Co-Opetition in Supply Chain Management and Manufacturing: A Conceptual Literature Review

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Abstract

In this study, it is aimed to conduct a conceptual literature review for co-opetition strategy in manufacturing and supply chain area. Furthermore, these reviewed studies will be quantitatively and qualitatively categorized under different groups. This study will be enlightening the gaps about co-opetition strategy which is mainly applied in manufacturing and supply chain management fields by a conceptual literature review since co-opetition concept gains importance. Even though co-opetition concept is rooted at the end of 90s, the details in co-opetition strategy are still uncertain to manage. Furthermore, the complexity of co-opetition strategy creates many gaps in the literature since the tensions in strategic, operational and management levels may pave the way to a dilemma that co-opetition may make a firm vulnerable. Thus, it is very crucial to comprehend the balance between making profits and not damaging to any company included in this strategy. In that sense, the originality of the paper lies in the fact that the study encompasses mainly the studies published between the years 2004 and 2023, which are the latest studies about co-opetition in manufacturing and supply chain management and investigates the tensions and value creation types by using the latest studies. Furthermore, there is not any study in the literature covering the co-opetition strategy not only in manufacturing but also supply chain management by the latest studies. The current studies in the literature only investigate co-opetition strategy in supply chain management or in manufacturing ecosystem frame separately. Hence, the integration of these fields given that they have both common and different points to be taken into consideration of co-opetition strategy frame, is still missing in the literature. Our findings show that game theory is widely used in the co-opetition literature as a modelling approach. Furthermore, for the latest 3 years, co-opetition field has gained attention from the scholars in terms of manufacturing and supply

This is a peer-reviewed, accepted author manuscript of the following paper: Konyalioglu, A. K., Ates, A., & Paton, S. (2023). Co-opetition in supply chain management and manufacturing: a conceptual literature review. Paper presented at 23rd European Academy of Management Conference, Dublin, Ireland.

chain management. Another important finding is that tensions and value creation in terms of social, economic and environmental aspects are mainly involved in the studies to explain co-opetition broadly.

Keywords: *Co-opetition, supply chain management, manufacturing, tensions*

1. Introduction

Many of companies are now seeking for the ways of how to maximize their profits and how to develop any strategy against their rivals. In this sense, Brandenburger and Nalebuff (1996) defined a new concept, called as co-opetition, indicating that firms are able to simultaneously compete with competitors and also cooperate with them. Another definition of co-opetition by Lado et al. (1997) has been explained that companies can follow a competitive cooperation in order to have a win-win strategy simultaneously and combination of these strategies is likely to create a more profitable relation between them. In manufacturing and supply chain firms, co-opetition strategies gain importance as this type of alliance may create more than one advantages if managed carefully (Luo et al., 2007). Considering that there can exist a dilemma that co-opetition may make a firm vulnerable (Rindfleisch and Moorman, 2003), co-opetition strategy between the firms can be very complex to manage (Dagnino and Padula, 2002). Thus, co-opetition applicability in manufacturing systems and firms is still a very remarkable gap since it is not always certain to prepare a strategy and adapt it to supply chains and manufacturing systems.

Although co-opetition concept has been rooted at the end of 90s, there are still many gaps in order to better understand the context and concept of co-opetition. Thus, there exist many researchers trying to apply different methods to deepen their knowledge about co-opetition and to figure out the “value creation” in the frame of co-opetition (Zineldin, 2004). Furthermore,

not only in supply chains but also in manufacturing systems, companies may collaborate with each other to minimize costs and directly to maximize profits (Gurnani et al, 2007). As these purposes about co-opetition are related to other disciplines as well, it is very important to deeply understand the studies in the literature including interdisciplinary studies, business and management theoretical literature and contextually applied studies. Thus, the gaps about co-opetition should only be understood by integrating different disciplines' perceptions towards co-opetition strategy and concept. Especially, one may argue that operations management in terms of manufacturing processes focuses on supply chain management as a centre point (Bales et al., 2004). When looked at co-opetition concept around manufacturing and supply chain management, co-opetitive relationships in this type of systems can be obtained in different forms and the co-opetitiors are supposed to share different specific experiences for co-opetition strategy as manufacturing and supply chain management in a co-opetitive environment is related (Schiavone and Simoni, 2011).

In this study, it is aimed to provide a conceptual literature review about co-opetition in supply chain management and manufacturing areas in order to deeply comprehend the gaps in this area. Furthermore, the study encloses the tensions about co-opetition strategy, which are defined as a contradiction occurring during the co-opetition strategy due to its paradoxical structure. Furthermore, the tensions are very decisive problematics in co-opetition which can occur in many levels, especially during project phase and networking phase in manufacturing systems and supply chains (Smiljic et al, 2022). Moreover, in this study, two main research questions will be covered to answer while reviewing the studies, the tensions and value creation types will be captured.

