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A QCA Analysis of Knowledge Co-Creation Based on University–Industry Relationships

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Abstract: This research aims to identify typologies of companies willing to cooperate with universities to foster knowledge co-creation and ease knowledge transfer to students within courses, training, communities of practises, etc., regardless of the business sector they are active in. To implement the research scope, we rely on the qualitative comparative analysis method (QCA). Interactions between causal factors within the university–industry relations, and knowledge co-creation have been examined. The results obtained indicate two typologies. Type 1 includes companies oriented towards supporting interactions with universities based on education, research, student placements, training, and community services such as consultancy, and product development. These acknowledge both the necessity of creating platforms to establish more ties with universities and the importance of alumni connections to develop effective campus management. Type 2 includes companies that are not interested in understanding or supporting the mission of universities in society, not developing ties with universities, and generating only a superficial interaction, which hinders their involvement in the creation of knowledge with universities. From a managerial perspective, this paper highlights the relationship between universities and industry and how this could contribute to increased resilience for a society facing unexpected challenges, such as the global crisis related to COVID-19 and the present state of international political instability.

Keywords: knowledge and technology transfer (KTT); policies; science, technology, and innovation (STI); knowledge co-creation; university–industry cooperation

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1. Introduction

In recent years, the emphasis placed on the development of education and research within universities as key players in solving the 'great challenges' of the knowledge society has increased [1]. In a knowledge-based economy, the role of higher education institutions is to generate and achieve knowledge transfer to the socioeconomic environment. They are responsible for the development, monitoring, and management of innovative and co-creation processes, and current trends that focus on the concept of 'open innovation' [2–5].

The collaboration between universities and companies aims at sharing research results, but also on developing different resources such as knowledge, ideas, expertise, certificates, and patents and towards moving to a better expansion and valorisation of products and services created together. Universities, as knowledge providers, support local and regional developments and are actively involved in strategic partnerships with companies and various organisations. This university–industry cooperation allows the use of attained knowledge to enhance the innovation potential [6].

Although the literature analyses the conceptualisation and contextualisation of knowledge co-creation in the academia–industry relationship [7–11], few studies approach the dynamics of this phenomenon at a relational level, involving the representatives of academia and industries and aiming to highlight how collaborative relations in real contexts could be established [12–14]. At the same time, the literature is scarce concerning the application of the QCA method in studying such relationships and in establishing the causal factors that determine their combination to measure the university–industry relation, which facilitates innovation through knowledge co-creation to enable KTT. The purpose of this research is to create, with the aid of qualitative comparative analysis, a prototype that measures real-life data generated by the university–industry relationship for knowledge co-creation through close cooperation, maintaining permanent interaction through workshops, communities of practise, consolidating campus management, to develop and/or anchor specific skills among students, and consolidate the student–industry relationship, to facilitate knowledge, and/or to develop the various shared projects of bi-directional knowledge transfer. Such intense university–industry cooperation facilitates innovation and knowledge co-creation [15–18].

QCA has been developed from Mill's canonical writings [19] with the aim of establishing causal relationships by means of systematic comparisons (the method of concord and difference). During recent years, there has been an increasing trend to adopt qualitative comparative analysis (QCA), developed on Boolean logic, because it managed to successfully replace previous correlation methods, thus allowing the establishment of causal conditions aimed at obtaining a certain result [20–24]. QCA allows using empirical data to generalise the analysis and to replicate that for future studies, but also to construct logical sentences (typologies of interaction) due to qualitative research into the investigated domain [20,21,25]. In this sense, one considers the prototype which facilitates innovation and knowledge co-creation based on typologies of interaction. This method can respond efficiently and parsimoniously to the challenges of illustrating the causal mode where the set of variables or typologies of interaction facilitate innovation and knowledge co-creation, between companies and universities [26–28].

The aim of the paper is to delimitate typologies of companies eager to establish relationships with universities to generate knowledge co-creation and thus ease students' access to them, but also foster knowledge assimilation within common courses, training, communities of practises, etc. Such company strategies may lead to an increase in the resilience for a society that is confronted with unexpected challenges when considering potential trippers for certain approaches of knowledge co-creation (the societal impact of science). This result is based on knowledge and technology transfer in terms of the future impact (sufficiency in the relationship) of societal development [14,29].

The paper is structured as follows: Section 2 contains the literature review concerning university–industry knowledge co-creation, highlighting the multifaceted phenomenon and its links to bidirectional knowledge transfer in the university–industry, along with the necessary factors enhancing this phenomenon. In conducting the survey of scholarly sources, we followed the recommendations of the previously published papers [30–34] which highlight the necessity of delimitating knowledge based on a systematic literature review on the considered research topic. Therefore, papers were selected according to the relevant keywords ('university–industry relationship/cooperation', 'co-creation', 'knowledge transfer'; 'QCA', 'knowledge co-creation') from both international well-ranked databases such as Scopus and Web of Science, but also international publishers such as

Emerald, Elsevier, Springer, etc. In this way, we could ensure that the literature review is systematically conducted, transparent and replicable [32–36]. We also followed the steps of 'Methodi Ordinatio' proposed by Pagani et al. [37,38] to only include the most relevant literature.

Section 3 is dedicated to the explanation of the Qualitative Comparative Analysis (QCA) theory and the way it translates to research, allowing the analysis of various cases and/or complex situations, and helping to explain the phenomenon in question in certain cases, but not all. This leads to Section 4, a presentation of the research methodology, including the research context, followed by Section 5, which contains the obtained results. Section 6 contains the research discussion, which highlights the originality of this research effort by comparing the obtained results with those from the literature. The last section covers the conclusions, consisting of both the theoretical contributions of the paper and the managerial implications, including limitations and perspectives of the research.

2. Literature Review

In the 19th century, research became one of the key activities of universities, ranked second only behind teaching. The 1980s marked another milestone in the evolution of research on the role of universities in society. This was signalled by a third mission, namely social development [39]. Due to the new function of establishing relationships with industry, academia is no longer perceived solely as a producer and disseminator of knowledge [40]. Academia is thus granted a pivotal role in fostering sustainability at local, regional, and national levels through inter-sectorial collaborations [41]. The emergence of this relationship between the university and the industrial domain (UI) as key players in the development of the innovation system has also increased connections between science and industry, creating a variety of collaborations [42] and improving economic performance, competitiveness, and innovation [43]. Various empirical studies analyse the factors that influence the innovation of companies that interact with universities [44]. However, there are surprisingly few articles that investigate the relationships between the innovation performance of companies, moreover, university–industry interactions [45]. There are few studies focused on whether the presence of cooperation, no matter what its purpose might be, influences or affects innovative performance [46]. Research measures the degree of innovation of companies revealed by licences and patents [46,47]. While measuring the impact of the interaction between university and industry on innovation, the literature has not considered whether the university–industry interaction is an important driver of innovation-based operations implemented by companies [48]. Knowledge about the university–industry type of university–industry interaction or configuration of the mentioned interaction creates high innovative performance, staying with a reduced level of knowledge, precariously tested empirically by previous literature [46]. Mikhailov et al. [47] orient themselves towards the investigation of the process of modelling the university–industry relationship towards the co-creation of knowledge based on the information and technology transfer as a facilitator of societal development.

The difference between theoretical knowledge and practical knowledge and its application [49], and the common exploration of usage may determine that the parties involved must identify the proper way knowledge allows a proper and synergically integration and broadening and its further development [6]. The term that governs co-creation highlights the idea that something new is jointly produced to have creation [50]. Co-creation of knowledge or value [51–53] is particular to university–industry collaborations. Value co-creation is based on different possibilities of mixing knowledge, thus allowing added new ideas to existing ones and further developing it [6]. Processes that generate (added) value are sharing and collaborating towards transfer, with the aim of reaching maximum utility [54]. In these processes, the emphasis is placed on utilising knowledge and on the way value is created, namely on value-in-use, which involves putting knowledge into practise, and on value-in-context, which refers to how culture, history, but also situational and social factors determine how knowledge is exploited [6,55].

