of benefits and the value of the internationalisation index, and to refute hypothesis $H_1$ – there is a monotonic relationship between the evaluation of benefits and the value of the internationalisation index.

**Table 3**

*Relationships between benefits and the internationalisation index of the studied STPs (Kendall's Tau correlation)*

| Specification | Kendall's Tau correlation coefficient |
|---|---|
| B1 – transferring good practice in order to improve the services offered by the park | -0,075 |
| B2 – creating partnerships in order to raise the park's potential | -0,034 |
| B3 – creating partnerships in order to raise the potential of tenant companies | -0,262 |
| B4 – acquiring funds, for example, by conducting projects together | 0,260 |
| B5 – supporting tenant companies in gaining new markets, clients, etc. | 0,150 |
| B6 – encouraging companies with foreign capital to set up a branch or affiliated company in the park | -0,045 |
| B7 – strengthening the park's brand | 0,181 |

*Note:* *correlation significant at the 0.05 level.

*Source:* own preparation based on Authors' research.

Among the obstacles to internationalisation, the highest score (4.0) was most often assigned by the respondents to factor O2 – shortage of own funds to start/continue internationalisation activities (Me – 4; Mo – 4) (Table 4).

**Table 4**
*Descriptive statistics assessing obstacles to STP internationalisation*

| Specification | Median (Me) | Mode (Mo) | Minimum | Maximum |
|---|---|---|---|---|
| O1 – lack of financing from external sources to undertake and pursue activities in this area | 3,0 | 1,0 | 1,0 | 5,0 |
| O2 – shortage of own funds to undertake/ pursue activities in this area | 4,0 | 4,0 | 1,0 | 5,0 |
| O3 – the need to redesign the current model of the park's operations | 2,0 | 2,0 | 1,0 | 5,0 |
| O4 – the lack of solutions implemented in the international marketing area | 3,0 | 1,0 | 1,0 | 5,0 |
| O5 – unwillingness of foreign entities to start cooperation | 2,0 | 1,0 | 1,0 | 4,0 |
| O6 – lack of employees with competences necessary in the process of internationalisation of the park | 3,0 | 1,0 | 1,0 | 4,0 |
| O7 – lack of knowledge of foreign languages | 2,0 | 1,0 | 1,0 | 4,0 |
| O8 – lack of professional experience in international organisations | 3,0 | 4,0 | 1,0 | 4,0 |
| O9 – lack of abilities to establish and maintain international business relationships | 2,0 | 1,0 | 1,0 | 4,0 |
| O10 – lack of knowledge of the specifics of foreign business culture | 2,0 | 3,0 | 1,0 | 5,0 |
| O11 – lack of knowledge of regulations governing conducting business in other countries | 3,0 | 3,0 | 1,0 | 5,0 |
| O12 – unwillingness to go on business trips abroad | 2,0 | 2,0 | 1,0 | 3,0 |
| O13 – unwillingness to make changes | 2,0 | 2,0 | 1,0 | 4,0 |

*Source:* own preparation based on Authors' research.

According to the respondents, the obstacles with the highest scores, i.e. suggesting these factors have very low or low significance, were the following: O5 – unwillingness of foreign entities to start cooperation (Me – 2.0; Mo – 1.0); O7 – lack of knowledge of foreign languages (Me – 2.0; Mo – 1.0) and O9 – lack of abilities to make and maintain international business relationships (Me – 2.0; Mo – 1.0). Worth noticing is the fact that in as many as six cases considered obstacles to internationalisation, the dominant score was 1, meaning that these factors bear very little importance (O1, O4, O5, O6, O7, O9). The minimum score in all cases was 1 (very little importance). As for the maximum score, the lowest scores were assigned to factor O12 – unwillingness to make business trips abroad (score 3 – moderate importance). The obstacles assessed as having very high significance (maximum score – 5) were: O1 – lack of financing from external sources to undertake and pursue activities in this area; O2 – shortage of own funds to undertake/pursue activities in this area; O3 – the need to redesign the current model of the park's operations; O4 – the lack of solutions implemented in the international marketing area; O10 – lack of knowledge of the specifics of foreign business culture; and O11 – lack of knowledge of regulations governing conducting business in other countries.

As regards the correlations between the evaluation of obstacles to internationalisation and the internationalisation index, it is possible to conclude that there is a statistically significant monotonic correlation between the evaluation of three obstacles (O1, O2, O11) versus the value of the internationalisation index (Table 5). This enables us to discard hypothesis $H_0$ – there is no monotonic relationship between the evaluation of obstacles and the value of the internationalisation index, in favour of hypothesis $H_1$ – there is a monotonic relationship between the evaluation of obstacles and the value of the internationalisation index in the cases of obstacles: O1 – lack of financing from external sources to undertake and pursue activities in this area; O2 – shortage of own funds to undertake/pursue activities in this area; and O11 – lack of knowledge of regulations governing conducting business in other countries. In these three cases, the Kendall's $\tau$ coefficient reached values above zero; hence, it can be assumed that there is a positive correlation between these individual factors included in the analysis. In the other cases, the Kendall's $\tau$ coefficient also achieved values above zero, and, therefore, it can be assumed that there is a positive albeit non-significant correlation between all the factors submitted to analysis.