RQ1. Which interdisciplinary techniques and methods are used in the studies about co-opetition in supply chains and manufacturing?

RQ2. Which interdisciplinary, extra disciplinary, business and management theory-based studies are used in co-opetition strategy in supply chains and manufacturing area?

2. Methodology

2.1. Data Gathering Search Query

Google scholar and Web of Science (WoS) have been used to gather the studies data for output. Furthermore, the output gathered is illustrated in graphs for indicating a comparison (Fetscherin and Usunier, 2012). Table 2.1 shows article gathering, time period and topics for filtering. Furthermore, Figure 2.1 shows the graphical abstract and graphical road map for the literature review about co-opetition in manufacturing and supply chain management.

Table 2.1. Data gathering search query

Keywords Used for this Review	"Co-opetition", "Co-opetition in Supply Chain Management", "Co-opetition in Manufacturing", "Co-opetition and tensions"
Topics	"Title and Abstract"
Paper Type	Book Chapters and Articles
Language	English
Timeline	2004-2023
Categories	Supply Chain Management, Management, Manufacturing and Management Science

In this part of the literature review study, the research questions given in the introduction section will be answered by grouping the reviewed articles in the literature review and content analysis section. Firstly, as this study mainly forms a conceptual literature review, the question is based upon 70 articles in which interdisciplinary techniques and methods are used in the studies about co-opetition in supply chains and manufacturing. Considering data search query, Figure 2.1 shows the graphical abstract and road map for the study and Figure 2.2 shows the years versus the amount of study for reviewed articles. It has been seen that 2021 and 2022 are the years where co-opetition topic has been mostly reviewed. Also, it can be seen that co-opetition strategy and applicability gain importance as firms want to make profit simultaneously and researchers focus on this topic considering the years 2004 and 2023. As an inclusion criterion, the last 20 years have been chosen to be reviewed about co-opetition in supply chain management and manufacturing.

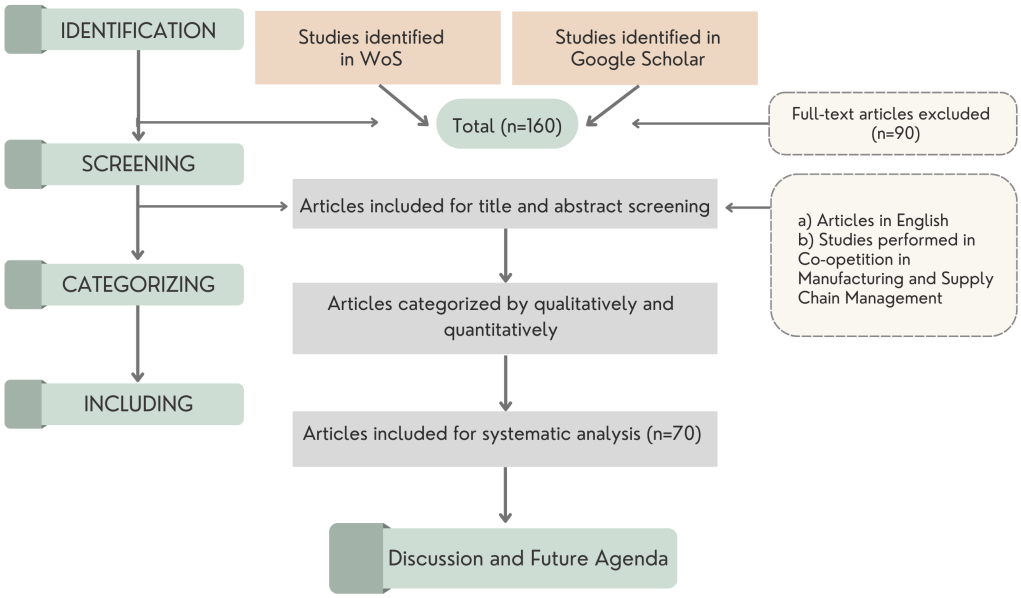

Figure 2.1. Graphical Road map and abstract for the literature review about co-opetition in manufacturing and supply chain management

