

Trzeciak, Matheusz; Kopec, Tomasz P.

## Article

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Article

# Constructs of Project Programme Management Supporting Open Innovation at the Strategic Level of the Organisation

Mateusz Trzeciak <sup>1,\*</sup> , Tomasz P. Kopec <sup>2</sup> and Aleksy Kwilinski <sup>3</sup>

<sup>1</sup> Faculty of Organization and Management, Silesian University of Technology, 44-100 Gliwice, Poland

<sup>2</sup> Faculty of Biosciences, Fisheries and Economics, UiT The Arctic University of Norway, 9037 Tromsø, Norway; tomasz.p.kopec@uit.no

<sup>3</sup> The London Academy of Science and Business, 3rd Floor, 120, Baker Street, London W1U 6TU, UK; a.kwilinski@london-asb.co.uk

\* Correspondence: mateusz.trzeciak@polsl.pl

**Abstract:** The main aim of the article is to fill the gap concerning the recognition of constructs of programme management supporting open innovations. Current knowledge on this subject is mainly limited to identifying success factors of open innovation and programme management. In the current literature, there are few publications indicating the use of the programme as a tool supporting innovation. In order to fill the identified knowledge gap, common factors of programme success and open innovations were compared and assessed successively. A quantitative study was conducted on an international group of experts, including 578 experts in programme management. As a result of applying cluster analysis and operationalising the obtained results, four programme constructs supporting open innovations were dimensioned, such as cooperation with the environment, transfer of knowledge and technology, organisational maturity, and ensuring and maintaining implementation capacity. Moreover, the discussion and the research revealed that the impact and scope of the structured approach to programme management not only allow for the implementation of the assumed outcomes and benefits at the strategic level, but also influence the shaping and adjustment of the whole organisation.



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**Keywords:** support for innovation; programme management; management of knowledge; project management

## 1. Introduction

Innovation is widely regarded as the driving force behind economic development [1] and the success of enterprises [2]. The popularisation of the concept of open innovation by Chesbrough [3] has contributed to the gradual development from exploratory [4,5] to quantitative [6] and qualitative [7] research. Research issues, including the importance, role, and development of open innovation, are currently dealt with in many areas, for example, software engineering [8], industry [9], tourism [10], Small and Medium Enterprises (SME) development [11], and management practices [12]. The use of open innovation in economic practice primarily results from the global increase in competitiveness, rising costs of R&D projects and the shortening of the product life cycle. As a consequence, organisations are, in a way, forced to build a cooperation network and promote the transfer of knowledge resulting from patented solutions.

Open Innovation (OI), according to Chesbrough and Bogers [13], is a scattered innovation process based on purposefully managed knowledge flow across organisational boundaries, using financial and nonfinancial mechanisms in line with the organisation's business model. There are three reasons for adopting the above definition. First, open innovation includes a set of practices that facilitate the targeted transfer of knowledge [12]. Second, it requires appropriate financial and nonfinancial mechanisms [14], which must be considered at the strategic level of the organisation, in line with the adopted business

model. Third, it is a distributed process that requires the relevant human resources [15], competencies [16], and process integration [17]. Collaboration is at the heart of the idea of open innovation [18]. Departments wishing to apply this type of solution must open up to new business partners and properly adapt to the new situation and conditions. Interaction within the innovation process not only relates to the enterprise–enterprise relationship [19]; all kinds of individuals can participate in its cocreation, e.g., customers, competitors, consultants, universities, associations, etc. Therefore, the enterprise should have an open innovation policy included in its strategic approach.

Each company, commercial, or state organisation follows a specific strategy in its activities. Nowadays, strategic management is an information and decision-making process [20], supported by the functions of an enterprise (i.e., planning, organising, motivating, and controlling). In addition, it assists in solving problems related to the development and survival of the organisation, taking into account the impact of the environment [21]. The strategy is implemented on a daily basis by repetitive operational activities, which are accompanied by a multitude of events that may affect the need for changes in the organisation, including its functioning. This necessitates the use of appropriate tools to manage these changes resulting from decisions regarding the need and the priority of investing in development. Such decisions take place at the level of portfolio management [22]. It is here that the decision is made whether there will be consent for financing the change. The second decision that is made at the strategic level is what tool should be used to implement the change. What we want to achieve and how to manage it—is it a project, is it a big change that should be implemented and managed as a programme where projects have to be managed as a whole and are only a way to achieve results and benefits. The programme, as an effective project management mechanism, acts as a bridge between projects and organisational strategy [23].

In view of the above considerations, the purpose of this article is to identify constructs of a programme supporting open innovation by assessing common factors for the success of open innovation and programme management. The authors define a construct in project, programme, and portfolio management as a certain abstract, logical whole that has meaning in theoretical terms, which cannot be directly measured but can be expressed by measuring the variables with which it shapes a certain area.

## 2. Literature Review

In the literature on the subject, the programme is understood as a group of interrelated projects [23], which in a coordinated way aim to achieve benefits [24,25], using a common pool of resources [24,26,27] and are managed by a separate programme organisation thus enabling the achievement of strategic goals [28,29]. The goal of the programme is to obtain results that support the strategy and goals of the organisation [30] by creating, disseminating, verifying, and supporting procedures, as well as building structures and implementing practices related to a given programme [26]. The outcomes of that are rules for efficient and effective decision making and support management, focused on gaining the programme objectives in a consistent manner [31], taking into account the risks and expectations of the stakeholders [32,33].

International project management certification organisations such as the Project Management Institute (PMI) and Office of Government Commerce (OGC) are successful in the programme of achieving benefits [34,35]. However, the researchers suggest measuring the success of the programme through the prism of the implementation of the strategy. For example, Michael Thiry [36] explained the difference between the underlying paradigms of programme management and project management. He pointed out that while programme management allows for delivering strategic changes, project management follows the efficiency paradigm based on short-term tactical results [36]. In addition, findings from literature analysis and research into the programme's success provide insight into the very concept of success, which is generally in line with Shao's [37] observations that they remain at the organisational level. In connection with the above and the researchers'

suggestions [37,38] that the definition of programme success will be different for individual stakeholder groups, it was assumed that the success of the programme is the achievement of the optimal result of the provided benefits with simultaneous stakeholder satisfaction. However, the success of programme management comes down to ensuring that the programme is carried out optimally, that is, in the most appropriate and effective manner for the fulfilment of its purpose and objectives.

Research on the key success factors of open innovation is carried out by many authors [16,39–42]. However, the topic of programme success is discussed by a few authors [37,38,43,44] who claim that the definitions of programme success still remain at the conceptual level and are limited to research within one case or context of the programme [45]. In the following discussion, based on the success factors of open innovation identified by researchers [39,41], an attempt was made to find equivalents in the success factors of the programme.

### *2.1. Leadership, Commitment and Management Competencies*

Literature on open innovation in terms of leadership [41,46], commitment [47,48], and managerial competencies [49] focuses on the elements of human and social capital, including skills and competencies related to leadership, entrepreneurship, and management at every level of the organisation [50–52]. In addition, taking into account that the condition for the success of modern organisations is innovation, it is not understood as a one-off event, but as developing new competencies and taking up new activities or making the most of opportunities. The above approach seems to be justified. As shown in research by Naqshbandi et al. [53], employee involvement is enhanced by the open combining of leadership and innovation. Moreover, strengthening employee involvement in making the right decisions improves the organisation's development and performance related to open innovation.

In programme management, the programme manager is responsible for leadership and management, right from the initiation of the programme, through the delivery of project results, the realisation of business benefits, and up to the closure [54]. Their qualifications and abilities play a key role in the success of the programme [55]. A comprehensive framework for programme management competencies was developed by Parington et al. [56] and Pellegrinelli [57] and is included in the 'MSP—Managing Successful Programmes' standard [35]. This significance was also confirmed by Shao [37] as a result of a study of the moderating influence of programme context on the relationship between the programme manager leadership competencies and the programme success. This led to the development of a programme success theory based on leadership competencies.