**Table 5**
*Relationships between obstacles and the internationalisation index of the studied STPs (Kendall's Tau correlation)*

| Specification | Kendall's Tau correlation coefficient |
|---|---|
| O1 – lack of financing from external sources to undertake and pursue activities in this area | 0,590* |
| O2 – shortage of own funds to undertake/pursue activities in this area | 0,614* |
| O3 – the need to redesign the current model of the park's operations | 0,169 |
| O4 – the lack of solutions implemented in the international marketing area | 0,342 |
| O5 – unwillingness of foreign entities to start cooperation | 0,190 |
| O6 – lack of employees with competences necessary in the process of internationalisation of the park | 0,341 |
| O7 – lack of knowledge of foreign languages | 0,232 |
| O8 – lack of professional experience in international organisations | 0,329 |
| O9 – lack of abilities to establish and maintain international business relationships | 0,086 |
| O10 – lack of knowledge of the specifics of foreign business culture | 0,170 |
| O11 – lack of knowledge of regulations governing conducting business in other countries | 0,380* |
| O12 – unwillingness to go on business trips abroad | 0,080 |
| O13 – unwillingness to make changes | 0,166 |

*Note:* *correlation significant at the 0.05 level.

*Source:* own preparation based on Authors' research.

When analysing the relationships between the characteristics of the management and the internationalisation index of the science parks, a statistically significant correlation was determined between five characteristics (C1, C3, C11, C13, C14) and the value of internationalisation in three cases (Table 6).

**Table 6**

*Relationships between the characteristics of management representatives and the internationalisation index of the studied STPs (Kendall's Tau correlation)*

| Specification | Kendall's Tau correlation coefficient |
|---|---|
| C1 – age | 0,512* |
| C2 – sex | -0,169 |
| C3 – education | -0,353* |
| C4 – Master of Business Association (MBA) degree | 0,000 |
| C5 – other post-graduate studies | -0,155 |
| C6 – expert trainings and workshops | 0,252 |
| C7 – internships and study visits | 0,030 |
| C8 – language courses | 0,222 |
| C9 – level of the knowledge of a foreign language | 0,102 |
| C10 – working experience in the park which is one's current place of employment | -0,011 |
| C11 – previous working experience in another science park | 0,398* |
| C12 – experience in a public organisation (other than a science and technology park) | -0,047 |
| C13 – experience in a company with foreign capital in Poland | 0,355* |
| C14 – experience in a company abroad | 0,355* |

*Note:* *correlation significant at the 0.05 level.

*Source:* own preparation based on Authors' research.

The above findings enable us to discard hypothesis $H_0$ – there is no monotonic relationship between the characteristics of representatives of parks' management and the level of the internationalisation index, and to confirm hypothesis $H_1$ – there is a monotonic relationship between the characteristics of science parks' managers and the value of the internationalisation index for the following characteristics: C1 – age; C3 – education; C11 – experience working in another science and technology park; C13 – experience working in a company with foreign capital in Poland; and C14 – experience working in a company abroad. In one case (C3 – education), the Kendall $\tau$ coefficient assumed values below zero, which means that there is a negative correlation between the individual factors submitted to analysis. A negative correlation was also deter-

mined between the characteristics C2, C10 and C12 versus the internationalisation index, although, in these cases, the correlations were not significant. As for characteristic C4 – having a Master of Business Administration (MBA) degree, no correlation with the internationalisation index was found (the Kendall $\tau$ coefficient = 0.000).

Based on the results of the research concerning benefits from and obstacles to internationalisation of science and technology parks, it can be confirmed that the parks' CEOs more readily identified gains from this process than obstacles. As suggested by other scholars (Błaszczyk et al., 2018; Cruz-Castro et al., 2015; Edler, 2008; Edler & Ebersberger, 2009; Zieliński et al., 2014), what drives managers towards internationalisation is most often access to a foreign knowledge database and cooperating partners, as well as the strengthening of the domestic consumer base and the park's own brand.

The research results point to varied weights of the identified obstacles to internationalisation. These obstacles may have different sources of origin. The literature on this subject and research results reported by other authors (Berger & Hofer, 2011; Charles & Ciampi Stancova, 2015: Cruz-Castro et al., 2015; Edler & Plot, 2007; Edler, 2008; Zacharewicz et al., 2017) distinguish two main groups of obstacles. External barriers refer to various factors in the macroenvironment that can stifle the park's potential to engage in international activities, such as political, legal and fiscal aspects of the target foreign market, lack of a cooperation framework on the international level and specific characteristics of one's domestic market. Internal obstacles, on the other hand, are related to the specific features and potential of a science park itself for internationalisation, including the mission, degree of autonomy, strategic orientation, lack of sufficient capabilities and resources or high costs.

It can therefore be concluded that the results of our study and those achieved by other researchers indicate that one of the important aspects of internationalisation is the question of funds, which have been implicated as both potential benefits and obstacles.