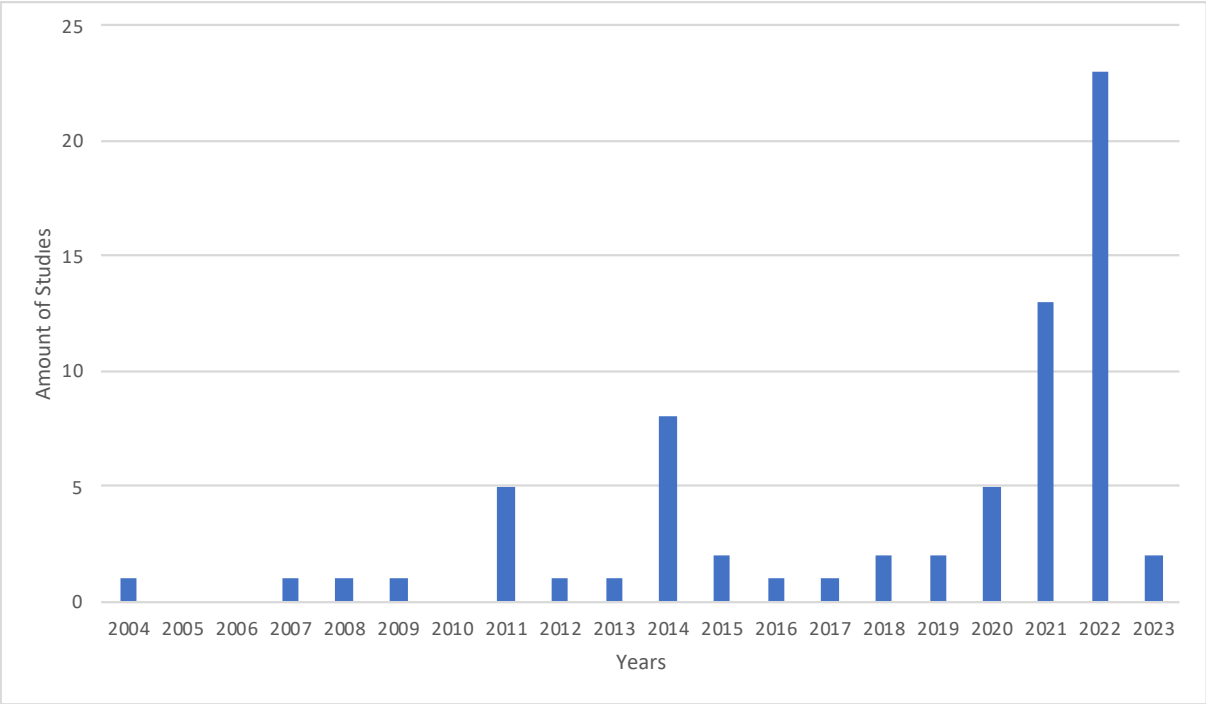

Figure 2.2. Study amount of co-opetition in manufacturing and supply chain management areas vs years

Furthermore, as a bibliometric analysis, the articles have been categorized based on the country where the authors published their studies. According to the table 2.2, it is seen that China is the country that co-opetition in manufacturing and supply chain management studies have been mostly published. It can be also perceived that in Europe, the studies covering co-opetition topic has been starting to increase.

Table 2.2. The country belonging to the authors and amount of studies in co-opetition literature

Countries	Amount of Studies
Australia	2
Brazil	2
Canada	1
China	22
Czech Republic	1
Finland	4

France	4
Germany	3
Greece	2
India	2
Iran	2
Italy	3
Luxembourg	1
Norway	1
Portugal	1
Sweden	2
Taiwan	1
Turkey	1
United Kingdom	4
United Arab Emirates	1
United States	10
Total	70

For the first research question, the articles have been grouped under techniques and methods for the synthesis. It can be seen in the Table 2.3 that game theory is the most used method in the articles. Furthermore, based on Game theory, the author used dynamic approaches as supply chains and manufacturing systems are not static compared to other systems. These mathematical models have been used to illuminate the profit strategies in co-opetition compared to the firms who have only competition or cooperation. In the articles, one may argue based on the game theory models that co-opetition strategy is most profitable as the objective functions of the models used in the article have more feasible areas when co-opetition strategy is applied.

Table 2.3. The methods used in the studies about co-opetition in manufacturing and supply chain management

Method	Amount of Studies
Comparative Case Study	1
Conceptual Framework	17
Conceptual Model	2
Content Analysis	1

Coopetition business models	1
Data Envelopment Analysis	1
Fuzzy Theory	2
Game Theory	23
Latent congruence modeling	1
Literature Review	1
Logistics Regression	1
Network Modelling	1
Paradox Theory	1
Randomized Clinical Trials	1
Resource Based Theory	1
Simulation	2
Statistical Analysis	9
Structural equation modeling	1
SWOT and IE	1
Thematic content analysis	1
Value Net Theory	1
Total	70

Based on the methods used in the studies concerning about co-opetition in manufacturing and supply chain management, Table 2.4 shows the empirical methods used in the studies. Under game theory, different sub-approaches including dynamic approach, evolutionary game theory approach, Sequential biform game method, Stackelberg game model and Two-stage game-based approaches have been mostly used while surveys and interviews have been widely used for qualitative approaches. Furthermore, the majority of articles consists of quantitative research methods.