The involvement of the programme management team and teamwork is considered by many authors and experts as one of the prerequisites for success in projects [58], programme [44,59,60], and portfolio management [16]. In addition, the teamwork aspect will apply to every level of the programme, from the sponsoring group through the programme board, programme office, and down to the level of the single project that will deliver the outcome.

### *2.2. Internal Innovation Capability*

Internal innovation capability in OI literature primarily focuses on the internal structures and resources required for an effective innovation process [61,62], including selection and prioritisation [63], accountability and delegation of authority [61], project and knowledge management [7,16], as well as technical competences related to R&D [41].

The programme as a tool for business transformation and change [26], both in terms of organisation [29] and innovation [64], also addresses the above issue.

The organisation of the programme presents its key elements, understood as a hierarchy of organisational dependencies necessary for effective programme management [27]. Appropriate programme organisation has clearly defined and described roles, unambiguously assigned responsibilities for these roles, and a management structure adequate to its

type, size, and complexity. In this sense, the organisational structure of the programme, and most of all the selection of an appropriate team [65], combining experience and competencies with the correct application of assigned roles, must support the decision-making process [56,57] both strategically and contextually, directly supporting innovation [64]. Moreover, the active interdependence of resources between projects helps to promote behaviour and leads to better programme performance [36]. Parolia et al. [66] also emphasise that the interdependence of resources to increase the level of communication, effort, and mutual support among programme members can be a critical management intervention in programme management practices. Without appropriate support for innovation, both by top management and the organisation of the programme, it is impossible to effectively and efficiently implement the programme [67].

### 2.3. Network Collaboration and Relationships

One of the key elements of strengthening open innovation by an organisation is its ability to build effective external relations [15,68]. Primarily, this requires defining and building competencies in the area of identifying stakeholders [49], acknowledging their needs and maintaining formal and informal relations [69] in order to build a collaboration network [19]. An organisation delivering its business value within open organisations should not only focus on the potential of this value and customer segments [70] but also on business partners thanks to whom it is created [12].

As previously mentioned, programme management is the process of creating, disseminating, verifying, and supporting procedures, as well as building structures and implementing practices related to a given program. The outcomes of that are rules for efficient and effective decision making and support management, focused on gaining the programme objectives in a consistent manner, taking into account the risks and expectations of the stakeholders [34]. Therefore, it is essential for proper programme management to balance the dilemmas of multiple stakeholders and maintain control while letting ideas emerge [71]. The network of actors is a key factor in developing programme management capacity [72]. In addition, it is emphasised that an organisation with an appropriate organisational culture focused on flexibility [31] and innovation [54] favours the achievement of the programme's objectives while simultaneously satisfying the stakeholders [71]. The level of collaboration between stakeholders also affects the delivery of benefits resulting from this cooperation, increasing the probability of their occurrence [73].

### 2.4. Knowledge Management

The source of innovation is the skilful management of knowledge, which is a strategic resource of the enterprise [74]. The creation of innovations is based on the acquisition of new and the use of already existing intellectual resources [4,15]. It is the most important factor in the process of creating innovation [75]. The internal exploration of knowledge boils down to the development of creative capacities, while the external—to the absorptive capacities [76]. As emphasised by Subtil de Oliveira et al. [41], exploiting absorptive capacity by improving competencies related to strategy development and management of information and knowledge for the development and implementation of open innovations becomes of key importance.

The significance of knowledge transfer in programme management and the use of individual influences and organisational forces (organisational culture) that positively modify educational behaviour are emphasised by many authors [38,55,77]. For example, Pellegrinelli et al. [78], when examining the retail bank's business transformation programme, observed that where the programme is not only a coordinating mechanism for relatively independent projects but an organisational mechanism for achieving a major strategic goal or for change, its component projects should be managed as much as possible to achieve efficiency implementation and the use of existing knowledge. However, beyond the mere importance of knowledge management, which should be seen as the ability to manage a programme, there is a need for holistic management, economic rationale,

leadership, and sound management processes with the simultaneous role of vertical and horizontal communication in hierarchical structures [79].

### 2.5. Culture and Values

Culture, as one of the success factors of open innovation, refers to both organisational culture and external cultural factors that influence the attitudes, abilities, skills, motivation, and even intentions of employees [41]. Laursen and Killen [77] revealed three themes regarding value creation (collaboration, coordination, and perception) when researching the public cultural programme of Aarhus 2017. Similar conclusions were proposed by Liu et al. [80] by identifying three sets of use values (i.e., commercial, intellectual, and collaborative) that are cocreated by stakeholders in the first stage of the programme life cycle. In addition, as noted by Laine et al. [64], creating meaning and a vision together makes it possible to understand and extend the impact of a programme.

Programme management as a tool to support open innovation of a strategic nature aims to achieve a balance between efficiency and strategy that allows adaptation [38] of the simultaneous flexible programme organisation, with guiding values and criteria for balancing different projects that can be used to achieve the programme objectives [71]. In addition, it provides measures related to the appropriate shaping of the culture and values that are common to open innovation, through structured control and supervision [81,82], integrity [26], organisation [29], as well as material, human, information, and financial resources [44].

## 3. Materials and Methods

Conclusions from the literature analysis conducted, comparing the important success factors of open innovation and programme management, emphasise the significant role of open innovation in programme management, as well as the role of the programme in strengthening OI at the strategic level of the organisation.

Accordingly, this article focuses on the dimensioning of programme constructs supporting open innovation by assessing common factors for the success of open innovation and programme management.

In order to achieve the assumed research goal, a literature review was conducted, and as a result, a list of common factors in the success of open innovation and programme management was developed. The identified factors are presented in Table 1.

In the next step, the results of a wider international study conducted using a questionnaire were used, based on the target group of experts participating in programme management. The overall study of assessing the success of the project programmes consisted of three main areas of question:

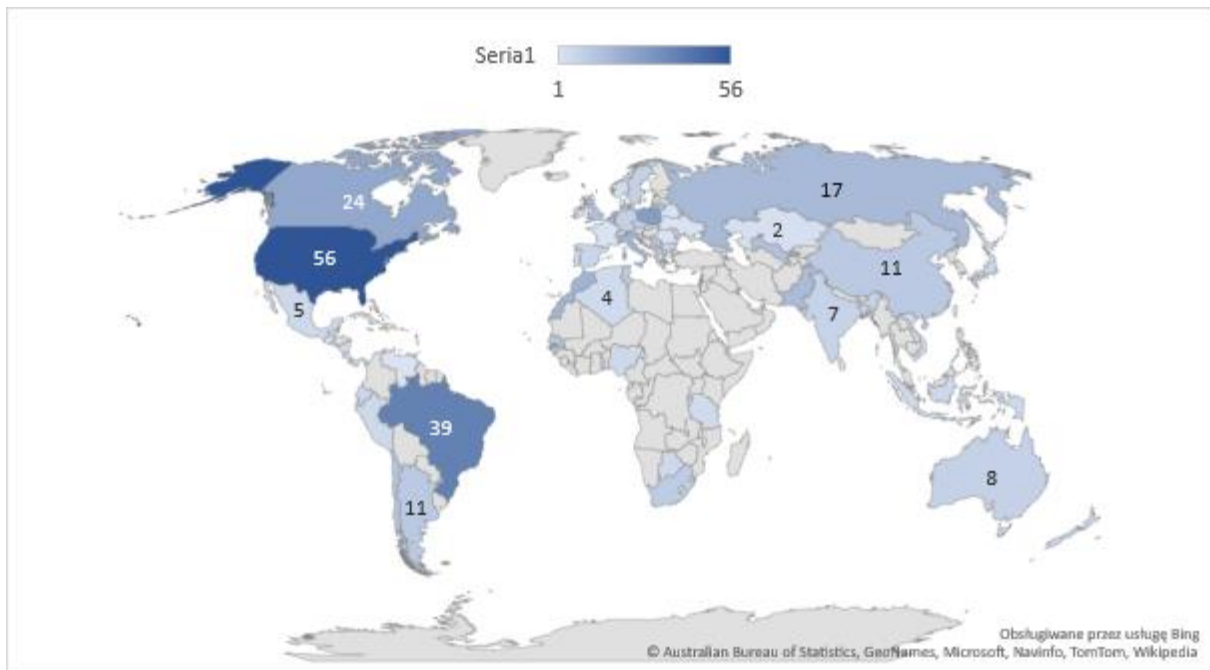
1. Characteristics of the respondent, including experience, role, country, and industries in which they implement the programs (four single choice questions);
2. Assessment of the degree of use of the indicated factors in programme management (76 single choice questions on a scale from 1 to 10);
3. Assessment of the impact of factors on the success of the programme (76 single choice questions presented on a five-point scale).