The research results enabled us to identify statistically significant personality traits of CEOs managing science and technology parks that determine the course of internationalisation (age, education, experience working in another STP, experience working in a company with foreign capital in Poland and/or abroad). Quite a strong impact (although not unambiguous) on internationalisation attributed to demographic characteristics has been implied by research results obtained by other authors. Some studies suggest that a lower average age (Herrmann & Datta, 2005; Tihanyi et al., 2000), elite higher education (Felício et al., 2012; Herrmann & Datta, 2005; Neubert & Van der Krogt, 2017; Saeed & Ziaulhaq, 2019; Tihanyi et al., 2000; Vallone et al., 2019), ethnic diversity (Vallone et al., 2019) and gender diversity (Song et al., 2020) have positive effects on internationalisation, and help strategic decision-makers to cope with the complexity of internationalisation, which leads to greater intensity of international markets and operations and a more diverse choice of countries chosen for expansion (Vallone et al., 2019). However, other studies conclude that age has an insignificant effect on internationalisation (Saeed & Ziaulhaq, 2019), and the presence of women on key managerial positions can inhibit this process (Anh Tu et al., 2021).

Furthermore, other studies provide evidence that the international work experience and seniority of top managers generally favour internationalisation (Bruneel et al., 2010; Cui et al., 2015; Harveston et al., 2000; Hsu et al., 2013; Nielsen, 2010; Lobo, 2019; Anh Tu et al., 2021; Vallone et al., 2019) and can improve chances of new businesses to survive (Freixanet & Renart, 2020), but this relationship can follow a linear course as well as an inverted U-curve (Li, 2018; Mohr & Batsakis, 2019). Business experience gained abroad promotes creating networks of contacts, gaining the skills of communicating in foreign languages, and learning by experience. Another significant gain is the development of soft skills related to the ability to understand a different culture. It is also observed that international work experience of managers is conducive to the growth of culture intelligence, which propels early internationalisation by reinforcing the managers' international orientation, who are also able to spot opportunities on international markets more rapidly and to accelerate internationalisation (Roecker & Floriani, 2022).

## 5. CONCLUSIONS

According to the research results, it emerges that internationalisation of science and technology parks is an important contributor to their development. The CEOs of these organisations were more inclined to mention benefits than obstacles when referring to this process. While the survey failed to demonstrate a statistically significant relationship between the CEOs' assessment of benefits and the value of the internationalisation index, the parks' managers mainly pointed to the high and very high importance of particular benefits. Particularly high importance was attributed to such benefits as raising funds, for example, through joint projects, supporting tenant enterprises in gaining new markets, clients, etc., and strengthening the park's brand.

Among the obstacles associated with internationalisation, the highest importance was most often attached to the shortage of own funds to start/continue activities in this area. The analysis confirmed a statistically significant dependence between the evaluation of obstacles by managers and the value of the internationalisation index for the following factors: lack of external funds to undertake and continue activities in this area, shortage of own funds that could be allocated to such activities, and the lack of knowledge of regulations governing business activities abroad. The importance of a barrier to internationalisation due to the lack of financial resources is confirmed by the literature on this subject.

This study also verified a statistically significant relationship between the level of internationalisation of science parks and some personal characteristics of the people who manage these parks, such as age, education, experience working in another park, experience working in a company with foreign capital in Poland, and experience working in a company abroad. The importance of these factors has also been evidenced by other authors, although some of the characteristics (e.g. age or sex) are given opposite significance in the process of internationalisation.

Considering differences among the science and technology parks operating in Poland in terms of their internationalisation, identified benefits and obstacles related to this process, dependencies shown between internationalisation and some characteristics of the parks' managerial personnel, as well as the importance and diversity of the internationalisation process mentioned by other authors, in addition to the ambiguity of weights attached to some determinants, it is necessary to continue more in-depth studies in order to diagnose the factors and mechanism involved in an efficient and effective performance of the internationalisation process in science parks. The limited scope of such studies arising from a relatively small number of all science parks as well as the chosen research sample also implicates the need to broaden future studies on a national and international scale.

The results of our study, conducted on a group embracing over 50% of all science and technology parks in Poland, and the outcome of research performed by other authors dealing with the importance and complexity of internationalisation and its pursuit suggest that science and technology parks should be offered encouragement and support in this process. Of particular importance is the help to diagnose the formal and legal background of internationalisation efforts. Managers often acquire knowledge about the actual conditions underlying internationalisation only after the process has been launched.

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## REFERENCES

Agndal, H., & Chetty, S. (2007). The impact of relationships on changes in internationalisation strategies of SMEs. *European Journal of Marketing*, *41*(11/12), 1449–1474. https://doi.org/10.1108/03090560710821251

Albahari, A., Barge-Gil, A., Pérez-Canto, S., & Landoni, P. (2022). The effect of science and technology parks on tenant firms: a literature review. *The Journal of Technology Transfer*, *48*(4), 1489–1531. https://doi.org/10.1007/s10961-022-09949-7

Albahari, A., Klofsten, M., & Rubio-Romero, J. C. (2019). Science and technology parks: a study of value creation for park tenants. *Journal of Technology Transfer*, *44*(4), 1256–1272. https://doi.org/10.1007/s10961-018-9661-9

Albahari, A., Pérez-Canto, S., Barge-Gil, A., & Modrego, A. (2017). Technology parks versus science parks: does the university make the difference? *Technological Forecasting and Social Change*, *116*, 13–28. https://doi.org/10.1016/j.techfore.2016.11.012

Allen, J. (2007). *Third generation science parks*. Manchester: Manchester Science Parks Ltd.