Participants in knowledge co-creation processes (universities, companies) must undertake an active role, as genuine engagement and involvement are crucial for knowledge usage [56] because of the ambiguity of its tacit component [49,57,58]. Experience and individual perspectives (universities–industry) constitute the basis for knowledge co-creation [59]. To obtain optimum stakeholder results, partners should focus on knowledge co-creation rather than on simple inter-partner knowledge transfer [10,49,60]. The activity is guided by academic expertise but is modelled around the target environment, product supply, and company capabilities. Academic engagement encompasses 'knowledge-related collaborations' [61] (p. 2) involving universities and external parties, including collaborative research, consultancy, and academic entrepreneurship, as well as informal efforts such as ad hoc consulting [3]. Knowledge co-creation starts from conceptualizing and designing an activity, and goes on to the completion, reporting, and sharing of results [61–63]. Collaborations based on the university–industry knowledge transfer are partnerships developing new technologies, offering new practise sites for students and dual studying [9,64,65], and organising lectures, workshops, and conferences for students together with industry experts [11]. These have been exponentially amplified, becoming a joint effort of industry and educational and research institutions to solve issues of common interest cooperatively [66]. Partnerships within the university–industry propose to diminish or even close the gap between theoretical knowledge offered by higher education institutions and the practical knowledge demanded by industries [67,68], as they are essential in maintaining entrepreneurial activities [69]. These collaborations become proper channels through which co-creation takes place towards knowledge transfer. The benefits are mutual—on the one hand, students can form a more accurate opinion of employer expectations and requirements; on the other hand, companies receive help in hiring future employees [9,70,71]. Knowledge transfer occurs through a variety of mechanisms and forms, which vary from hiring students and/or alumni, personnel exchange, internships, involving students in industry-related research projects, consultancy, scholarships, and other privately financed facilities, meetings, symposiums, and/or conferences organised by industry experts and successful entrepreneurs [7–11,72].

When supporting the commercialisation of technological knowledge, universities often resort to establishing concerned structures, such as technology transfer offices, science parks, and/or business incubators [65,70,72], offering expertise and/or up-to-date research results to industry [73]. This validates the idea that knowledge transfer can be evaluated by detecting modifications in knowledge [74] or performance within companies, since industries, by utilising knowledge gained from universities [75], can form innovation clusters. The literature [74,76] detects commensurable factors of transfer valuables in the university–industry: (1) drivers for undertaking collaborative engagement, (2) transfer activities conducted in interactions, (3) factors involved in the transfer process, (4) enablers and barriers to knowledge transfer, and (5) innovation outcomes in the transfer process. Knowledge transfer has various approaches [74]: (1) technology adoption, (2) work reorganisation, (3) more qualified workforce, (4) learning of organisational skills, (5) management practises, (6) industry policies, (7) entrepreneurial ability of companies and the region, (8) work organisation and (9) tacit and codified knowledge, leading to the emergence of the concept of intelligent specialisation with a direct impact on the growth of the student base—an essential vector in advancing knowledge and the knowledge-shared economy [8,70,74,75]. The literature is orientated towards the study of the UI relationship from the perspective of innovation to the detriment of co-creation results [46,47].

Universities are encouraged to initiate research based on the impact and co-creation of key players outside academia. This surpasses the traditional vision of scientific communication, which is frequently interpreted as knowledge transfer. The main concern is the societal impact of science, with which we associate terms such as "cocreation, crowdsourcing, science 2.0, incorporating open science, access, and data" [1]. The last decade has seen a rising focus on knowledge sharing, science-based policymaking, co-creation, and the control post of academia in shaping social progress [1,68,75].

3. ConQCA Configurational Theories

From the theoretical context previously created, we deduced that the nature of our research is exploratory, typical for inductive QCA [77–80]. QCA is an advanced methodology playing a role in examining the hypotheses of research and in creating new theories [68,81]. According to the literature, QCA has three main variations: QCA with an unclear set (fsQCA), QCA with clear sets (csQCA), and QCA with multiple values (mvQCA) [82]. The nature of the involved data, as well as the aim of our research, determined us to select fsQCA as in other cases that use the same methodology [68,82,83]. The development of our research around the QCA framework places it around research to identify all possible solutions that explain a result to test the specific relational models among the variables studied [20–22].

Consequently, the fsQCA algorithm revolves around the idea of sharing the sample in subsets, thus examining more combinations of conditions. The research focuses on the conjectural causality that always supposes that there is no permanent and uniform causality, but a causality specific to the background and configuration [84,85]. Causality generates the possibility to elaborate causal explanations for the 'success' and/or 'failure' of the results of the fsQCA research. In our study, fsQCA investigates the manner in which the result (level of development of university–industry interactions) are associated with the entry variables (interactions, expectations from universities, from the collaboration between universities and industry, participating at special workshops, understanding the concept of management of the campus) in a causal combination that generates expectations within the institution regarding the co-creation of knowledge in university–industry interactions.

4. Research Methodology

4.1. Research Context

The mission of academia in the 21st century is to support innovation and competitiveness, not only through the provision of remarkable educational processes and research but also through large-scale interactions with companies and society. The literature [64,74,75] demonstrates the positive contribution that universities make to socioeconomic development. However, companies do not always understand how to benefit from their interactions with universities, how to contribute to knowledge co-creation, or how to "profit from" the extensive knowledge that has been developed together with higher education institutions during bootcamps, communities of practise, and/or learning [11,86]. The scenario this research is based on refers to the situation in which universities must be open and accessible for local companies to co-create knowledge and to favour alumni insertion within the labour market [10]. It would be useful for companies to accept and understand that the mission of universities is to contribute to knowledge co-creation to sustain a society based on knowledge and progress, and to streamline students' entry into the labour market by familiarising them early not only with employers' requirements on necessary skills but also with subsequent responsibilities and duties as future employees [1,39].

Data were collected through a questionnaire distributed during the COVID-19 pandemic to managers of 45 francophone companies listed in the Transylvanian Annuary of Francophone Companies, Romania. When the research was conducted, only 45 companies were present in this Annuary [87], therefore the investigation was an exhaustive one, comprising all companies in the respective sector. To ease the fill-in, respondents were presented with the research scope, but also with a letter of intent. Of those that were active, 4.44% of them were in Agri-food (active since 2006 on national level, since 2009 on regional level and since 2016 on international level); 6.67% of the sample were in architecture, real estate, interior design (active since 2009 on national level, since 2011 on regional level and since 2015 on international level); 11.11% of the sample in Trade (active since 2006 on national level, since 2008–2010 on regional level and since 2017 on international level; 20.00% of the sample in consulting (active since 1994 on national level, since 2003 on regional level and since 2011 international level); 4.44% of the sample in Energy, water, and environment (active since 1856 on national level and since 1991 on regional

level, international market); 28.89% of the sample in industry, construction, and public works (active since 1977 on national level, since 2000 on regional level and since 2013 on international level); 6.67% of the sample in logistics, transport, and related activities (active since 2010 on national level and since 2014 on international level); 6.67% of the sample in Recruitment and training (active since 2001 on national level, since 2007 on regional level and since 2010 on international level); 2.22% of the sample in general services (active since 2015 on national level, since 2016 on regional level and targeting the international market); 2.22% of the sample banking and insurance (active since 1999 on the national market). Of the sample, 2.22% were in communication and public relations (active since 2015 at a national level); 4.44% of the sample was in information and communications technology (active since 2015 on a national level, since 2016 on a regional level, and targeting the international market). The questionnaire was created on the model of the Carnegie Mellon Questionnaire centered on research and industrial development [88]. The database of the inquiry of university–industry relationships were built as follows: firms were contacted by phone, and those who accepted to participate in the valuation receivd the questionnaire online. These companies had been cooperating with universities for a long time, their representatives having participated in workshops, boot camps, and other events organised in partnership with universities to facilitate knowledge co-creation and entrepreneurial up-skilling by students, and to facilitate their insertion into the labour market. The data collected were analysed according to the literature [89,90].

In identifying the manner of knowledge co-creation in the university–industry relationship, we followed the following steps:

1. Adopting communication and collaboration practises regarding negotiation is the key to successful cooperation, and these practises must be understood by companies. Through collaboration, companies and universities reach mutual understanding, improve transparency, implement a solid structure within the collaborative framework with clear milestones, and are open to negotiations. The two parties understand that intense communication gets down to the team level. In contrast to a managerial top-bottom approach, it determines a win-win relationship [75] and may form innovation clusters, innovative ecosystems, networks of technology transfer centers, etc.
2. Creating an interaction portfolio with universities is built around research, training, personnel placement, knowledge exchange between employees out of various universities, and/or technological services (consultancy, testing, and prototyping).
3. Research and teaching staff are essential pillars when it comes to most interactions between universities and industry. To endorse such interactions, higher education institutions might let and encourage academics to cooperate more often and/or more intensely with the industry, offering, for instance, consistent and significant support in each initiative. Representatives of both universities and companies could grow new applications to produce more relationships. Links with alumni are very helpful as they act an essential part in connecting academia to industry endeavours, which universities could further grow and employment to produce knowledge.

The starting hypothesis of this research paper is that companies that share a suite of engagement with universities afford additional gains stemming from various endeavours and activities within academia. The literature [9,71,91] suggests that academics, through personal relationships with company representatives, constitute true catalysts for university–industry interactions, knowledge co-creation, and for the development of efficient campus management, sustaining technology transfer offices which consolidate institutional links, facilitating the identification of an engagement portfolio favourable to all parties involved.