For the purposes of this article, the focus was on carrying out a statistical analysis of selected questions from the third area, including the assessment of the impact factors on the success of the programme.

**Table 1.** Common factors for the success of open innovation and programme management.

Factor	Authors
Risk management related to the relationship with stakeholders	[28,31,37–39]
Recognition of stakeholder attributes	[23,27,28,31,37,38,44,55,59,65,71,77,80]
Supplier relationship management	[28,29,37,38,41,44,65,77,80]
Stakeholder management	[25,28,29,31,37,38,44,55,59,64,65,71,77,78,80]
Satisfaction of key stakeholders	[25,38,41,44,55,64,71,78,80]
Collaboration between project participants initiated under the program	[23,27,31,32,55,59,64,66,71,77,78,80,81]
The staff of the office technically/substantively competent with regard to the program	[23,27,33,55]
Involvement of the programme management team	[23,27,29,32,44,54,55,66,77]
Teamwork	[27,29,31,37,44,54,55,59,64,77]
Qualified and charismatic programme manager	[23,37,54,55]
Programme manager leadership	[23,32,37,44,54,55]
Incremental delivery of programme benefits	[25,31,32,78]
Passing on business benefits	[25,27,29,31,32,44,65,78]
Project maturity of the organisation	[31,54]
Holistic view of the programme organisation	[25,54,65,77]
Programme management infrastructure (e.g., resources, processes)	[25,27,28,44,71,78,80]
Organisational culture	[25,27,37,44,54,55,64,65,71,80]
Delegation of powers and responsibilities	[32,38,44,54,55,77]
Internal corporate mechanisms	[27,29,31,44,54,55]
Ensuring continuity of financing	[83]
Budgeting the program	[29,38,64]
Vertical and horizontal communication	[38,44,55,59,83]
Effective and timely decision making	[31–33,38,59,64,65]
Coordination of projects in the context of the program	[25,27,31,33,38,64–66,72,78]
Resource allocation between projects	[33,66,72,78]
Knowledge management-measurement and analysis of knowledge	[31,37,38,44,54,55,64,72,77,80]
Information management	[29,37,44,54,55,64–66,71,78,80,81]
Fast introduction of new technologies	[31,64,83]

The sampling method used in the questionnaire is theoretical selection, which means that experts should be people who know the subject matter of the study best [84]. The size of the sample required to meet the representativeness of the study was established with the following assumptions: the  $p$  fraction index was assumed at the level of 50%; the error rate for the fraction index was set at 5%; significance level  $\alpha = 0.05$ . In consequence, the required sample size was 385. To obtain the widest possible research sample, invitations to participate in the research were distributed by two international organisations, i.e., IPMA and PMI, and through direct contacts via LinkedIn, where people were searched for by experience and the role of the programme manager. In addition, in order to increase the reflexivity, the questionnaire was prepared in electronic form in seven languages (i.e., English, French, Spanish, Japanese, German, Polish, Russian). As a result of the effort, 578 correctly filled questionnaires from 67 countries were gathered. The geographic distribution of respondents is presented in Figure 1.



**Figure 1.** Geographical distribution of respondents by the country where the programme was administered.

Taking into account the exploratory nature of the research, it is assumed that they should be reliable. The Cronbach's alpha [85] coefficient was used to measure reliability, which for the analysed questions on a five-point scale was 0.9224, which proves the excellent reliability of the research. The statistical analysis of the data was performed using the STATISTICA 13.3 software.

#### 4. Results

In order to identify the areas of programme success, cluster analysis was used, which relates to the segmentation or clustering of data and is one of the most frequently used methods of data mining [86]. The aim of cluster analysis is to arrange objects into groups in such a way that the degree of association of objects within the same group is as high as possible but with objects from other groups as little as possible [87].

The analysis was performed with data obtained as part of the research, which was conducted using a questionnaire on an international sample (578 experts), including the results of assessing the impact of 76 factors on the success of the programme. The influence of factor effects on the programme success was assessed by experts on the Likert scale, where: 1—no impact, 2—low impact, 3—moderate impact, 4—high impact, 5—very high impact. Taking into account the outcomes from the conducted analysis of the literature in the field of open innovation, 28 common factors for programme management and OI were adopted for further analysis. Basic statistical data of selected factors are presented in Table 2.

The choice of a specific measure of distance is determined by the measuring scale but also depends on the method of normalisation of the variables [86]. Taking into account the five-point scale used, the raw nature of the data and the subjective opinion of experts, the Euclidean measure was selected for further analysis.

The next step in line with the procedure is choosing the method of grouping objects. One of the most popular hierarchical methods is Ward's method, in which the distance is determined using the analysis of variance approach [86,87]. Considering the effectiveness of this method and its popularity, it was used to carry out the analysis.



**Table 2.** Factors (variables) were adopted for the cluster analysis.

Factor	Average	Standard Deviation
Risk management related to the relationship with stakeholders	3.9619	0.7553
Recognition of stakeholder attributes	4.0173	0.7422
Supplier relationship management	3.7457	0.9562
Stakeholder management	4.2612	0.6335
Satisfaction of key stakeholders	4.3201	0.6087
Collaboration between project participants initiated under the program	4.0069	0.6891
The staff of the office technically/substantively competent with regard to the program	3.9585	0.8019
Involvement of the programme management team	4.0986	0.7714
Teamwork	4.4723	0.6477
Qualified and charismatic programme manager	4.1003	0.7879
Programme manager leadership	4.3875	0.6519
Incremental delivery of programme benefits	3.8045	0.7865
Passing on business benefits	3.9827	0.7742
Project maturity of the organisation	3.8304	0.7203
A holistic view of the programme organisation	3.7630	0.8035
Programme management infrastructure (e.g., resources, processes)	3.7682	0.8294
Organisational culture	4.0087	0.9243
Delegation of powers and responsibilities	3.9965	0.6609
Internal corporate mechanisms	3.6142	0.8996
Ensuring continuity of financing	4.1090	0.7768
Budgeting the programme	4.3235	0.6510
Vertical and horizontal communication	4.1315	0.7162
Effective and timely decision making	4.4567	0.6415
Coordination of projects in the context of the programme	4.3166	0.6954
Resource allocation between projects	4.0657	0.7511
Knowledge management—measurement and analysis of knowledge	3.5190	0.7474
Information management	3.6298	0.7571
Fast introduction of new technologies	3.7266	0.9876

The use of Ward’s method and the Euclidean distance matrix resulted in an agglomeration of 28 variables analysed within 27 steps, thus creating a single group of objects containing all the analysed variables. The course of the agglomeration is shown in Figure 2.