Amal, M., & Filho, A. (2010). Internationalization of small- and medium-sized enterprises: a multi case study. *European Business Review*, *22*(6), 608–623. https://doi.org/10.1108/09555341011082916

Amoroso, S., & Hervás Soriano, F. (2019). An international perspective on science and technology parks. In S. Amoroso, A. N. Link & M. Wright (Eds.), *Science and Technology Parks and Regional Economic Development: An International Perspective* (pp. 1–8). Palgrave Macmillan. https://doi.org/10.1007/978-3-030–30963-3_1

Anh Tu, P., Khuong Ninh, L., & Thuy Huong, D. (2021). Internationalization and Turkish Manufacturing Firm Performance – Does Managerial Personality Matter? In N. M. Alsharari (Ed.), *Accounting and Finance Innovations.* IntechOpen. https://doi.org/10.5772/intechopen.97432

Beckerman, W. (1956). Distance and the Pattern of Intra-European Trade. *The Review of Economics and Statistics*, *38*(1), 31–40. https://doi.org/10.2307/1925556

Berger, M. & Hofer, R. (2011). The internationalisation of research technology organisations (RTO) – conceptual notions and illustrative examples from European RTOs in China. *Science Technology Society*, *16*(1), 99–122. https://doi.org/10.1177/097172181001600106

Beugelsdijk, S., Kostova, T., Kunst, V., Spadafora, E., & Essen, M. (2017). Cultural Distance and Firm Internationalization: A Meta-Analytical Review and Theoretical Implications. *Journal of Management*, *44*, 89–130. https://doi.org/10.1177/0149206317729027

Bilkey, W. J., & Tesar, G. (1977). The Export Behavior of Smaller-Sized Wisconsin Manufacturing Firms. *Journal of International Business Studies*, *8*(1), 93–98. https://doi.org/10.1057/palgrave.jibs.8490783

Bengtsson, L., & Löwegren, M. (2001). *Internationalization in nordic and baltic science parks. A report on park activities and firm needs*. Lund University Press.

Bigliardi, B., Dormio, A. I., Nosella, A., & Petroni G. (2006). Assessing science parks' performances: directions from selected Italian case studies. *Technovation*, *26*(4), 489–505. https://doi.org/10.1016/j.technovation.2005.01.002

Błaszczyk, M., Kwieciński, L., Stawicka, M., & Wróblewski, M. (2018). *Parki technologiczne jako element regionalnej polityki wsparcia internacjonalizacji innowacyjnych firm z sektora MŚP*. CeDeWu.

Błaszczyk, M., Olszewska, K. M., & Wróblewski, M. (2023). Internationalisation of firms in the digital economy. Analysis of tenants of Polish technology parks. *European Business Review*, *35*(2), 223–238. https://doi.org/10.1108/ebr-12-2021-0266

Bradley F. (2005). *International Marketing Strategy*. Harlow: Pearson Education Ltd.

Bruneel, J., Yli-Renko, H., & Clarysse, B. (2010). Learning from experience and learning from others: how congenital and interorganizational learning substitute for experiential learning in young firm internationalization. *Strategic Entrepreneurship Journal*, *4*(2), 164–182. https://doi.org/10.1002/sej.89

Cavusgil, S. T. (1984). Differences among exporting firms based on their degree of internationalization. *Journal of Business Research*, *12*(2), 195–208. https://doi.org/10.1016/0148-2963(84)90006-7

Charles, D., & Ciampi Stancova, K. (2015). Research and technology organisations and smart specialisation. *S3 Policy Brief Series, 15*. European Commission, Joint Research Centre, Institute for prospective Technological Studies, Spain.

Chen, C., Zhan, Y., Yi, C., Li, X., & Wu, Y. J. (2020). Psychic distance and outward foreign direct investment: the moderating effect of firm heterogeneity. *Management Decision, 58*(7), 1497–1515. https://doi.org/10.1108/md-06-2019-0731

Chetty, S. K., & Stangl, L. M. (2010). Internationalization and innovation in a network relationship context. *European Journal of Marketing*, *44*(11/12), 1725–1743. https://doi.org/10.1108/03090561011079855

Child, J., Rodrigues, S. B., & Frynas, J. G. (2009). Psychic Distance, its Impact and Coping Modes. *Management International Review*, *49*(2), 199–224. https://doi.org/10.1007/s11575-008-0136-3

Conway, T., & Swift, J. S. (2000). International relationship marketing – The importance of psychic distance. *European Journal of Marketing*, *34*(11/12), 1391–1414. https://doi.org/10.1108/03090560010348641

Coviello, N., & Munro, H. (1997). Network relationships and the internationalisation process of small software firms. *International Business Review*, *6*(4), 361–386. https://doi.org/10.1016/s0969-5931(97)00010-3