4.2. Research Design: The Analysis Prototype and Steps to QCA Application

Our research presents 'empirical results (see Table A1) based on real theoretical knowledge', typical for the QCA approach [92]. In this research context, the causal complexity is guided by three principles: (1) conjunction that refers to a result that derives from the

interdependence of several conditions [92]; (2) equifinality suggests the possibility of multiple ways that lead to the same result [93]; and (3) asymmetry, which means that the found variables are causally linked in a configuration in which they could be linked or nonlinked [94]. The representativeness of the sample does not affect the solutions [95], while its robustness is not affected by the previous values. These values can range from very small (<50 cases) to very large (thousands of cases) [96]. Fuzzy-set QCA may be applied to different types of data (Likert scales, multimodal data) that may be transformed into fuzzy sets in the calibration stage, according to a specific formula [90].

Consequently, the typologies (see Table A1, Appendix A) concerning the expectations at the level of development of university–industry interactions are identified. At the end of the research, with the help of QCA, we identified all possible combinations of independent variables, compatible with causal processes linked to competing explanations of the result (see Table A1). The application of classical procedures of analysis based on variation may be reached in the situation where independent variables compatible with different causal processes may be detected as anomalous or undetected values so that important results are lost. Research results obtained based on the QCA method do not have the aim to identify the net effects of causal conditions [97], but they contribute to discovering causal combinations of necessary and/or sufficient variables [20,95] for producing the research result [98] (see Table A1). The imposed analysis prototype [90,92,95] when the QCA application is decided comprises several steps.

The actions performed in the first stage are the projection of the configurational model (the survey), building empirical data (according to Table A1), and calibration of the tool [99]. The stage of verifying the robustness of variables consisted of factor analysis, followed by the validity of the model convergence [100], using the loading factors and significance of the indicator. By applying this method, variables were established that met the criteria of discriminating validity [101]. Interpreting the results, the recommendation according to which alpha Cronbach must overcome 0.6 [102], while the robustness of the compound must overcome 0.7 [100], we obtained the Cronbach value 0.710 and the average values and standard deviation 15:40 $\pm$ 4.202. We concluded that items may be used according to [100] to assess the relationship between university–industry for cocreating knowledge. According to [103], Robustness_Fit = 0.878 QCA is applicable to the present research. We continue the analysis according to the literature [20–22] with a calibration step.

(1) Data from the study are purely categorical, not ordered [104] so calibration is required [100,101] based on external factors (on knowledge and the literature: collaboration between the university and industry—see [64]) and on internal criteria (participating actively meaning co-creation of knowledge by exhibition stands of companies, thematic workshops, professional projects, simulating job interviews), limited to the clear binary sets (csQCA). We selected zero to induce the idea of completely excluded and one for completely included [92,105]. fsQCA allows defining 'qualitative anchors' so that (1) means "completely in" a given set [84,85], (0.5) is 'not inside, not outside" the set, while (0) is 'completely outside' the set [21] to obtain the result.

(2) Simplifying multiple solutions: creating a table of truth using the equation 2^k lines, where k is the number of conditions, each representing a specific configuration [96]. While the number of variables grows, the number of possible configurations grows exponentially (2^k). In conclusion, the larger the number of variables, the more likely combinations will have zero frequency, thus obtaining a table of configurations (the table of truth, Table A3).

(3) Interpreting the results is reduced to studying the table of truth to determine if every combination (every line in the table) explains the result. The solution is a combination of configurations generated in many cases, based on the rule "combination leads to result' (the minimum threshold of acceptance of a rule is 0.75—see [21,92]).

(4) The last stage appeals to Boolean logic, where QCA searches for the simplest combinations of conditions that overlap with the result, through the algorithm to minimise the algorithm Quine-McCluskey. This facilitates the writing of QCA solutions (causal combinations) as Boolean expressions. According to the literature [21,92], our model shows

that the presented paths in Table A4 Appendix D there are complex solutions (the most difficult to interpret), parsimonious (simplified solutions), and intermediary (using only a subset of simplified hypotheses in the parsimonious solution) [90], which means that the proposed model is very consistent.

Our solution of the study consisted of more combinations of associated characteristics with a result, reflecting thus that more combinations can be associated with a given result. The 'core conditions' are first identified, which facilitates obtaining parsimonious solutions and intermediary solutions, respectively [22]. The fsQCA results are presented in the table (see Table A3, Appendix C). Every column represents an alternative combination of conditions (symbol '(○)' indicates the characteristic that facilitates the result, while symbol (●) indicates the absence of the condition [21] that is associated with generating the university–industry relationship to co-create knowledge (see Table A4, Appendix D). Moreover, the qualitative comparative analysis allowed us to identify typologies that facilitate the interpretation of levels of development of the university–industry relationship.

5. Results

The QCA methodology allows the analysis of the distinct casual combination of the generated data [106], effects on expectations regarding the identification of knowledge co-creation within the university–industry relationship and identifying typologies more accurately (in the process of co-creation with universities). This example shows the model in which QCA highlights that our tool managed to reveal the degree of relevance between interactions, expectations (participation, participation, visibility, entrepreneurship) from academia, and expectations (participation, participation, visibility, entrepreneurship) from industry to produce a result (formal interaction of transfer between industry and university). The results of Stage 1 of designing the configurational model (the questionnaire), building empirical data as pure categorical data, appeared only as clear binary sets (Table A1 in Appendix A). Table A1 contains explanations for the dataset which allows the studying of company availability to get involved in the knowledge co-creation process with universities, in generating new ideas and/or valorising opportunities for such collaborations which relate to the growth of new services, products, and/or processes, and to the identification of integrated solutions towards some socioeconomic issues typical of the Twenty-first Century.

In the data analysis stage, theoretical measurements of consistency and coverage took place [20,21] and were used for the evaluation of necessity and sufficiency relations. Using necessity and sufficiency logic [20,21], configurations generating a consistent outcome could be identified. Consistency scores (the degree of match between different conditions which comprise a configuration that leads to an outcome), and coverage (empirical relevance of configurations) were utilised to evaluate outcomes [21,82,90,96]. Table A2, Appendix B shows not just one condition (which measures the interaction between the company and the university), but a mix of conditions that had a consistency value of over 0.80—allowing the results in Table A2 (see Appendix B). According to the results in Table A2, we conclude that the conditions measured individually are not necessary for there to be an outcome.

Hereafter "truth table", contain configurations apt to present data in a more synthetic manner (see Table A3 Appendix C). This table represents different combinations (interaction, expectation, participation) that produced an outcome (university–industry interaction) in the way of a co-creation with universities. The results obtained based on this theory are presented in Table A3, Appendix C. In the last step of constructing Table A3, Appendix C, we resorted to the Quine-McCluskey algorithm [21,96], Table A4. Employing the cluster analysis according to QCA methodology [106] allowed us to analyse distinct combinations identified concerning practises (interactions, expectations from universities, expectations from the university–industry environment collaboration, shared workshops and/or boot camp attendance to generate knowledge, understanding the concept of campus management), to produce an outcome (university–industry interaction) in the knowledge co-creation process with universities. In this case, the model in which QCA showed that our tool managed to reveal the degree of relevance between inputs

(interactions, expectations from universities, expectations from the university–industry environment collaboration, shared workshops and/or attendance to generate knowledge, understanding the concept of campus management), in the knowledge co-creation process with universities. The narrative synthesis (Table A4, Appendix D) set of attributes that must be measured according to the type of relation practised by companies to determine the degree of interactions, expectations, participations, and understanding) based on the overall solution consistency is: Path 1 (Table A4, Appendix D column S1) jointly explains 0.98 of membership in the case of type 1 of relation university–industry and in the case of a non-based relation (superficial—see Table A4, Appendix D column ~S1) also obtain Pathway 2 (Table A4, Appendix D column S2) named superficial relation type 0.96 of membership in the present outcome type 2 result of relation university–industry and in the case of non-based relationship (superficial—see Table A4, Appendix D column ~S2). The finding (see Table A4, Appendix D) shows the existence of various configurations sufficient for the model of university–industry interaction indicates equifinality [95]. The general coverage is 0.98 for the non-superficial type (which means that 98% of the outcome is covered by Pathway 1 containing 18 companies) and 0.91 for the superficial type of university–industry interaction (96% of the outcome is covered by Pathway 2 containing 28 companies) [21,92,96]. Thematic patterns or the narrative synthesis concerning relation typologies for university–industry interaction that emerged are:

Solution (Pathway) 1 (Table A4, Appendix D column S1): reflects the combination with the greatest coverage (indicating 75% of non-superficial interactions for companies), which comprises the cumulative presence of the following outputs: Expectations under the mission of universities (which do not impose a greater effort than consolidating the university–industry relationship), expectations from the university–industry relationship, which does not impose changes in mentality; active participation in professional gatherings; direct involvement in universities; as a 'recipe' that builds the model of non-superficial interactions between companies and universities. This approach was enough to generate the study outcome and is a very good solution to obtain behavioural typologies which lead to non-superficial relations. The type of relationship that will give the university the position of facilitator of societal development towards knowledge co-creation is based on knowledge and technology transfer. This is a result that supports the research results of [1,68,75].