The literature suggests the use of several measures to determine the number of clusters, and for the purposes of the analysis, it was decided to use three of them:

- indication of the measure maximum

$$g_i = d_i - d_{i-1} \tag{1}$$

- calculation of T. Grabiński’s measure [88]

$$g_i = \max\left(\frac{d_i}{d_{i-1}}\right) \tag{2}$$

- use of R. Mojena’s rule [89]

$$d_{i+1} > \bar{d} + kS(d) \tag{3}$$

Based on the calculation results of the above measures, a decision was made on the cutoff point of the dendrogram. In the case of the distance difference ( $g_i = 13.7137$ ) and distance product ( $g_i = 1.2807$ ) measures, the place of division is indicated by the highest value of the indicator. In the case of the Mojena rule, the place of cutoff is indicated by the formula at the moment of meeting the inequality, where, after making calculations with the assumption of  $k = 1.2$ , the following was obtained:

$$36.4695 > 35.9718 \tag{4}$$

Graph of the binding distance relative to the binding steps  
Euclidean distance

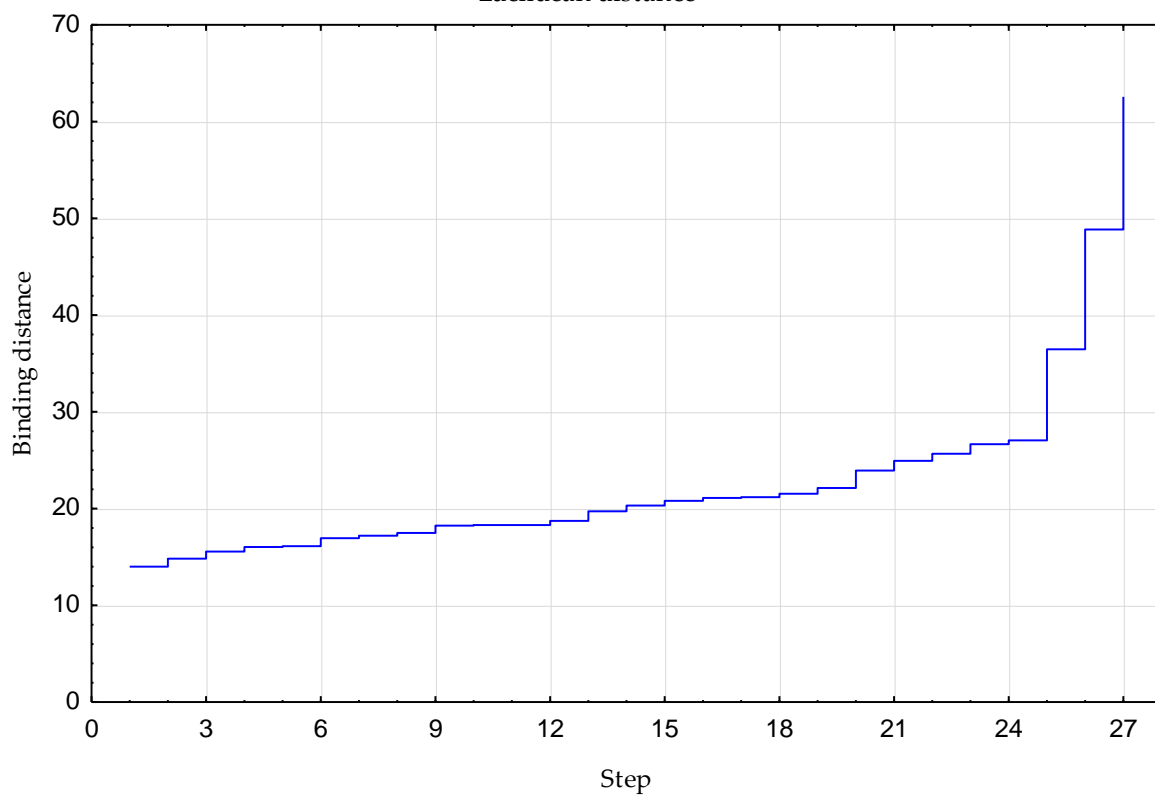


Figure 2. Graph of the binding distance relative to the binding steps. Euclidean distance.

Detailed measures of distance and measures calculated as differences and quotients of distance are presented in Table 3.

Table 3. Detailed measures of distance and measures calculated as differences and quotients of distance.

Distance	$d_i - d_{i-1}$	$q_i = \max\left(\frac{d_i}{d_{i-1}}\right)$
14.0000	-	-
14.8293	0.8293	1.0592
15.5564	0.7270	1.0490
16.0312	0.4749	1.0305
16.1182	0.0869	1.0054
16.9411	0.8229	1.0511
17.2047	0.2636	1.0156
17.4929	0.2882	1.0168

Table 3. Cont.

Distance	$d_i - d_{i-1}$	$q_i = \max\left(\frac{d_i}{d_{i-1}}\right)$
18.2470	0.7541	1.0431
18.3030	0.0560	1.0031
18.3055	0.0025	1.0001
18.7304	0.4249	1.0232
19.7231	0.9926	1.0530
20.3224	0.5993	1.0304
20.8014	0.4790	1.0236
21.0989	0.2975	1.0143
21.1896	0.0907	1.0043
21.5432	0.3535	1.0167
22.1359	0.5928	1.0275
23.9309	1.7949	1.0811
24.9434	1.0126	1.0423
25.6656	0.7222	1.0290
26.6561	0.9905	1.0386
27.0591	0.4030	1.0151
36.4695	9.4105	1.3478
48.8559	12.3864	1.3396
62.5695	13.7137	1.2807

Based on the obtained results, a decision was made to select four clusters, thereby cutting off the dendrogram after 24 links. A detailed distribution of the variables classified into individual clusters is presented in Figure 3.