Cruz-Castro, L., Jonkers, K., & Sanz-Menéndez, L. (2015). The internationalisation of research institutes. In L. Wedlin & M. Nedeva (Eds.). *Towards European science. Dynamics and policy of an evolving European research space* (pp. 175–198). Cheltenham: Edward Elgar. https://doi.org/10.4337/9781782545514

Cui, L., Li, Y., Meyer, K. E., & Li, Z. (2014). Leadership Experience Meets Ownership Structure: Returnee Managers and Internationalization of Emerging Economy Firms. *Management International Review*, *55*(3), 355–387. https://doi.org/10.1007/s11575-014-0221-8

Czinkota, M. R., Ronkainen, I. A., & Otiz-Buonafina, M. (2004). *The Export Marketing Imperative*. Thomson.

Dow, D. (2000). A Note on Psychological Distance and Export Market Selection. *Journal of International Marketing*, *8*(1), 51–64. https://doi.org/10.1509/jimk.8.1.51.19563

EARTO. (2015, March 15). *EU R&I policy & data-driven decision making. Knowing your innovation ecosystem actors: data on European RTOs*. https://www.earto.eu/wp-content/uploads/EARTO_Paper_-_Data_on_European_RTOs_-_Final_01.pdf

Edler, J. (2008). Creative internationalization: widening the perspectives on analysis and policy regarding international R&D activities. *The Journal of Technology Transfer*, *33*(4), 337–352. https://doi.org/10.1007/s10961-007-9051-1

Edler, J., & Ebersberger, B. (2009, October 2–3). Internationalization of public research organizations. Context, strategies and effects. *The Atlanta Conference on Science and Innovation Policy*, Atlanta. https://smartech.gatech.edu/handle/1853/32320

Edler, J., & Polt, W. (2007). International industrial R&D—policy challenges: introduction to the special issue. *Journal of Technology Transfer*, *33*(4), 331–336. https://doi.org/10.1007/s10961-007-9052-0

Engelman, R., Fracasso, E. M., & Zen, A. C. (2015). The impact of the incubator on the internationalization of firms. *Journal of Technology Mangement & Innovation*, *10*(1), 29–39. https://doi.org/10.4067/S0718–27242015000100003

Egwuonwu, A., Sarpong, D., & Mordi, C. (2020). Cultural intelligence and managerial relational performance: a resource advantage perspective. *Journal of Intellectual Capital*, *23*(3), 617–638. https://doi.org/10.1108/jic-07-2020-0243

Felício, J. A., Caldeirinha, V. R., & Rodrigues, R. (2012). Global mindset and the internationalization of small firms: The importance of the characteristics of entrepreneurs. *International Entrepreneurship and Management Journal*, *8*(4), 467–485. https://doi.org/10.1007/s11365-012-0232-5

Franco, M., Haase, H., & Rodini, A. (2020). The Role of Incubators in the Internationalization Process of Incubated SMEs: A Perspective of International Cooperation. *Global Business Review*, *24*(3), 488–509. https://doi.org/10.1177/0972150920919381

Freixanet, J., & Renart, G. (2020). A capabilities perspective on the joint effects of internationalization time, speed, geographic scope and managers' competencies on SME survival. *Journal of World Business*, *55*(6), 101110. https://doi.org/10.1016/j.jwb.2020.101110

Golonka, M. (2014). Współpraca międzyorganizacyjna jako strategia umiędzynarodowienia przedsiębiorstw. In A. K. Koźmiński & D. Latusek-Jurczak (Eds.), *Relacje międzyorganizacyjne w naukach o zarządzaniu* (pp. 440–478). Wolters Kluwer.

Guadix, J., Carrillo-Castrillo, J., Onieva, L., & Navascués, J. (2016). Success variables in science and technology parks. *Journal of Business Research*, *69*(11), 4870–4875. https://doi.org/10.1016/j.jbusres.2016.04.045

Håkanson, L., & Ambos, B. (2010). The antecedents of psychic distance. *Journal of International Management*, *16*(3), 195–210. https://doi.org/10.1016/j.intman.2010.06.001

Hambrick, D. C., & Mason, P. A. (1984). Upper echelons: The organization as a reflection of its top managers. *The Academy of Management Review*, *9*(2), 193–206. https://doi.org/10.2307/258434

Harveston, P., Kedia, B., & Davis, P. (2000). Internationalization of Born Global and Gradual Globalizing Firms: The Impact of the Manager. *Advances in Competitiveness Research*, *8*(92), 278–286.