Solution (Pathway) 2 (Table A4, Appendix D column S2): reflects the combination with the greatest coverage (indicating 65% of superficial interactions for companies), which comprises the cumulative presence of the following outputs: Expectations outside of the university mission are immediate and impose a greater effort than defining the university–industry relationship; Expectations from the university–industry relation impose changes in mentality; Passive participation in professional gatherings; Indirect involvement in universities; as a "recipe" that builds the model of superficial interactions between companies and universities. This approach was enough to generate the study outcome and is a very good solution to obtain behavioural typologies that lead to superficial relations.

6. Discussion

The research constitutes an example illustrating a good effect of a combination of methods (QCA, cluster analysis) necessary to study the set of items that facilitate the co-creation of innovation between companies and universities [107]. As compared with previous challenges, we support the idea previously developed in the literature [107] according to which employing QCA is associated with the identification of "standards of good practise". Performing an analysis with QCA prevents the risks of automatic and mechanical application of the analysis [92,108] and guarantees that the results are valid. Cluster analysis can be utilised to determine similarities and models among observed entities, and to explore data since it uses the entire range of available variables, especially as it allows the extraction of the best informational content when data are dichotomous [21,95,96]. The results of the cluster analysis can be understood and validated

theoretically by employing the QCA [84,85]. The OCA enables theoretical shaping where the proposed groups of data transform into exploration groups, which can be accepted or refused as artefacts that do not make sense explanations regarding the studied dimensions. The study highlights the fact that the way knowledge transfer from university to the industry is implemented is strongly influenced by national culture [109]. The typologies of UI interaction were measured and analysed on a sample that was composed exclusively of companies that consider the university to be an important agent in its activities of co-creation as a facilitator of social development in the century of innovation through cooperation. In its turn, this composition of the research sample improves the factor's quality validity of the employed and the results.

Knowledge co-creation facilitates a higher understanding of the procedure where worth can be co-created in universities—industries collaborations. The results validate previous research [110], which demonstrated that a university strongly oriented towards applied research is strongly determined to imply in general activities of KTT, whereas Perkmann et al. [3], showed that skill development in universities is based on the synergy of cooperating with companies from various industries. Universities must orient towards a careful analysis of employment prerequisites [111] to tighten their relationship with companies. Gaining knowledge is not enough to draw on the innovation potential present in university–industry collaborations, because the presence of tacit knowledge makes difficult their identification and usage [112], as the core of future innovation and value creation. Through co-creation, a collaboration between universities and companies' facilities expands the direction of integrating knowledge and supporting innovation, expanding the capacity for recognition of the value of knowledge, as it facilitates innovation. A perspective in the exploration of knowledge co-creation within collaboration among academia and industry representatives is rare and can be approached as a premise for the support of public policies on a local, regional, or national level. This can drive to add value for stakeholders and all communities. QCA helped identify the presence of studied conditions from an ontological point of view, allowing U-I to act in ways that grant and ensure the achievement of results. In conclusion, causes make the results possible [113], as causality is emergent, not deterministic [114].

The results of the current study reinforce previous results [47], namely that the companies which interact with higher education institutions and undertake more elaborate relationships tend to achieve a higher level of innovation than the ones which do not. The first group is orientated towards co-creation and support of the university as a social developer. The results suggest that to achieve a high level of innovation and technology transfer, the company must certainly employ more complex long-term interactions with the university. This facilitates the theoretical, empirical, and political implications, which are always important in all unexpected social changes. The second option allows companies that are not interested in understanding the mission of universities in society and/or not supporting it continuously. These entities do not place emphasis on strengthening ties with academia, generating a typology of superficial interaction that does not allow them to get involved in the creation and/or development of knowledge with universities.

The results of the study support the idea, knowledge of the context, or knowledge preparation is a sub-measure that facilitates co-creation [6]. We can conclude that key university employees (research and teaching staff) represent the essential pillars to initiate the bulk of university–industry interactions. The order of making similar interplays, universities must be actively involved in developing, encouraging, and sustaining academics who wish to cooperate more frequently and/or more intensely with companies, offering them consistent and significant support in every initiative. University representatives, together with those of companies, could develop new platforms of knowledge sharing to improve knowledge generation. Of great importance to alumni are connections, which play a key role in industry relations with universities. These must be continuously developed and used for knowledge generation. To provide empirical evidence for this research, we examined four important pathways necessary to construct the business

model according to expectations, in terms of participation, participation, visibility, and entrepreneurship. Later, using data from 45 companies, a QCA analysis was implemented, which concluded that the inputs were not exclusively present; in all the resultant configurations meant to model businesses that generated innovation through knowledge co-creation, integrative, and differentiated antecedents were present. This model was heterogeneous in its configurations.

Unborn studies on knowledge creation could concentrate on how it wastes resilience [6]. Resilience is related to an increased ability to cope with a series of challenges [115], and the links between resilience and knowledge readiness could therefore be an attractive zone for research

7. Conclusions and Implications

7.1. Theoretical Implications

From a theoretical perspective, our research enriches the QCA literature applied to social sciences. QCA demonstrates that the tool used succeeded in discovering the degree of relevance of set relations between existing measures (interactions, expectations from universities, expectations from the university–industry environment collaboration, shared workshop attendance, understanding the concept of campus management), which is a causal combination produced effects on expectations regarding the industry model concerning company interactions with universities, identifying more accurately the typologies (pathways) in expectations regarding the level of development of university–industry interactions, validating the results of the cluster analysis. The fsQCA results highlight the importance of understanding academia to have a clearer picture of the model for the development of university–industry relations. Solution 1 identifies those companies that resort to the adoption of communication and collaboration practises by negotiating with academia, aware that collaboration alone is the key to success in terms of knowledge co-creation and a good relationship with academia. This practise is meant to help companies understand the role universities play in the process of knowledge co-creation and their own contribution to this relationship. In practise, companies and universities achieve mutual understanding, enhance transparency, implement a solid structure within the collaborative framework with clear milestones, and are open to negotiations. The two parties understand that intense communication gets into the team level. In contrast to a top-bottom approach, it determines a win-win relationship. This type of relationship will give the university the position of facilitator of societal development toward knowledge co-creation based on knowledge and technology transfer.

Type one typology identifies those companies orientated towards creating an interactive portfolio with universities, built around research, training, personnel placement, and other services, such as technological services (for instance, consultancy, testing, and prototyping) are the ones accepting the need for a platform that can build more ties among them and alumni connections to develop effective campus management. This type of relationship is highlighted in the literature [45], which demonstrates that the most frequent interactions between universities and industry (UI) are orientated towards development. Many companies forward the university not only to optimise their products or processes, but also to achieve a much higher point of novelty and co-creation, thus tendering the university the function of societal evolution.

7.2. Practical Implications

From a practical perspective, this paper contributes by creating a measuring prototype of real-life contexts within the university–industry relationship for knowledge co-creation and determining the actual level of training of key players involved, based on the QCA. The application of QCA was considered an appropriate method for researching complex causality that stands between qualitative and quantitative models, and thus possesses strong points from both models. The perspectives of this analysis will not only help researchers, but also offer practitioners a good standpoint on numerous pathways (which

are not limited contextually or structurally). Based on this analysis, it is demonstrated that company representatives display a homogenous behaviour within their sector but differ in their perception of relationships with academia (as an important stage in the innovation process through knowledge co-creation depending on the various variables/conditions to obtain the desired outcome, namely university–industry collaboration, thus facilitating innovation and knowledge co-creation). Perceptions are influenced by the market in which companies operate, be they international or regional, whether they use the relevant language at work, whether they desire to be actively involved in academia, or are not reticent about developing management centres. This attitude generated two typologies. In practise, according to the study conducted, we estimate that:

(1) A reduced proportion of companies are constantly involved in the theoretical and practical activities of a course, in which the knowledge assimilated is as envisaged; more precisely, they desire to carry on with their involvement in academic endeavours, reinforcing the idea that university–industry environment collaboration facilitates innovation and knowledge co-creation.
(2) A relatively large number of companies would get actively involved in knowledge co-creation and/or in the strengthening of their relationship with academia, on condition that they obtain immediate benefits or if they estimate that this relationship is sufficiently innovative for them.
(3) University–industry cooperation is, in most cases, oscillating, with various degrees of involvement, generating less satisfaction for its management. The kindness and motivation of management in the industry to maintain and endure a connection with academia are low in the absence of any external impulse.