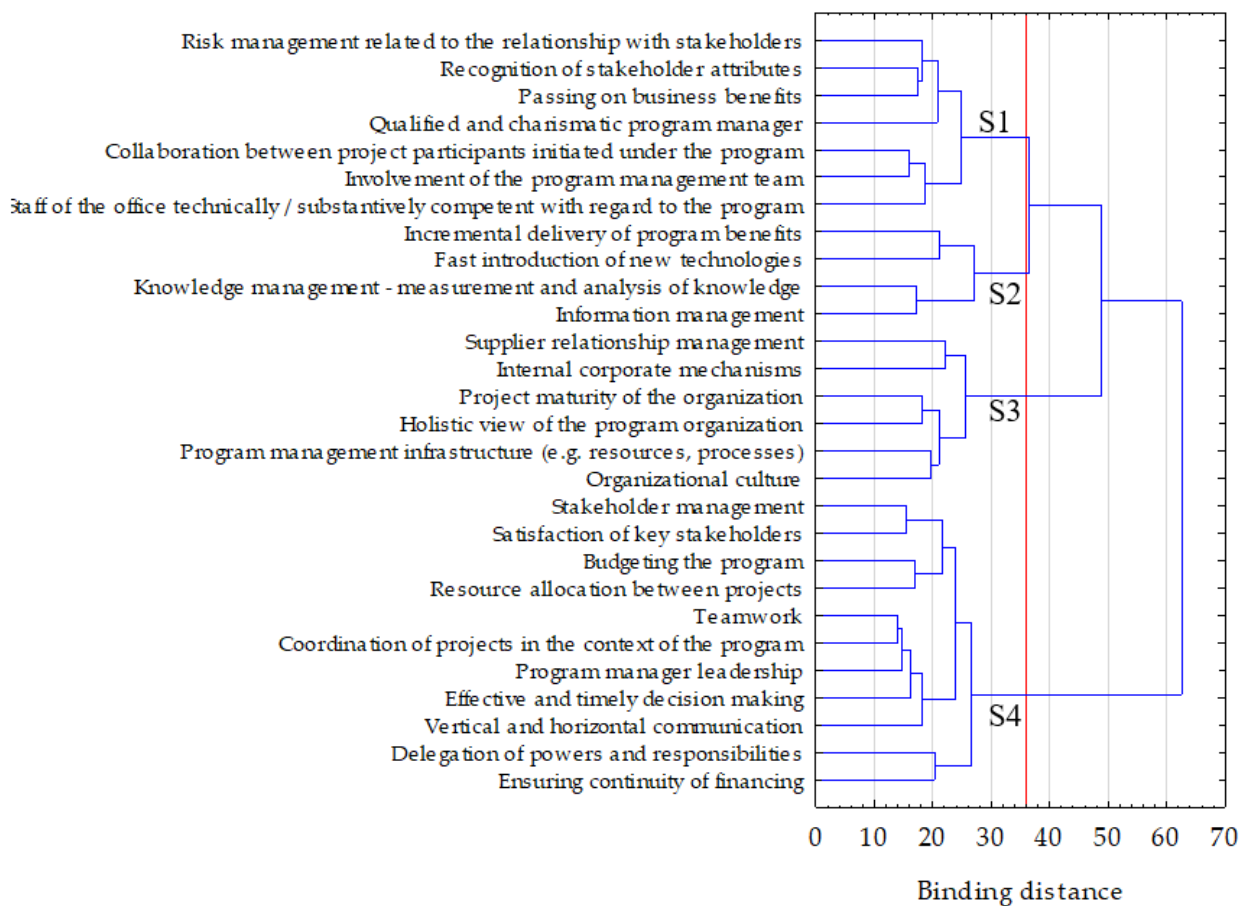


Figure 3. A detailed distribution of the variables classified into individual clusters.

When analysing the obtained results in terms of individual links and means of clusters, it can be seen that the S1 cluster is largely determined by the stakeholders and competencies, including collaboration. The S2 cluster covers issues related to the factors directly arising from knowledge management, including, for example, the rapid introduction of new technologies, information management, or measurement and analysis of knowledge. Subsequently, the S3 cluster focuses on aspects relating to procedures, organisational processes, and the organisation managing the programme. In contrast, the S4 cluster includes processes directly related to programme management focusing on delivering and sustaining results and benefits.

Taking into account the above and the outcomes resulting from the literature analysis, the separated clusters were called constructs as follows:

- S1—Cooperation with the environment;
- S2—Transfer of knowledge and technology;
- S3—Organisational maturity;
- S4—Ensuring and maintaining implementation capacity.

## 5. Discussion

Previous research in the area of programme management has mainly focused on [26]: the role of the programme and its context [23,37], competencies [37,57], and management of the programme life cycle [31]. There are not many publications showing the impact of the programme on other areas of economic activity. In this discussion, arguments will be indicated for which programme, within the framework of separate constructs, supports open innovations at the strategic level of the organisation.

### 5.1. Cooperation with the Environment

The programme, similar to the project, enforces cooperation with the environment. However, the programme, due to its complexity and context, affects a wider range of stakeholders than the case of a single project. The way the programme engages its stakeholders is critical to its success. Stakeholders are individuals, groups of people, or organisations that may influence, be influenced by, or believe they are influenced by a programme [35].

Throughout the programme life cycle, stakeholders will be identified, assessed, engaged, and monitored, which also leads to the expansion of stakeholder groups at the organisational level, giving new potential and opportunities for cooperation or cocreation of value. Relationships built over the course of the programme or strengthened through it can also be used at the strategic level, both during and after the implementation of the programme. Moreover, the programme also leads to the completion of competencies as a result of acquiring new intellectual resources from the environment or cooperation with business partners.

The programme also supports open innovation by simply delivering business benefits that are cocreated by its projects. Firstly, communicating benefits already achieved strengthens the commitment and support of programme stakeholders. Secondly, the results and benefits achieved by the programme may also benefit individual projects, organisations, or particular groups of stakeholders within their own specific needs.

### 5.2. Transfer of Knowledge and Technology

Programme management, due to its specificity and context, enables the direct transfer of knowledge and technology by building activation potential as a means of acquiring new knowledge, which can also be used at the organisational level. Moreover, one of the programme's attributes is a set of related projects aimed at achieving a specific strategic goal. Knowledge in this regard will be expressed as regulations, rules, strategies, structures, processes, etc., thanks to which stakeholders cooperate within a given community.

Behind both economic and financial reasons, there is a desire for organisations to strengthen their intellectual capital. The programme, depending on the context and specificity, in a way, responds to this desire during its implementation by generating, for example,

knowledge about customers and their needs, building relationships with customers and stakeholders, strengthening competencies related to organisation management, technological know-how, and patents (allowing, e.g., to obtain a qualitative advantage in the market). As emphasised by Duryan and Smyth [54], knowledge management should be viewed as a programme management capability that needs investment, leadership, and solid human resource management processes.

Knowledge and technology transfer will not only occur within the programme itself on the basis of the results achieved by projects within it, or at the project level, including the ways and possibilities of producing the results themselves. Knowledge and technology transfer will also occur between the programme and the host organisation, and the programme and its external environment, thus supporting the concept of open innovation.

### 5.3. Organisational Maturity

Organisational maturity is understood as the awareness of the creation of new values related to the organisational culture through the systematisation of structures, processes, or mechanisms related to corporate governance.

Corporate governance, in accordance with the 'Managing Successful Programmes' standard, is the continuous maintenance of a solid internal control system, by means of which members of an organisation's management staff ensure that effective management systems along with monitoring and financial control systems are implemented to protect assets, profitability, and the reputation of an organisation [35].

Any control framework related to programme implementation that may be adopted or used by the organisation will initially be viewed as an addition to the normal business activities. This means a programme that is properly managed and supported by the organisation and top management can impact both the core business and the culture of the organisation by creating value, supporting innovation, policies, strategies, and resources. Moreover, in line with international programme management standards [34,35], a number of strategies and plans are defined to implement the governance mechanisms as soon as the programme is established.

### 5.4. Ensuring and Maintaining Implementation Capacity

One of the features that distinguish a programme from a project is the process of benefits management, which identifies a set of key activities to be performed with a clear set of controls, inputs, outputs, and resources [25].

The programme, as a tool to achieve the strategic goals of the organisation through the management of benefits, also transfers and maintains them at the organisational level. Similar observations were observed by Fernandes and O'Sullivan [25] when examining the programme of collaboration between large universities and industry (UIC), which are implemented by the University of Minho and Bosch Car Multimedia Corporation and co-financed by the Portuguese government. According to their benefits management model, one of the stages is the transfer and maintenance of benefits. Moreover, they observed that the main purpose of this activity is to transfer the results of the programme to participating organisations, ensuring that the results obtained under the programme are properly used and stored by the partners [25]. This means that the programme not only manages the benefits provided by the projects included in it but also introduces mechanisms related to their enforcement and appropriate use at the organisational level, which is also confirmed by the programme governance standards.

### 5.5. Programme Management Supporting Open Innovation

As a tool for implementing a strategic plan through appropriate innovation orientation [54] and supporting the organisations [44,56], the programme can directly support open innovations [90,91]. This support can be achieved first by building an organisational environment open to cooperation [92]. As Lisowska and Stanisławski [93] emphasise, there are many barriers to the implementation of the principles of open innovation in the

context of cooperation (e.g., lack of recognition of the purpose and benefits of cooperation). In turn, appropriate programme management integrates entities motivated to achieve a common goal and business benefits [26]. Secondly, knowledge and technology transfer will also occur between the programme and the host organisation [94,95] and the programme and its external environment [75,76], thus supporting the concept of open innovation [41]. Third, the programme provides, at the level of the organisation, the potential to create new values [77,78] as a result of provided business benefits [64], mechanisms of change [26], assets [39,40] and human resources competencies [44]. Fourth, the effectiveness of the concept of open innovation occurs when the organisation is able to maintain the implementation capacity [41,96]. Programme management allows the organisation to implement mechanisms related to the empowerment of business change [25], ensuring that the delivered results and benefits are properly used by both the organisation and its partners [61,62].