Herrmann, P., & Datta, D. K. (2005). Relationships between Top Management Team Characteristics and International Diversification: an Empirical Investigation. *British Journal of Management*, *16*(1), 69–78. https://doi.org/10.1111/j.1467-8551.2005.00429.x

Hsu, W.-T., Chen, H.-L., & Cheng, C.-Y. (2013). Internationalization and firm performance of SMEs: The moderating effects of CEO attributes. *Journal of World Business*, *48*(1), 1–12. https://doi.org/10.1016/j.jwb.2012.06.001

IASP. (2024). *Global Survey 2024: Science and technology parks and innovation districts, areas of innovation and other organized innovation spaces throughout the world*. International Association of Science Parks and Areas of Innovation. https://www.iasp.ws/our-industry/Definitions

İmer, S. T., Öktem, M. K., & Kaskatı, O. T. (2021). How to increase the internationalization capacity of science & technology park firms: some lessons for the managers. *Sosyoekonomi*, *29*(47), 43–58. https://doi.org/10.17233/sosyoekonomi.2021.01.02

Johanson, J., & Vahlne, J. E. (1990). The mechanism of internationalization. *International Marketing Review*, *7*(4), 11–24. https://doi.org/10.1108/02651339010137414

Johanson, J., & Vahlne, J. E. (1977). The Internationalization Process of the Firm – A Model of Knowledge Development and Increasing Foreign Market Commitments. *Journal of International Business Studies*, *8*(1), 23–32. https://doi.org/10.1057/palgrave.jibs.8490676

Johanson, J., & Wiedersheim-Paul, F. (1975). The Internationalization of the Firm – Four Swedish Cases, *The Journal of Management Studies*, *12*(3), 305–323. https://doi.org/10.1111/j.1467-6486.1975.tb00514.x

Karaszewski, W. (2004). *Bezpośrednie inwestycje zagraniczne. Polska na tle świata*. TNOiK.

Klimek, A. (2010). Internacjonalizacja polskich instytucji finansowych. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu. Ekonomia*, *12*(149), 164–170.

Kontinen, T., & Ojala, A. (2010). Internationalization pathways of family SMEs: psychic distance as a focal point. *Journal of Small Business and Enterprise Development*, *17*(3), 437–454. https://doi.org/10.1108/14626001011068725

Kuzel, M. (2018). *Kapitał intelektualny organizacji w procesie polskich przedsiębiorstw i inwestorów zagranicznych*. UMK.

Kyvik, O., Saris, W., Bonet, E., & Felício, J. A. (2013). The internationalization of small firms: The relationship between the global mindset and firms' internationalization behavior. *Journal of International Entrepreneurship*, *11*(2), 172–195. https://doi.org/10.1007/s10843-013-0105-1

Lai, H.-C., & Shyu, J. Z. (2005). A comparison of innovation capacity at science parks across the Taiwan strait: the case of Zhangjiang high-tech park and Hsinchu science-based industrial park. *Technovation*, *25*(7), 805–813. https://doi.org/10.1016/j.technovation. 2003.11.004

Leonidou, L. C., Katsikeas, C. S., & Piercy, N. F. (1998). Identifying Managerial Influences on Exporting: Past Research and Future Directions. *Journal of International Marketing*, *6*(2), 74–102. https://doi.org/10.1177/1069031X9800600209

Li, P.-Y. (2016). The impact of the top management teams' knowledge and experience on strategic decisions and performance. *Journal of Management & Organization*, *23*(4), 504–523. https://doi.org/10.1017/jmo.2016.24

Li, P-Y. (2018). Top management team characteristics and firm internationalization: The moderating role of the size of middle managers. *International Business Review*, *27*, 125–138. https://doi.org/10.1016/J.IBUSREV.2017.05.011

Lin, K. H., & Chaney, I. (2007). The Influence of Domestic Interfirm Networks on the Internationalization Process of Taiwanese SMEs. *Asia Pacific Business Review*, *13*(4), 565–583. https://doi.org/10.1080/13602380701345499

Link, A. N., & Scott, J. T. (2018). *Geographic Proximity and Science Parks*. Oxford Research Encyclopedia of Economics and Finance. https://doi.org/10.1093/acrefore/9780190625979.013.272

Liu, L., Henley, J., & Mousavi, M. M. (2021). Foreign interfirm networks and internationalization: Evidence from sub-Saharan Africa. *Journal of International Management*, *27*(1), 100810. https://doi.org/10.1016/j.intman.2020.100810.

Lizińska, W., & Sobol, D. (2023). Internationalization of science and technology parks in Poland versus their development phase. In A. P. Balcerzak, & I. Pietryka (Eds.), *12th International Conference on Applied Economics Contemporary Issues in Economy*, *Abstract book* (p. 98). Instytut Badań Gospodarczych. https://doi.org/10.24136/eep.abs.2023.1

Lizińska, W., Sobol, D., & Rūtelionė, A. (2024). Internationalisation of science and technology parks and the stage of their life: The Central European perspective. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, *19*(2), 549–590. https://doi.org/10.24136/eq.3085

Lobo, C. A., Maldonado, I., & Pinho, C. (2019). International New Ventures and Early Internationalization – Networks And Skills As Enhancing Agents. In M. Özşahin, & T. Hıdırlar (Eds.), *New Challenges in Leadership and Technology Management* (pp. 460–472). Future Academy. https://doi.org/10.15405/epsbs.2019.01.02.39

Lund, E. (2019). The Strategic Choices That Science and Technology Parks Must Make. In S. Amoroso, A. N. Link, & M. Wright (Eds.), *Science and Technology Parks and Regional Economic Development: An International Perspective* (pp. 9–24). Palgrave Macmillan. https://doi.org/10.1007/978-3-030–30963-3_2