Involving firms in academia and strengthening each other dealings by knowledge co-creation, the establishment of workshops, lectures, communities of practise, and generating input to the design of curricula compatible with the long-term demands of the labour market, represent central points on which the university–industry relationship can be sustainably made. Involving companies in the development, maintenance, and consolidation of such relations differs due to countless extrinsic and intrinsic factors. The willingness and motivation to implement such efforts are relatively low without appropriate external stimuli from policies, legal frameworks, or the academic leadership's understanding of how facilitating such relationships could improve the employability of their own students, raising awareness of their crucial role in scientific innovation and co-creation that eases knowledge transfer. By using QCA as a supplementary tool in the concept of testing the co-creation potential through the university–industry relationship, managers can identify early on which relationship will be superficial or non-superficial, based on the attributes which define co-creating innovation.

7.3. Limitations and Future Research Perspectives

The limitations of this research are the relatively small number of companies reviewed in this study, along with the time span of the analysis. The technology transfer model is an integration of various types of knowledge, and university–industry collaborations; it is considered helpful by way of its ability to produce knowledge that overcomes mindsets. Another limitation is due to the almost exclusive approach of companies from a single region, despite being nationally relevant, as it is the second most attractive region in terms of foreign investments. Living in an elaborate world, key actors currently must weigh the challenge for which they were not in all readies; for example, the ongoing global crisis related to COVID-19 or the deterioration of international relations because of the war in Ukraine. Could knowledge preparation and co-creation of values be useful perspectives in this respect?

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S.M.; writing—original draft preparation, C.B.P., V.C., L.S. and I.D.P.; writing—review and editing, C.B.P. and D.-C.D.; visualization, C.B.P. and D.-C.D.; supervision, C.B.P.; project administration, C.B.P.; funding acquisition, C.B.P. All authors have read and agreed to the published version of the manuscript.

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Appendix A

Table A1. Input variables used in the QCA analysis.

Types of Existing Interactions between Companies and Universities (Cronbach α: 0.707; Mean: 3.67; Std.Dv.: 0.155)	
1: Knowledge co-creation The knowledge co-creation relation is based on coursework content, or another means of transferring knowledge/abilities with the help of a company representative; the participation of a company representative in examinations/defence committees.	0: Knowledge non-co-creation The knowledge non-co-creation (recruitment activities for students, such as internships; testimonials/feedback from company representatives in relation to someone from your company)
Companies' expectations from universities (Cronbach α: 0.808; Mean: 4.10; Std.Dv.: 0.811)	
1: Expectations under the mission of universities These expectations could be immediate; they do not impose a great effort on consolidating the university–industry relationship; consolidating the students–industry relationship; a better understanding of labour market needs.	0: Expectations outside of the mission of universities Expectations to establish a long-term collaboration that will foster trust in academia and will allow the development/consolidation and/or change of mentality; the lack of positive valorisation within university–industry relationship derives from lack of trust of companies in higher education; the orientation of tertiary education towards company needs (partly accepted: academia prepares students for the labour market, and they upskill in the workplace)
Companies' expectations from the university–industry relationship (Cronbach α: 0.805; Mean: 0.85; Std.Dv.: 0.065)	
1: The companies' general expectations from universities General expectations refer to the existence of qualified and competent staff, rigorous work methods, and the identification of solutions regarding complex industry issues	0: The companies' specific expectations from universities Specific expectations of companies, which refer to internship offers, and specific training adapted to each company, case by case
Active participation of companies in professional gatherings organized with academia with the aim to co-create knowledge specifically for alumni insertion into the labour market (Cronbach α: 0.702; Mean: 0.52; Std.Dv.: 0.501)	
1: Companies desire to take part in such events	0: Companies do not desire to take part in such events and/or criticize their existence
Active participation of companies in professional gatherings organized by academia (Cronbach α: 0.785; Mean: 3.96; Std.Dv.: 1.056)	
1: Active participation Active participation in knowledge co-creation through company display stands; organization of themed workshops; professional projects; hiring interview simulation; workshops; boot camps; hackathons;	0: Passive participation Motivational presentations of the professional success of certain individuals with no focus on knowledge co-creation for the participants

Table A1. *Cont.*

Types of Existing Interactions between Companies and Universities (Cronbach α: 0.707; Mean: 3.67; Std.Dv.: 0.155)	
Campus Management: designing a development and consolidation program for the university–industry environment towards knowledge co-generation (Cronbach α: 0.705; Mean: 0.91; Std.Dv.: 0.066)	
1: Active knowledge co-creation Knowledge co-creation to build and/or consolidate a durable relationship with a certain university, developing and financing research projects with universities	0: Companies' egotistical reasons for self-fulfilment by participating Companies' egotistical reasons: recruiting young graduates after their studies; identifying the talent pool; raising brand awareness among graduates

Note: Output variable: The company interacts with the university. 0: no; 1: yes.

Appendix B

Table A2. Necessary Conditions.

Conditions Tested:	**Consistency**	**Coverage**
1_Interact_total_superficial	0.467	1.000
2_Expectations_immediate_durable	0.500	0.750
3_Expectations_relatons_industry	0.667	0.833
4_Presence_Professional_Sallons	0.533	0.800
5_Typ_Participation	0.533	0.800
6_Reason_Campus_Management	0.233	0.700

Appendix C

Table A3. Truth table.

1	**2**	**3**	**4**	**5**	**6**	**Number**	**0**	**Cases**	**Raw Consist.**	**PRI Consist.**	**SYM Consist.**
0	0	0	0	0	0	12(26%)	0.4167	F2014(1.00;1.00); F2015(1.00;0.00); F2006(1.00;1.00); F2016(1.00;0.00); F1999(1.00;1.00); F2006(1.00;0.00); F2001(1.00;0.00); F2017(1.00;0.00); F2009(1.00;1.00); F2014(1.00;0.00); F1991(1.00;1.00); F2008(1.00;0.00)	0.417	0.417	0.417
0	0	0	1	1	0	6(40%)	0.500	F2004(1.00;0.00); F2009(1.00;0.00); F2002(1.00;0.00); F1977(1.00;1.00); F2004(1.00;1.00); F2007(1.00;1.00);	0.5	0.500	0.500
1	1	1	1	1	1	5(51%)	1.000	F1856(1.00;1.00); F2007(1.00;1.00); F2017(1.00;1.00); F2003(1.00;1.00); F2015(1.00;1.00)	1	1	1
0	0	1	0	0	0	4(60%)	0.500	F2014(1.00;1.00); F2016(1.00;0.00); F2014(1.00;0.00); F2014(1.00;0.00);	0.5	0.5	0.5
1	1	1	0	0	0	4(68%)	1.000	F2009(1.00;1.00); F2011(1.00;1.00); F2010(1.00;1.00); F2012(1.00;1.00)	1	1	1
0	0	1	1	1	0	3(75%)	1.000	F2005(1.00;1.00); F2013(1.00;1.00); F2007(1.00;1.00)	1	1	1
1	1	1	1	1	0	3(82%)	1.000	F1994(1.00;1.00); F2010(1.00;1.00); F2000(1.00;1.00)	1	1	1
0	1	0	0	0	0	2(86%)	0.500	F2006(1.00;1.00); F2011(1.00;1.00)	0.5	0.5	0.5
0	1	1	0	0	0	2(91%)	0.500	F2016(1.00;1.00); F2015(1.00;0.00)	0.5	0.5	0.5

Table A3. *Cont.*

1	2	3	4	5	6	Number	0	Cases	Raw Consist.	PRI Consist.	SYM Consist.
1	0	0	0	0	0	1(93%)	1.000	F2009(1.00;1.00)	1	1	1
0	1	0	1	1	0	1(95%)	0	F2010(1.00;0.00)	0	0	0
1	0	1	1	1	0	1(97%)	1.000	F1994(1.00;1.00)	1	1	1
0	1	1	1	1	0	1(100%)	1.000	F2003(1.00;1.00)	1	1	1

Appendix D

Table A4. Paths to lead to the outcome of relationship university–industry.

Solution	S1	~S1	S2	~S2
7_Interact_total_superficial	○	○	●	○
8_ Expectations_immediate_durable	●	○	○	
9_Expectations_relatons_industry	●	●	●	
10_Presence_Professional_Sallons	●	●	●	●
11_Typ_Participation	●	○	●	●
12_Reason_Campus_Management	○	○	○	
Raw coverage	0.343	0.134	0.433	0.467
Unique Consistency	0.013	0.023	0.033	0.334
Consistency	0.926	0.891	0.904	0.975
Overall solution coverage	0.75		0.65	
Overall solution consistency	0.98		0.96	

Note: ● presence of a condition. ○ absence of a condition. The grey areas indicate necessary conditions. The blue circles indicate core conditions (based on the parsimonious solution); based on [95].