## 6. Conclusions

The research presented in this article has both theoretical and practical contributions. Contribution to the literature includes the identification of common factors supporting programme success and open innovation. Moreover, the obtained research results may constitute the basis for further in-depth qualitative research covering various programme contexts. However, the practical implications focus on the implementation of the overarching goal of the article—dimensioning programme constructs supporting open innovations in the form of cooperation with the environment, knowledge and technology transfer, organisational maturity, and ensuring and maintaining implementation capacity.

Moreover, the discussion and the research revealed that a structured approach to programme management and its impact and scope not only allows for the implementation of the assumed outcomes and benefits at the strategic level, but also influences the shaping and adjustment of the organisation created by the implemented mechanisms. Thus, similar to a project portfolio, it provides support for core business activities and tools for resource allocation, decision making, and environmental impact management.

We acknowledge the disadvantages of the research process carried out, which mainly result from the decisions we have made regarding the methodological approach. Firstly, the identification of factors was only dependent on the conducted literature review, where there may be different factors depending on both the organisation and the context of the programme. Secondly, since only people involved in the implementation and management of the programme participated in the study, their competencies in the field of open innovation were not tested. This offers the possibility of extending this research in the area of required competencies.

Therefore, it is recommended to conduct broader qualitative research in the areas of projects, programmes, and portfolios that can positively moderate the development of the concept of open innovation and the required competencies in this area.

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## References

1. Zhou, X.; Song, M.; Cui, L. Driving force for China's economic development under Industry 4.0 and circular economy: Technological innovation or structural change? *J. Clean. Prod.* **2020**, *271*, 122680. [\[CrossRef\]](#)
2. Singh, S.H.; Bhowmick, B.; Eesley, D.; Sindhav, B. Grassroots innovation and entrepreneurial success: Is entrepreneurial orientation a missing link? *Technol. Forecast. Soc. Chang.* **2021**, *164*, 119582. [\[CrossRef\]](#)
3. Chesbrough, H. The Era of Open Innovation. *MIT Sloan Manag. Rev.* **2003**, *44*, 35–41.
4. Gassmann, O.; Enkel, E.; Chesbrough, H. The future of open innovation. *R D Manag.* **2010**, *40*, 213–221. [\[CrossRef\]](#)
5. Lichtenthaler, U. Open innovation: Past research, current debates, and future directions. *Acad. Manag. Perspect.* **2011**, *25*, 75–93. [\[CrossRef\]](#)
6. Rauter, R.; Globocnik, D.; Perl-Vorbach, E.; Baumgartner, R.J. Open innovation and its effects on economic and sustainability innovation performance. *J. Innov. Knowl.* **2019**, *4*, 226–233. [\[CrossRef\]](#)
7. Ferraris, A.; Santoro, G.; Papa, A. The cities of the future: Hybrid alliances for open innovation projects. *Futures* **2018**, *103*, 51–60. [\[CrossRef\]](#)
8. Paternoster, N.; Giardino, C.; Unterkalmsteiner, M.; Gorschek, T.; Abrahamsson, P. Software development in startup companies: A systematic mapping study. *Inf. Softw. Technol.* **2014**, *56*, 1200–1218. [\[CrossRef\]](#)
9. Cano-Kollmann, M.; Awate, S.; Hannigan, T.J.; Mudambi, R. Burying the hatchet for catch-up: Open innovation among industry laggards in the automotive industry. *Calif. Manag. Rev.* **2018**, *60*, 17–42. [\[CrossRef\]](#)
10. Naramski, M. The Application of ICT and Smart Technologies in Polish Museums—Towards Smart Tourism. *Sustainability* **2020**, *12*, 9287. [\[CrossRef\]](#)
11. Abubakar, M.N. Innovation Co-operation Impact on Operations of Small, Medium and Large (SML) Firms: A Malaysia Perspective. *Indian-Pac. J. Account. Financ.* **2018**, *2*, 4–15. [\[CrossRef\]](#)
12. Saebi, T.; Foss, N.J. Business models for open innovation: Matching heterogeneous open innovation strategies with business model dimensions. *Eur. Manag. J.* **2015**, *33*, 201–213. [\[CrossRef\]](#)
13. Chesbrough, H.; Bogers, M. Explicating open innovation: Clarifying an emerging paradigm for understanding innovation. In *New Frontiers in Open Innovation*; Oxford University Press, Forthcoming: Oxford, UK, 2014; pp. 3–28.
14. Spender, J.C.; Corvello, V.; Grimaldi, M.; Rippa, P. Startups and open innovation: A review of the literature. *Eur. J. Innov. Manag.* **2017**, *20*, 4–30.
15. Huizingh, E.K. Open innovation: State of the art and future perspectives. *Technovation* **2011**, *31*, 2–9. [\[CrossRef\]](#)
16. Zaman, U.; Nawaz, S.; Nadeem, R.D. Navigating Innovation Success through Projects. Role of CEO Transformational Leadership, Project Management Best Practices, and Project Management Technology Quotient. *J. Open Innov. Technol. Mark. Complex.* **2020**, *6*, 168. [\[CrossRef\]](#)
17. Gianiodis, P.T.; Ellis, S.C.; Secchi, E. Advancing a typology of open innovation. *Int. J. Innov. Manag.* **2010**, *14*, 531–572. [\[CrossRef\]](#)
18. Ojasalo, J.; Kauppinen, H. Collaborative innovation with external actors: An empirical study on open innovation platforms in smart cities. *Technol. Innov. Manag. Rev.* **2016**, *6*, 49–60. [\[CrossRef\]](#)
19. Scuotto, V.; Del Giudice, M.; Bresciani, S.; Meissner, D. Knowledge-driven preferences in informal inbound open innovation modes. An explorative view on small to medium enterprises. *J. Knowl. Manag.* **2017**, *21*, 640–655. [\[CrossRef\]](#)
20. Alyoubi, B.A. Decision support system and knowledge-based strategic management. *Procedia Comput. Sci.* **2015**, *65*, 278–284. [\[CrossRef\]](#)
21. Beer, M.; Voelpel, S.C.; Leibold, M.; Tekie, E.B. Strategic management as organizational learning: Developing fit and alignment through a disciplined process. *Long Range Plan.* **2005**, *38*, 445–465. [\[CrossRef\]](#)
22. Martinsuo, M. Project portfolio management in practice and in context. *Int. J. Proj. Manag.* **2013**, *31*, 794–803. [\[CrossRef\]](#)
23. Shao, J.; Müller, R. The development of constructs of program context and program success: A qualitative study. *Int. J. Proj. Manag.* **2011**, *29*, 947–959. [\[CrossRef\]](#)
24. Breese, R.; Jenner, S.; Serra, C.E.M.; Thorp, J. Benefits management: Lost or found in translation. *Int. J. Proj. Manag.* **2015**, *33*, 1438–1451. [\[CrossRef\]](#)
25. Fernandes, G.; O'Sullivan, D. Benefits management in university-industry collaboration programs. *Int. J. Proj. Manag.* **2021**, *39*, 71–84. [\[CrossRef\]](#)
26. Martinsuo, M.; Hoverfält, P. Change program management: Toward a capability for managing value-oriented, integrated multi-project change in its context. *Int. J. Proj. Manag.* **2018**, *36*, 134–146. [\[CrossRef\]](#)
27. Frederiksen, N.; Gottlieb, S.C.; Leiringer, R. Organising for infrastructure development programmes: Governing internal logic multiplicity across organisational spaces. *Int. J. Proj. Manag.* **2021**, *39*, 223–235. [\[CrossRef\]](#)
28. Angus, G.Y.; Kittler, M. Matching programme structure to environment: A comparative study of two IS-based change programmes. *Int. J. Proj. Manag.* **2012**, *30*, 740–749. [\[CrossRef\]](#)
29. Miterev, M.; Jerbrant, A.; Feldmann, A. Exploring the alignment between organization designs and value processes over the program lifecycle. *Int. J. Proj. Manag.* **2020**, *38*, 112–123. [\[CrossRef\]](#)
30. Sanchez, H.; Robert, B.; Bourgault, M.; Pellerin, R. Risk management applied to projects, programs, and portfolios. *Int. J. Manag. Proj. Bus.* **2009**, *2*, 14–35. [\[CrossRef\]](#)
31. Ritson, G.; Johansen, E.; Osborne, A. Successful programs wanted: Exploring the impact of alignment. *Proj. Manag. J.* **2012**, *43*, 21–36. [\[CrossRef\]](#)