MacKenzie, S. B., & Podsakoff, P. M. (2012). Common method bias in marketing: Causes, mechanisms, and procedural remedies. *Journal of Retailing*, *88*(4), 542–555. https://doi.org/10.1016/j.jretai.2012.08.001

Manolova, T. S., Brush, C. G., Edelman, L. F., & Greene, P. G. (2002). Internationalization of Small Firms. *International Small Business Journal: Researching Entrepreneurship*, *20*(1), 9–31. https://doi.org/10.1177/0266242602201003

Manolova, T. S., Manev, I. M., & Gyoshev, B. S. (2010). In good company: The role of personal and inter-firm networks for new-venture internationalization in a transition economy. *Journal of World Business*, *45*(3), 257–265. https://doi.org/10.1016/j.jwb.2009.09.004

Martínez-Vela, C. (2016). Benchmarking research and technology organizations (RTOs): a comparative analysis. *MIT-IPC Industrial Performance Center, Working Paper Series*, 16-005, 1–23. https://ipc.mit.edu/sites/default/files/2019-01/16-005.pdf

Masiello, B., & Izzo, F. (2019). Interpersonal Social Networks and Internationalization of Traditional SMEs. *Journal of Small Business Management, 57*(2), 658–691. https://doi.org/10.1111/jsbm.12536

McDougall, P., Shane, S., & Oviatt, B. (1994). Explaining the formation of international new ventures: the limits of theories from international business research. *Journal of Business Venturing*, *9*(6), 469–487. https://doi.org/10.1016/0883-9026(94)90017-5

Mohr, A., & Batsakis, G. (2018). The Contingent Effect of TMT International Experience on Firms' Internationalization Speed. *British Journal of Management*, *30*(4), 869–887. https://doi.org/10.1111/1467-8551.12293

Musteen, M., Datta, D. K., & Butts, M. M. (2014). Do International Networks and Foreign Market Knowledge Facilitate SME Internationalization? Evidence from the Czech Republic. *Entrepreneurship Theory and Practice*, *38*(4), 749–774. https://doi.org/10.1111/etap.12025

Neubert, M., & Van Der Krogt, A. (2017). Lean Internationalisation of High-Tech Firms. *International Journal of Teaching and Case Studies*, *8*(2–3), 133–150. https://doi.org/10.1504/IJTCS.2017.086679

Nielsen, S. (2010). Top Management Team Internationalization and Firm Performance. *Management International Review*, *50*(2), 185–206. https://doi.org/10.1007/s11575-010-0029-0

O'Grady, S., & Lane, H. W. (1996). The Psychic Distance Paradox. *Journal of International Business Studies*, *27*(2), 309–333. https://doi.org/10.1057/palgrave.jibs.8490137

Peces, M. del C., & Trillo, M. A. (2023). Relational Capital in the Technology Sector: An International Strategic Model. *Sustainability*, *15*(5), 4351. https://doi.org/10.3390/su15054351

Penrose, E. (1959). *The theory of the growth of the firm*. Wiley.

Peyrefitte, J., Fadil, P., & Thomas, A. (2002). The Influence of Managerial Experiences on Large Firm Internationalization. *The International Journal of Management*, *19*(4), 95–502.

Pluta-Olearnik, M. (2012). Orientacja międzynarodowa w strategii instytucji naukowych i badawczych. *Prace Instytutu Lotnictwa*, *4*(225), 41–53. https://doi.org/10.5604/05096669.1077680

Powell, W. W., Koput, K. W., & Smith-Doerr, L. (1996). Inter-organizational collaboration and the locus of innovation: Networks of learning in biotechnology. *Administrative Science Quarterly*, *41*, 116–145. https://doi.org/10.2307/2393988

Reid, S. D. (1981). The Decision-Maker and Export Entry and Expansion. *Journal of International Business Studies*, *12*(2), 101–112. https://doi.org/10.1057/palgrave.jibs.8490581

Roecker, R., & Floriani, D. E. (2022). Cultural intelligence, international experience and early internationalization: An essay on connecting constructs. *Contextus – Revista Contemporânea de Economia e Gestão*, *20*, 112–124. https://doi.org/10.19094/contextus.2022.72806

Saeed, A., & Ziaulhaq, H. M. (2019). The Impact of CEO Characteristics on the Internationalization of SMEs: Evidence from the UK. *Canadian Journal of Administrative Sciences*, *36*(3), 322–335. https://doi.org/10.1002/cjas.1497

Safari, A., & Chetty, S. (2019). Multilevel psychic distance and its impact on SME internationalization. *International Business Review*, *28*(4), 754–765. https://doi.org/10.1016/j.ibusrev.2019.03.001

Saiyed, A. A., & Ricard, A. (2021). Entrepreneurial characteristics and internationalisation of new ventures: a study of cognitive factors. *Journal for Global Business Advancement*, *14*(2), 166. https://doi.org/10.1504/jgba.2021.115772

Santos, J., Mota, J., & Baptista, C. (2021). The role of a strategic net in international entrepreneurship: overcoming the liabilities of foreignness and outsidership in the context of the Pharma industry. *International Entrepreneurship and Management Journal*, *17*, 63–82. https://doi.org/10.1007/s11365-019-00615-3

Sanz, L., Klofsten, M., Van Dinteren, J., & Jansen, P. (2023). *A Taxonomy of Organised Innovation Spaces.* Publications Office of the European Union.