References

1. Stier, J.; Smit, S.E. Co-creation as an innovative setting to improve the uptake of scientific knowledge: Overcoming obstacles, understanding considerations, and applying enablers to improve scientific impact in society. *J. Innov. Entrep.* **2021**, *10*, 35. [CrossRef]
2. Perkmann, M.; Neely, A.; Walsh, K. How should firms evaluate success in university–industry alliances? A performance measurement system. *RD Manag.* **2011**, *41*, 202–216. [CrossRef]
3. Perkmann, M.; Tartari, V.; McKelvey, M.; Autio, E.; Broström, A.; D'Este, P.; Fini, R.; Geuna, A.; Grimaldi, R.; Hughes, A.; et al. Academic engagement and commercialisation: A review of the literature on university–industry relations. *Res. Policy* **2013**, *42*, 423–442. [CrossRef]
4. D'Este, P.; Guy, F.; Iammarino, S. Shaping the formation of university-industry research collaborations: What type of proximity does really matter? *J. Econ. Geogr.* **2013**, *13*, 537–558. [CrossRef]
5. Leydesdorff, L. *Triple Helix of University-Industry-Government Relations*; Springer: New York, NY, USA, 2013.
6. Mathisen, L.; Jørgensen, E.J.B. The significance of knowledge readiness for co-creation in university industry collaborations. *Innovation* **2021**, *23*, 534–551. [CrossRef]
7. Muscio, A. Il trasferimento tecnologico in Italia: Risultati di un' indagine sui dipartimenti universitari. *Industria* **2008**, 245–268.
8. Geuna, A.; Muscio, A. The governance of university knowledge transfer: A critical review of the literature. *Minerva* **2009**, *47*, 93–114. [CrossRef]
9. Franco, M.; Silva, R.; Rodrigues, M. Partnerships between higher education institutions and firms: The role of students' curricular internships. *Ind. High. Educ.* **2019**, *33*, 172–185. [CrossRef]
10. Pocol, C.B.; Stanca, L.; Dabija, D.C.; Pop, I.D.; Mișcoiu, S. Knowledge Co-creation and Sustainable Education in the Labor Market-Driven University–Business Environment. *Front. Environ. Sci.* **2022**, *10*, 781075. [CrossRef]
11. Stanca, L.; Dabija, D.C.; Voj, E. Community of Practice: Converting IT Graduate Students into Specialists via Professional Knowledge Sharing. *Kybernetes* **2022**, *51*, 557–581. [CrossRef]
12. Andronie, M.; Lăzăroiu, G.; Iatagan, M.; Uță, C.; Ștefănescu, R.; Cocoșatu, M. Artificial Intelligence-Based Decision-Making Algorithms, Internet of Things Sensing Networks, and Deep Learning-Assisted Smart Process Management in Cyber-Physical Production Systems. *Electronics* **2021**, *10*, 2497. [CrossRef]

13. Andronie, M.; Lăzăroiu, G.; Karabolevski, O.L.; Ștefănescu, R.; Hurloiu, I.; Dijmărescu, A.; Dijmărescu, I. Remote Big Data Management Tools, Sensing and Computing Technologies, and Visual Perception and Environment Mapping Algorithms in the Internet of Robotic Things. *Electronics* **2023**, *12*, 22. [CrossRef]
14. Lăzăroiu, G.; Androniceanu, A.; Grecu, I.; Grecu, G.; Neguriță, O. Artificial Intelligence-based Decision-Making Algorithms, Internet of Things Sensing Networks, and Sustainable Cyber-Physical Management Systems in Big Data-driven Cognitive Manufacturing. *Oeconomia Copernic.* **2022**, *13*, 1045–1078. [CrossRef]
15. Andronie, M.; Lăzăroiu, G.; Ștefănescu, R.; Ionescu, L.; Cocoșatu, M. Neuromanagement Decision-Making and Cognitive Algorithmic Processes in the Technological Adoption of Mobile Commerce Apps. *Oeconomia Copernic.* **2021**, *12*, 863–888. [CrossRef]
16. Lăzăroiu, G.; Pera, A.; Ștefănescu-Mihăilă, R.O.; Mircică, N.; Neguriță, O. Can Neuroscience Assist Us in Constructing Better Patterns of Economic Decision-Making? *Front. Behav. Neurosci.* **2017**, *11*, 188. [CrossRef]
17. Kliestik, T.; Valaskova, K.; Nica, E.; Kovacova, M.; Lazaroiu, G. Advanced methods of earnings management: Monotonic trends and change-points under spotlight in the Visegrad countries. *Oeconomia Copernic.* **2020**, *11*, 371–400. [CrossRef]
18. Nagy, M.; Lăzăroiu, G. Computer Vision Algorithms, Remote Sensing Data Fusion Techniques, and Mapping and Navigation Tools in the Industry 4.0-based Slovak Automotive Sector. *Mathematics* **2022**, *10*, 3543. [CrossRef]
19. Mill, J.S. *A System of Logic*; University Press of the Pacific: Honolulu, HI, USA, 2002.
20. Ragin, C.C. *Fuzzy Set Social Science*; University of Chicago Press: Chicago, IL, USA, 2000.
21. Ragin, C.C. *Redesigning Social Inquiry: Fuzzy Sets and Beyond*; University of Chicago Press: Chicago, IL, USA, 2008.
22. Ragin, C.C.; Fiss, P.C. Net effects analysis versus configurational analysis: An empirical demonstration. In *Redesigning Social Inquiry: Fuzzy Sets and Beyond*; Ragin, C.C., Ed.; University of Chicago Press: Chicago, IL, USA, 2008; pp. 190–212.
23. Vis, B. The Comparative Advantages of fsQCA and Regression Analysis for Moderately Large-N Analyses. *Sociol. Methods Res.* **2012**, *41*, 168–198. [CrossRef]
24. Woodside, A.G. Moving beyond multiple regression analysis to algorithms: Calling for adoption of a paradigm shift from symmetric to asymmetric thinking in data analysis and crafting theory. *J. Bus. Res.* **2013**, *66*, 463–472. [CrossRef]
25. Woodside, A.G. *Case Study Research: Theory, Methods and Practice*; Emerald: Bingley, UK, 2010.
26. Andronie, M.; Lăzăroiu, G.; Ștefănescu, R.; Uță, C.; Dijmărescu, I. Sustainable, Smart, and Sensing Technologies for Cyber-Physical Manufacturing Systems: A Systematic Literature Review. *Sustainability* **2021**, *13*, 5495. [CrossRef]
27. Lăzăroiu, G. Is There an Absence of Capability in Sustainable Development in Universities? *Educ. Philos. Theory* **2017**, *49*, 1305–1308. [CrossRef]
28. Valaskova, K.; Nagy, M.; Zabojnik, S.; Lăzăroiu, G. Industry 4.0 Wireless Networks and Cyber-Physical Smart Manufacturing Systems as Accelerators of Value-Added Growth in Slovak Exports. *Mathematics* **2022**, *10*, 2452. [CrossRef]
29. Andronie, M.; Lăzăroiu, G.; Iatagan, M.; Hurloiu, I.; Dijmărescu, I. Sustainable Cyber-Physical Production Systems in Big Data-Driven Smart Urban Economy: A Systematic Literature Review. *Sustainability* **2021**, *13*, 751. [CrossRef]
30. Dinu, V.; Săvoiu, G.; Dabija, D.C. *A Concepe, a Redacta şi a Publica un Articol Științific. O Abordare în Contextul Cercetării Economice*, 2nd ed.; ASE Publishing House: Bucharest, Romania, 2017.
31. Dinu, V.; Câmpian, V.; Vasiliu, C.; Tăchiciu, L.; Dabija, D.C. Ethics and Integrity in the Context of Economic Research Within Doctoral Schools. *Amfiteatru Econ.* **2022**, *24*, 912–933. [CrossRef]
32. Kraus, S.; Breier, M.; Dasí-Rodríguez, S. The art of crafting a systematic literature review in entrepreneurship research. *Int. Entrep. Manag. J.* **2020**, *16*, 1023–1042. [CrossRef]
33. Lim, W.M. The art of writing for premier journals. *Glob. Bus. Organ. Excell.* **2022**, *41*, 5–10. [CrossRef]
34. Lim, W.M.; Kumar, S.; Ali, F. Advancing knowledge through literature reviews: The "what", "why", and "how" of writing the different types of literature review. *Serv. Ind. J.* **2022**, *42*, 418–513. [CrossRef]
35. Kraus, S.; Ribeiro-Soriano, D.; Schüssler, M. Fuzzy-set qualitative comparative analysis (fsQCA) in entrepreneurship and innovation research–the rise of a method. *Int. Entrep. Manag. J.* **2018**, *14*, 15–33. [CrossRef]
36. Kraus, S.; Mahto, R.V.; Walsh, S. The importance of literature reviews in small business and entrepreneurship research. *J. Small Bus. Manag.* **2021**, 1–12. [CrossRef]
37. Pagani, R.N.; Kovaleski, J.L.; Resende, L.M. Methodi Ordinatio: A proposedmethodology to select and rank relevant scientific papers encompassing the impactfactor, number of citation, and year of publication. *Scientometrics* **2015**, *105*, 2109–2135. [CrossRef]
38. Pagani, R.N.; Petroso, B.; dos Santos, C.B.; Picinin, C.T.; Kovaleski, J.L. Methodi Ordinatio 2.0: Revisited under statistical estimation, and presenting FInder and RankIn. *Qual. Quant.* **2022**. [CrossRef]
39. Dabija, D.C.; Dinu, V.; Postelnicu, C.; Mihăilă, A. Stakeholders' Perception of Sustainability Orientation within a Major Romanian University. *Int. J. Sustain. High. Educ.* **2017**, *18*, 533–553. [CrossRef]
40. Andersson, S.; Berggren, E. Born global or local? Factors influen-cing the internationalization of university spin-offs—The case of Halmstad University. *J. Int. Entrep.* **2016**, *14*, 296–322. [CrossRef]
41. Trencher, G.; Bai, X.; Evans, J.; McCormick, K.; Yarime, M. University partnerships for co-designing and co-producing urban sustainability. *Glob. Environ. Change* **2014**, *28*, 153–165. [CrossRef]
42. Yoon, J. The evolution of South Korea's innovation system: Moving towards the triple helix model? *Scientometrics* **2015**, *104*, 265–293. [CrossRef]