32. Van Buuren, A.; Buijs, J.M.; Teisman, G. Program management and the creative art of cooptation: Dealing with potential tensions and synergies between spatial development projects. *Int. J. Proj. Manag.* **2010**, *28*, 672–682. [\[CrossRef\]](#)
33. Görög, M. Translating single project management knowledge to project programs. *Proj. Manag. J.* **2011**, *42*, 17–31. [\[CrossRef\]](#)
34. Project Management Institute. *The Standard for Program Management*, 4th ed.; Project Management Institute, Inc.: Newtown Square, PA, USA, 2017.
35. Office of Government Commerce. *Managing Successful Programmes*, 2011 edition; The Stationery Office: London, UK, 2014.
36. Thiry, M. “For DAD”: A programme management life-cycle process. *Int. J. Proj. Manag.* **2004**, *22*, 245–252. [\[CrossRef\]](#)
37. Shao, J. The moderating effect of program context on the relationship between program managers’ leadership competences and program success. *Int. J. Proj. Manag.* **2018**, *36*, 108–120. [\[CrossRef\]](#)
38. Rijke, J.; van Herk, S.; Zevenbergen, C.; Ashley, R.; Hertogh, M.; Ten Heuvelhof, E. Adaptive programme management through a balanced performance/strategy oriented focus. *Int. J. Proj. Manag.* **2014**, *32*, 1197–1209. [\[CrossRef\]](#)
39. Durst, S.; Stähle, P. Success factors of open innovation—a literature review. *Int. J. Bus. Res. Manag.* **2013**, *4*, 111–131.
40. Zhang, N.; Zhao, X.; Zhang, Z.; Meng, Q.; Tan, H. What factors drive open innovation in China’s public sector? A case study of official document exchange via microblogging (ODEM) in Haining. *Gov. Inf. Q.* **2017**, *34*, 126–133. [\[CrossRef\]](#)
41. De Oliveira, L.S.; Echeveste, M.E.; Cortimiglia, M.N. Critical success factors for open innovation implementation. *J. Organ. Chang. Manag.* **2018**, *31*, 1283–1294. [\[CrossRef\]](#)
42. Oh, M.; Choi, S. The competence of project team members and success factors with open innovation. *J. Open Innov. Technol. Mark. Complex.* **2020**, *6*, 51. [\[CrossRef\]](#)
43. Maylor, H.; Brady, T.; Cooke-Davies, T.; Hodgson, D. From Projectification to Programmification. *Int. J. Proj. Manag.* **2006**, *24*, 663–674. [\[CrossRef\]](#)
44. Shao, J.; Müller, R.; Turner, J.R. Measuring program success. *Proj. Manag. J.* **2012**, *43*, 37–49. [\[CrossRef\]](#)
45. Shao, J.; Turner, J.R.; Müller, R. The program manager’s leadership style and program success: A literature review and research outline. In Proceedings of the IRNOP (International Research Network for Organizing in Projects), Berlin, Germany, 11–13 October 2009.
46. De Araújo Burcharth, A.L.; Knudsen, M.P.; Søndergaard, H.A. Neither invented nor shared here: The impact and management of attitudes for the adoption of open innovation practices. *Technovation* **2014**, *34*, 149–161. [\[CrossRef\]](#)
47. Rangus, K.; Slavec, A. The interplay of decentralization, employee involvement and absorptive capacity on firms’ innovation and business performance. *Technol. Forecast. Soc. Chang.* **2017**, *120*, 195–203. [\[CrossRef\]](#)
48. Amundsen, O.; Aasen, T.M.B.; Gressgård, L.J.; Hansen, K. Preparing organisations for employee-driven open innovation. *Int. J. Bus. Sci. Appl. Manag.* **2014**, *9*, 24–35.
49. Podmetina, D.; Soderquist, K.E.; Petraite, M.; Teplov, R. Developing a competency model for open innovation: From the individual to the organisational level. *Manag. Decis.* **2018**, *56*, 1306–1335. [\[CrossRef\]](#)
50. Du Chatenier, E.; Verstegen, J.A.; Biemans, H.J.; Mulder, M.; Omta, O. The challenges of collaborative knowledge creation in open innovation teams. *Hum. Resour. Dev. Rev.* **2009**, *8*, 350–381. [\[CrossRef\]](#)
51. Chiaroni, D.; Chiesa, V.; Frattini, F. The Open Innovation Journey: How firms dynamically implement the emerging innovation management paradigm. *Technovation* **2011**, *31*, 34–43. [\[CrossRef\]](#)
52. Da Mota Pedrosa, A.; Välling, M.; Boyd, B. Knowledge related activities in open innovation: Managers’ characteristics and practices. *Int. J. Technol. Manag.* **2013**, *61*, 254–273. [\[CrossRef\]](#)
53. Naqshbandi, M.M.; Tabche, I.; Choudhary, N. Managing open innovation: The roles of empowering leadership and employee involvement climate. *Manag. Decis.* **2019**, *57*, 703–723. [\[CrossRef\]](#)
54. Duryan, M.; Smyth, H. Service design and knowledge management in the construction supply chain for an infrastructure programme. *Built Environ. Proj. Asset Manag.* **2019**, *9*, 118–137. [\[CrossRef\]](#)
55. Pollack, J. Transferring knowledge about knowledge management: Implementation of a complex organisational change programme. *Int. J. Proj. Manag.* **2012**, *30*, 877–886. [\[CrossRef\]](#)
56. Partington, D.; Pellegrinelli, S.; Young, M. Attributes and levels of programme management competence: An interpretive study. *Int. J. Proj. Manag.* **2005**, *23*, 87–95. [\[CrossRef\]](#)
57. Pellegrinelli, S.; Pellegrinelli, S. *Thinking and Acting as a Great Programme Manager*; Palgrave Macmillan: New York, NY, USA, 2008.
58. Hoegl, M.; Parboteeah, P. Autonomy and teamwork in innovative projects. *Hum. Resour. Manag.* **2006**, *45*, 67–79. [\[CrossRef\]](#)
59. Wen, Q.; Qiang, M.; Gloor, P. Speeding up decision-making in project environment: The effects of decision makers’ collaboration network dynamics. *Int. J. Proj. Manag.* **2018**, *36*, 819–831. [\[CrossRef\]](#)
60. Bushuyev, S.; Verenych, O. Organizational maturity and project: Program and portfolio success. In *Developing Organizational Maturity for Effective Project Management*; IGI Global: Ukraine, PA, USA, 2018; pp. 104–127.
61. Cheah, S.L.Y.; Ho, Y.P. Effective industrial policy implementation for open innovation: The role of government resources and capabilities. *Technol. Forecast. Soc. Chang.* **2020**, *151*, 119845. [\[CrossRef\]](#)
62. Badir, Y.F.; Frank, B.; Bogers, M. Employee-level open innovation in emerging markets: Linking internal, external, and managerial resources. *Acad. Mark. Sci. Rev.* **2020**, *48*, 891–913. [\[CrossRef\]](#)
63. Caetano, M.; Amaral, D.C. Roadmapping for technology push and partnership: A contribution for open innovation environments. *Technovation* **2011**, *31*, 320–335. [\[CrossRef\]](#)