Sedziniauskiene, R., Sekliuckiene, J., & Zucchella, A. (2019). Networks' Impact on the Entrepreneurial Internationalization: A Literature Review and Research Agenda. *Management International Review*, *59*(5), 779–823. https://doi.org/10.1007/s11575-019-00395-6

Sobol, D., Lizińska, W., & Krukowski, K. (2024). *Parki naukowo-technologiczne i ich rola w stymulowaniu rozwoju innowacyjności: Studium na przykładzie województwa warmińsko-mazurskiego.* Ostrołęckie Towarzystwo Naukowe im. Adama Chętnika w Ostrołęce.

Sobol, D., Lizińska, W., & Nazarczuk, J. (2023). The role of science parks in Poland in the internationalization of tenant businesses. *Scientific Papers of Silesian University of Technology – Organization and Management Series*, *184*, 535–557. https://doi.org/10.29119/1641-3466.2023.184.27

Song, H., Yoon, Y., & Kang, K. (2020). The relationship between board diversity and firm performance in the lodging industry: The moderating role of internationalization. *International Journal of Hospitality Management*, *86*, 102461. https://doi.org/10.1016/j.ijhm.2020.102461

Squicciarini, M. (2008). Science parks' tenants versus out-of-park firms: Who innovates more? A duration model. Journal of Technology Transfer, *33*(1), 45–71. https://doi.org/10.1007/s10961-007-9037-z

Tihanyi, L., Ellstrand, A. E., Daily, C. M., & Dalton, D. R. (2000). Composition of the Top Management Team and Firm International Diversification. *Journal of Management*, *26*(6), 1157–1177. https://doi.org/10.1177/014920630002600605

Tihanyi, L., Griffith, D. A., & Russell, C. J. (2005). The effect of cultural distance on entry mode choice, international diversification, and MNE performance: a meta-analysis. *Journal of International Business Studies*, *36*(3), 270–283. https://doi.org/10.1057/palgrave.jibs.8400136

Tomelin, J., Amal, M., Zen, A. C., & Arrabito, P. (2018). Internationalisation of Science Parks: Experiences of Brazilian Innovation Environments. *International Business in the Information and Digital Age*, *13,* 391–408. https://doi.org/10.1108/s1745-886220180000013017

Unlü, H. (2022). The performance of science and technology parks under triple helix system in Turkey. In T. Daim, M. Dabić, & Y.-S. Su (Eds.), *The routledge companion to technology management* (pp. 303–319). Routledge.

Vallone, T., Elia, S., Greve, P., Longoni, L., & Marinelli, D. (2019). Top Management Team Influence on Firms' Internationalization Complexity. In R. V. Tulder, A. Verbeke & B. Jankowska (Eds.), *International Business in a VUCA World: The Changing Role of States and Firms* (pp. 199–226). Emerland Publishing Limited.

Vandermerwe, S., & Chadwick, M. (1989). The Internationalisation of Services. *The Service Industries Journal*, 9(1), 79–93. https://doi.org/10.1080/02642068900000005

Wach, K. (2014), Theoretical Framework of the Firm-Level Internationalisation in Business Studies. In A. Duréndez & K. Wach (Eds.), *Patterns of Business Internationalisation in Visegrad Countries – In Search for Regional Specifics*. Universidad Politécnica de Cartagena.

Williams, D. W., & Grégoire, D. A. (2014). Seeking commonalities or avoiding differences? Re-conceptualizing distance and its effects on internationalization decisions.

*Journal of International Business Studies*, *46*(3), 253–284. https://doi.org/10.1057/jibs.2014.52

Yamin, M., & Sinkovics, R. R. (2006). Online internationalisation, psychic distance reduction and the virtuality trap. *International Business Review*, *15*(4), 339–360. https://doi.org/10.1016/j.ibusrev.2006.03.002

Yan, H., Hu, X., & Liu, Y. (2020). The international market selection of Chinese SMEs: How institutional influence overrides psychic distance. *International Business Review*, *29*(4), 101703. https://doi.org/10.1016/j.ibusrev.2020.101703

Zacharewicz, T., Sanz Menendez, L., & Jonkers, K. (2017). *The internationalisation of research and technology organisations*. Luxembourg: Publications Office of the European Union. https://doi.org/10.2760/944413

Zahoor, N., & Al-Tabbaa, O. (2021). Post-entry internationalization speed of SMEs: The role of relational mechanisms and foreign market knowledge. *International Business Review*, *30*(1), 101761. https://doi.org/10.1016/j.ibusrev.2020.101761

Zieliński, M., Rogala, A., & Takemura, M. (2014). Business model of science and technology parks: comparison of European best practice. *The Bulletin of the Faculty of Commerce Meiji University*, *1*, 15–28.