43. Skute, I.; Zalewska-Kurek, K.; Hatak, I.; de Weerd-Nederhof, P. Mapping the field: A bibliometric analysis of the literature on university–industry collaborations. *J. Technol. Transf.* **2019**, *44*, 916–947. [CrossRef]
44. Li, X.; Li, J.; Wu, X. University spillovers, spatial distance, and firm innovation: Evidence at Chinese listed firms. *Emerg. Mark. Financ. Trade* **2020**, *56*, 1504–1519. [CrossRef]
45. Schaeffer, P.R.; Dullius, A.C.; Rodrigues, R.M.; Zawislak, P.A. Searching to bridge the gaps: A new typology of university-industry interaction. *Acad. Rev. Latinoam. Adm.* **2017**, *30*, 459–473. [CrossRef]
46. Arant, W.; Fornahl, D.; Grashof, N.; Hesse, K.; Söllner, C. University-industry collaborations-The key to radical innovations? *Rev. Reg. Res.* **2019**, *39*, 119–141. [CrossRef]
47. Mikhailov, A.; Puffal, D.; Santini, M. University-industry relations and industrial innovation: Evidence from Brazil. *J. Technol. Manag. Innov.* **2020**, *15*, 6–16. [CrossRef]
48. Baba, Y.; Shichijo, N.; Sedita, S.R. How do collaborations with universities affect firms' innovative performance? The role of "Pasteur scientists" in the advanced materials field. *Res. Policy* **2009**, *38*, 756–764. [CrossRef]
49. De Wit-de Vries, E.; Dolfsma, W.A.; van der Windt, H.J.; Gerkema, M.P. Knowledge transfer in university–industry research partnerships: A review. *J. Technol. Transf.* **2019**, *44*, 1236–1255. [CrossRef]
50. De Koning, J.I.; Crul, M.R.; Wever, R. Models of Co-Creation. Service Design Geographies. In Proceedings of the ServDes, Copenhagen, Denmark, 24–26 May 2016; Linköping University Electronic Press: Linköping, Sweden; pp. 266–278.
51. Kambil, A.; Ginsberg, A.; Bloch, M. Re-inventing Value Propositions. In *Working Paper Series Stern*; Leonard N. Stern School of Business: New York, NY, USA, 1996; IS-96-21; pp. 1–33.
52. Zwass, V. Co-Creation: Toward a Taxonomy and an Integrated Research Perspective. *Int. J. Electron. Commer.* **2010**, *15*, 11–48. [CrossRef]
53. Lindgreen, A.; Hingley, M.K.; Grant, D.B.; Morgan, R.E. Value in business and industrial marketing: Past present and future. *Ind. Mark. Manag.* **2012**, *41*, 207–214. [CrossRef]
54. Namisango, F.; Kang, K. A Typology of Knowledge Co-creation in Social Networks. *ACIS 2017 Proceedings 1*. 2017. Available online: https://core.ac.uk/download/pdf/301385171.pdf (accessed on 10 November 2022).
55. Akaka, M.A.; Parry, G. Value-in-context: An exploration of the context of value and the value of context. In *Handbook of Service Science*; Maglio, P.P., Kieliszewski, C.A., Spohrer, J.C., Lyons, K., Patrício, L., Sawatani, Y., Eds.; Springer International Publishing: Cham, Switzerland, 2019; Volume II, pp. 457–477.
56. Lusch, R.F.; Nambisan, S. Service innovation: A service-dominant logic perspective. *MIS Q.* **2015**, *39*, 155–175. [CrossRef]
57. Nonaka, I.; Toyama, R.; Konno, N. SECI, Ba and Leadership: A Unified Model of Dynamic Knowledge Creation. *Long Range Plan.* **2000**, *33*, 5–34. [CrossRef]
58. Eklinder-Frick, J.O. Clustering or interacting for knowledge? Towards an entangled view of knowledge in regional growth policy. *IMP J.* **2016**, *10*, 221–242. [CrossRef]
59. Prahalad, C.K. The blinders of dominant logic. *Long Range Plan.* **2004**, *37*, 171–179. [CrossRef]
60. Abbate, T.; Cesaroni, F.; Presenza, A. Knowledge transfer from universities to low- and medium-technology industries: Evidence from Italian winemakers. *J. Technol. Transf.* **2021**, *46*, 989–1016. [CrossRef]
61. Rossi, F.; Rosli, A.; Yip, N. Academic engagement as knowledge co-production and implications for impact: Evidence from Knowledge Transfer Partnerships. *J. Bus. Res.* **2017**, *80*, 1–9. [CrossRef]
62. Cherney, A.; Head, B.; Povey, J.; Boreham, P.; Ferguson, M. The Utilisation of social science research–The perspectives of academic researchers in Australia. *J. Sociol.* **2015**, *51*, 252–270. [CrossRef]
63. Farr, M. Co-production and value co-creation in outcome-based contracting in public services. *Public Manag. Rev.* **2016**, *18*, 654–672. [CrossRef]
64. OECD. *University-Industry Collaboration: New Evidence and Policy Options*; OECD Publishing: Paris, France, 2019.
65. Kangas, R.; Aarrevaara, T. Higher education institutions as knowledge brokers in smart specialisation. *Sustainability* **2020**, *12*, 3044. [CrossRef]
66. Ha, Y.; Kwon, S. A study on factors influencing the outcomes of university-industry collaborative activities focusing on the faculty's need for and engagement in university-industry collaborative activities. *Indian J. Sci. Technol.* **2016**, *9*, 1–8. [CrossRef]
67. Lai, W.H. Willingness-to-engage in technology transfer in industry–university collaborations. *J. Bus. Res.* **2011**, *64*, 1218–1223. [CrossRef]
68. Jones, S.; Coates, N. A Micro-Level View on Knowledge Co-Creation Through University-Industry Collaboration in a Multi-National Corporation. *J. Manag. Dev.* **2020**, *39*, 723–738. [CrossRef]
69. Wynn, M.; Jones, P. Context and entrepreneurship in Knowledge Transfer Partnerships with small business enterprises. *Int. J. Entrep. Innov.* **2019**, *20*, 8–20. [CrossRef]
70. Draghici, A.; Baban, C.F.; Gogan, M.L.; Ivascu, L.V. A Knowledge Management Approach for The University-Industry Collaboration in Open Innovation. *Procedia Econ. Financ.* **2015**, *23*, 23–32. [CrossRef]
71. Compagnucci, L.; Spigarelli, F. The Third Mission of the university: A systematic literature review on potentials and constraints. *Technol. Forecast. Soc. Change* **2020**, *161*, 120284. [CrossRef]
72. Cramarenco, R.E.; Burcă-Voicu, M.I. Resilient Universities in Pandemic Times. The Case of Babeș-Bolyai University. *Rom. J. Reg. Stud.* **2021**, *15*, 1–14.