64. Laine, T.; Korhonen, T.; Martinsuo, M. Managing program impacts in new product development: An exploratory case study on overcoming uncertainties. *Int. J. Proj. Manag.* **2016**, *34*, 717–733. [[CrossRef](#)]
65. Miterev, M.; Engwall, M.; Jerbrant, A. Exploring program management competences for various program types. *Int. J. Proj. Manag.* **2016**, *34*, 545–557. [[CrossRef](#)]
66. Parolia, N.; Jiang, J.J.; Klein, G.; Sheu, T.S. The contribution of resource interdependence to IT program performance: A social interdependence perspective. *Int. J. Proj. Manag.* **2011**, *29*, 313–324. [[CrossRef](#)]
67. Steinfort, P. Community and post-disaster program management methodology. *Int. J. Proj. Manag.* **2017**, *35*, 788–801. [[CrossRef](#)]
68. Igartua, J.I.; Garrigós, J.A.; Hervás-Oliver, J.L. How innovation management techniques support an open innovation strategy. *Res.-Technol. Manag.* **2010**, *53*, 41–52. [[CrossRef](#)]
69. Porto Gomez, I.; Otegi Olaso, J.R.; Zabala-Iturriagoitia, J.M. Trust builders as open Innovation intermediaries. *Innovation* **2016**, *18*, 145–163. [[CrossRef](#)]
70. Martinez, M.G. Co-creation of value by open innovation: Unlocking new sources of competitive advantage. *Agribusiness* **2014**, *30*, 132–147. [[CrossRef](#)]
71. Näsholm, M.H.; Blomquist, T. Co-creation as a strategy for program management. *Int. J. Manag. Proj. Bus.* **2015**, *8*, 58–73. [[CrossRef](#)]
72. Pollack, J.; Costello, K.; Sankaran, S. Applying Actor–Network Theory as a sensemaking framework for complex organisational change programs. *Int. J. Proj. Manag.* **2013**, *31*, 1118–1128. [[CrossRef](#)]
73. Szromek, A.R.; Naramski, M. Measuring trust in business relations between tourist facilities on one thematic touristic route. *Sustainability* **2019**, *11*, 3935. [[CrossRef](#)]
74. Gray, C. Absorptive capacity, knowledge management and innovation in entrepreneurial small firms. *Int. J. Entrep. Behav. Res.* **2006**, *12*, 345–360. [[CrossRef](#)]
75. Yeşil, S.; Koska, A.; Büyükbese, T. Knowledge sharing process, innovation capability and innovation performance: An empirical study. *Procedia Soc. Behav. Sci.* **2013**, *75*, 217–225. [[CrossRef](#)]
76. Gebauer, H.; Worch, H.; Truffer, B. Absorptive capacity, learning processes and combinative capabilities as determinants of strategic innovation. *Eur. Manag. J.* **2012**, *30*, 57–73. [[CrossRef](#)]
77. Laursen, M.; Killen, C.P. Programming for holistic value creation: Collaboration, coordination and perception. *Int. J. Manag. Proj. Bus.* **2019**, *12*, 71–94. [[CrossRef](#)]
78. Pellegrinelli, S.; Murray-Webster, R.; Turner, N. Facilitating organizational ambidexterity through the complementary use of projects and programs. *Int. J. Proj. Manag.* **2015**, *33*, 153–164. [[CrossRef](#)]
79. Duryan, M.; Smyth, H. Cultivating sustainable communities of practice within hierarchical bureaucracies. *Int. J. Manag. Proj. Bus.* **2019**, *12*, 400–422. [[CrossRef](#)]
80. Liu, Y.; van Marrewijk, A.; Houwing, E.J.; Hertogh, M. The co-creation of values-in-use at the front end of infrastructure development programs. *Int. J. Proj. Manag.* **2019**, *37*, 684–695. [[CrossRef](#)]
81. Shehu, Z.; Akintoye, A. Major challenges to the successful implementation and practice of programme management in the construction environment: A critical analysis. *Int. J. Proj. Manag.* **2010**, *28*, 26–39. [[CrossRef](#)]
82. Trzeciak, M.; Jonek-Kowalska, I. Monitoring and Control in Program Management as Effectiveness Drivers in Polish Energy Sector. Diagnosis and Directions of Improvement. *Energies* **2021**, *14*, 4661. [[CrossRef](#)]
83. Nogeste, K. Understanding mergers and acquisitions (M & As) from a program management perspective. *Int. J. Manag. Proj. Bus.* **2010**, *3*, 111–138. [[CrossRef](#)]
84. Bell, E.; Bryman, A.; Harley, B. *Business Research Methods*; Oxford University Press: Oxford, UK, 2018.
85. Cresswell, J.W. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 3rd ed.; SAGE: London, UK, 2009.
86. Granato, D.; Santos, J.S.; Escher, G.B.; Ferreira, B.L.; Maggio, R.M. Use of principal component analysis (PCA) and hierarchical cluster analysis (HCA) for multivariate association between bioactive compounds and functional properties in foods: A critical perspective. *Trends Food. Sci. Technol.* **2018**, *72*, 83–90. [[CrossRef](#)]
87. Sienkiewicz-Małyjurek, K.; Owczarek, T. Complementarity of Communication and Coordination in Ensuring Effectiveness of Emergency Management Networks. *Sustainability* **2021**, *13*, 221. [[CrossRef](#)]
88. Hoła, B.; Nowobilski, T. Classification of economic regions with regards to selected factors characterizing the construction industry. *Sustainability* **2018**, *10*, 1637. [[CrossRef](#)]
89. Mojena, R. Hierarchical grouping methods and stopping rules: An evaluation. *Comput. J.* **1977**, *20*, 359–363. [[CrossRef](#)]
90. Delavari, M.; Sobhiyah, M.H. A theoretical model for new product development performance in open innovation environments based on program management capabilities. *J. Manag. Improv.* **2018**, *11*, 137–159.
91. Pénin, J.; Hussler, C.; Burger-Helmchen, T. New shapes and new stakes: A portrait of open innovation as a promising phenomenon. *J. Innov. Econ. Manag.* **2011**, *1*, 11–29. [[CrossRef](#)]
92. Xia, H.; Weng, J. Effectiveness of industry-university-research cooperation in China: Impact of innovation input and open innovation environment. *Int. J. Innov. Sci.* **2021**, *14*, 62–78. [[CrossRef](#)]
93. Lisowska, R.; Stanisławski, R. The cooperation of small and medium-sized enterprises with business institutions in the context of open innovation. *Procedia Econ. Financ.* **2015**, *23*, 1273–1278. [[CrossRef](#)]
94. Villani, E.; Rasmussen, E.; Grimaldi, R. How intermediary organizations facilitate university–industry technology transfer: A proximity approach. *Technol. Forecast. Soc. Chang.* **2017**, *114*, 86–102. [[CrossRef](#)]

95. Huang, T.; Wang, W.C.; Ken, Y.; Tseng, C.Y.; Lee, C.L. Managing technology transfer in open innovation: The case study in Taiwan. *Mod. Appl. Sci.* **2010**, *4*, 2. [[CrossRef](#)]
96. Naramski, M.; Szromek, A.R.; Herman, K.; Polok, G. Assessment of the Activities of European Cultural Heritage Tourism Sites during the COVID-19 Pandemic. *J. Open Innov. Technol. Mark. Complex.* **2022**, *8*, 55. [[CrossRef](#)]