73. Polese, F.; Ciasullo, M.V.; Montera, P. Value co-creation in University-Industry collaboration. An exploratory analysis in digital research projects. *Sinergie–Ital. J. Manag.* **2021**, *39*, 117–134. [CrossRef]
74. Fioravanti, V.L.; Stocker, F.; Macau, F. Knowledge transfer in technological innovation clusters. *Innov. Manag. Rev.* 2021, *ahead-of-print*. [CrossRef]
75. Santos, J.B. Knowledge-intensive business services and innovation performance in Brazil. *Innov. Manag. Rev.* **2020**, *17*, 58–74. [CrossRef]
76. Costa Neto, E.; Perin, M.; Ferreira, G. Transferencia de conhecimento: A perspectiva empresarial. *Rev. Gest. Tecnol.* **2019**, *19*, 195–216. [CrossRef]
77. Misangyi, V.F.; Acharya, A.G. Substitutes or complements? A configurational examination of corporate governance mechanisms. *Acad. Manag. J.* **2014**, *57*, 1681–1705. [CrossRef]
78. Campbell, J.T.; Sirmon, D.G.; Schijven, M. Fuzzy logic and the market: A configurational approach to investor perceptions of acquisition announcements. *Acad. Manag. J.* **2016**, *59*, 163–187. [CrossRef]
79. Haxhi, I.; Aguilera, R.V. An institutional configurational approach to cross-national diversity in corporate governance. *J. Manag. Stud.* **2017**, *54*, 261–303. [CrossRef]
80. Federo, R.; Saz-Carranza, A. A Configurational Analysis of Board Involvement in Intergovernmental Organizations. *Corp. Gov. Int. Rev.* **2018**, *26*, 414–428. [CrossRef]
81. Ragin, C.C.; Rihoux, B. Replies to commentators: Reassurances and rebuttals. *Qual. Methods* **2004**, *2*, 22–24.
82. Ragin, C.C.; Fiss, P.C. *Intersectional Inequality: Race, Class, Test Scores, and Poverty*; University of Chicago Press: Chicago, IL, USA, 2017.
83. Ragin, C.C.; Strand, S.I.; Rubinson, C. User's guide to fuzzy set/qualitative comparative analysis. *Univ. Ariz. Ann.* **2008**, *87*, 1–87.
84. Berg-Schlosser, D.; De Meur, G.; Rihoux, B.; Ragin, C.C. Qualitative Comparative Analysis (QCA) as an approach. In *Configurational Comparative Methods. Qualitative Comparative Analysis (QCA) and Related Techniques*; Rihoux, B., Ragin, C.C., Eds.; SAGE: Thousand Oaks, CA, USA, 2009; pp. 1–18.
85. Berg-Schlosser, D.; De Meur, G. Comparative research design: Case and variable selection. In *Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques*; Rihoux, B., Ragin, C.C., Eds.; SAGE: Thousand Oaks, CA, USA, 2009; pp. 19–32.
86. Dima, A.M.; Busu, M.; Vargas, V.M. The mediating role of students' ability to adapt to online activities on the relationship between perceived university culture and academic performance. *Oeconomia Copernic.* **2022**, *13*, 1253–1281. [CrossRef]
87. French Business Club. *Transylvanian Annuary of Francophone Companies*; French Business Club: Cluj-Napoca, Romania, 2020.
88. Cohen, W.M.; Nelson, R.R.; Walsh, J.P. Links and impacts: The influence of public research on industrial R&D. *Manag. Sci.* **2002**, *48*, 1–23.
89. Dillman, D.A. *Mail and Internet Surveys: The Tailored Design Method*, 2nd ed.; John Wiley & Sons: New York, NY, USA, 2000.
90. Rihoux, B.; Ragin, C.C. *Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques*; SAGE: Thousand Oaks, CA, USA, 2009.
91. Mathieu, A. University-Industry interactions and knowledge transfer mechanisms: A critical survey. *Cent. Emile Bernheim CEB Work. Pap.* **2011**, *11*, 15.
92. Schneider, C.Q.; Wagemann, C. *Set-Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis*; Cambridge University Press: Cambridge, MA, USA, 2012.
93. Gresov, C.; Drazin, R. Equifinality: Functional equivalence in organization design. *Acad. Manag. Rev.* **1997**, *22*, 403–428. [CrossRef]
94. Meyer, A.D.; Tsui, A.S.; Hinings, C.R. Configurational approaches to organizational analysis. *Acad. Manag. J.* **1993**, *36*, 1175–1195. [CrossRef]
95. Fiss, P.C. Building better causal theories: A fuzzy set approach to typologies in organization research. *Acad. Manag. J.* **2011**, *54*, 393–420. [CrossRef]
96. Greckhamer, T.; Fiss, P.; Furnari, S. Studying configurations with qualitative comparative analysis: Best practices in strategy and organization research. *Strateg. Organ.* **2018**, *16*, 482–495. [CrossRef]
97. Wagemann, C.; Buche, J.; Siewert, M.B. QCA and business research: Work in progress or a consolidated agenda? *J. Bus. Res.* **2016**, *69*, 2531–2540. [CrossRef]
98. Fiss, P.C. A set-theoretic approach to organizational configurations. *Acad. Manag. Rev.* **2007**, *32*, 1180–1198. [CrossRef]
99. Thiem, A. Conducting configurational comparative research with qualitative comparative analysis: A hands-on tutorial for applied evaluation scholars and practitioners. *Am. J. Eval.* **2017**, *38*, 420–433. [CrossRef]
100. Hair, J.F.; Ringle, C.M.; Sarstedt, M. PLS-SEM: Indeed, a silver bullet. *J. Mark. Theory Pract.* **2011**, *19*, 139–152. [CrossRef]
101. Chin, W.W. Commentary: Issues and opinion on structural equation modeling. *MIS Q.* **1998**, *22*, vii–xvi.
102. Emmenegger, P.; Schraff, D.; Walter, A. QCA, the Truth Table Analysis and Large-N Survey Data: The Benefits of Calibration and the Importance of Robustness Tests. Compasss Working Paper 2014-79. 2014. Available online: https://www.researchgate.net/publication/305497059_QCA_the_Truth_Table_Analysis_and_Large-N_Survey_Data_The_Benefits_of_Calibration_and_the_Importance_of_Robustness_Tests (accessed on 20 December 2022).
103. Nunnally, J.C.; Bernstein, I.H. The Assessment of Reliability. *Psychom. Theory* **1994**, *3*, 248–292.
104. Duşa, A. *QCA with R. A Comprehensive Resource*; Springer International: Cham, Switzerland, 2019.

105. Bojadziev, G.; Bojadziev, M. *Advances in Fuzzy Systems: Applications and Theory: Fuzzy Logic for Business, Finance, and Management*, 2nd ed.; World Scientific Publishing: Singapore, 2007; Volume 23.
106. Miller, D. Challenging trends in configuration research: Where are the configurations? *Strateg. Organ.* **2017**, *16*, 147612701772931. [CrossRef]
107. Fernández-Esquinas, M.; Sánchez-Rodríguez, M.I.; Pedraza-Rodríguez, J.A. The use of QCA in science, technology, and innovation studies: A review of the literature and an empirical application to knowledge transfer. *Scientometrics* **2021**, *126*, 6349–6382. [CrossRef]
108. Gerrits, L.; Verweij, S. *The Evaluation of Complex Infrastructure Projects: A Guide to Qualitative Comparative Analysis*; Edward Elgar: Cheltenham, UK, 2018.
109. Catal, D. The Demola model as a public policy tool boosting collaboration in innovation: A comparative study between Finland and Spain. *Technol. Soc.* **2020**, *63*, 101358. [CrossRef]
110. Arvanitis, S.; Kubli, U.; Woerter, M. University-industry knowledge and technology transfer in Switzerland: What university scientists think about cooperation with private enterprises. *Res. Policy* **2008**, *37*, 1865–1883. [CrossRef]
111. Plăiaş, I.; Pop, C.M.; Băbuţ, R.; Dabija, D.C. Employers' Perception of Competences acquired through Academic Marketing Training. *Amfiteatru Econ.* **2011**, *13*, 448–463.
112. Hermans, J.; Castiaux, A. Knowledge creation through university-industry collaborative research projects. *Electron. J. Knowl. Manag.* **2007**, *1*, 43–54.
113. Beach, D.; Pedersen, R. *Causal Case Study Methods: Foundations and Guidelines for Comparing, Matching and Tracing*; University of Michigan Press: Ann Arbor, MI, USA, 2016.
114. Collier, A. *Crit. Realism: Introd. Roy Bhaskar's Philos*; Verso: London, UK, 1994.
115. Billington, M.G.; Karlsen, J.; Mathisen, L.; Pettersen, I.B. Unfolding the relationship between resilient firms and the region. *Eur. Plan. Stud.* **2017**, *25*, 425–442. [CrossRef]