Table 2.4. The empirical methods used in the studies about co-opetition in manufacturing and supply chain management

Empirical Method	**Amount of Studies**
Agent Based Simulation	1
Shapley value method	1
Case Study	9
Data envelopment analysis (DEA)	1
Discrete Event Simulation	1
Configurational Approach	1
Evolutionary game theory	1
Dynamic Approach	14
Fuzzy Qualitative Approach	1

Hypothesis Testing	1
Fuzzy Sets Techniques	1
Interview	12
Nonlinear Programming	1
Nonlinear Approach	2
Monte Carlo Simulation	1
None	1
Point of view	3
Observation	1
Spatial Dependence Matrix Method	1
Sequential biform game method	1
Spatial Analysis	1
Stackelberg game model	3
Survey	8
Two-stage game	1
The Grounded Theory	1
The Relational View	1
Total	70

Underneath all, although game theory is mainly used in the field of economics, optimization or mathematical modelling, it may be argued that dynamic game theory approach has been used as interdisciplinary research. For business and management theory-based studies, the authors decided to use conceptual frameworks for theoretically understanding co-opetition strategy. Moreover, game theory application may be perceived as an applied disciplinary area as it is directly related to applied optimization for co-opetition strategy since it aims to maximize the profit in every aspect including innovation, money and system related to win-win strategy.

Furthermore, there exist many of journals that co-opetition in manufacturing and supply chain management studies have been published. Table 2.5 illustrates the journals that the studies have been published and their shares in %. According to Table 2.5, Industrial Marketing Management and Transportation Research Part E: Logistics and Transportation Review are the journals that co-opetition is mostly involved and accepted.

Table 2.5. The journals that the co-opetition studies have been published and their shares in % about

Main Journals	Shares in %
Industrial Marketing Management	16%
Transportation Research Part E: Logistics and Transportation Review	6%
European Journal of Operational Research	4%
Long Range Planning	4%
International Journal of Hospitality Management	3%
Journal of Operations Management	3%
Production and Operations Management	3%
Scandinavian Journal of Management	3%
Technovation	3%

3. Literature Review and Content Analysis

In this part of the study, a conceptual literature review and related content analysis including interdisciplinary studies, business and management theoretical literature and contextually applied studies are presented. In this sense, reviewed studies are briefly explained and thereafter, they are grouped under different categories in order to see not only their similarities and differences but also their convergent and divergent points in a timeline-based method. Also, the literature review and content analysis section has been divided into three parts to better analyse the context of the studies.

3.1. Game Theory and Modelling Applications in Co-opetition

In this part of the context analysis, the studies have been investigated in terms of game theory and modelling applications in co-opetition. Firstly, Min et al. (2008) evaluated co-

opetition strategies by considering its parameters in the frame of cluster supply chains and manufacturing via three-step game theory model and compared the strategies by using different game theory models. Mention (2011) highlighted that co-opetition has many affecting factors such as innovation novelties, information from market sources and good-service innovations to broad manufacturing and marketing strategies. In this study, logistics regression is used to evaluate information sources and co-operation types. At the same year, Zhang and Frazier (2011) focused on the modelling of co-opetition in supply chain management systems by game theory and enlightened that strategic alliances in co-opetition may increase supply chain performance.

In 2012, Renna and Argoneto evaluated capacity investment management under co-opetition strategy by combining fuzzy engines and real options. In this study, these options have been simulated by an approach of discrete event simulation to compare the results. Chen and Hao (2013) determined the optimal policy of two different airlines' co-opetition strategy by using game theory and concluded that co-opetition strategy increases companies' revenues and service qualities.

Moreover, Wang et al. (2014) revealed that co-opetition strategy may be effective to forecast regional logistic problems in each layer by the aid of Game theory. Luo et al. (2016) evaluated the relationship between low carbon emission in manufacturing and co-opetition concept by using Game Theory and concluded that co-opetition can pave the way to not only operate manufacturing systems in a lower carbon emission but also higher profit. Zhang et al. (2017) integrated Game Theory and Monte Carlo simulation for determining if a strategy, which includes only a cooperation or a competition, will create the highest profit for agricultural supply chain or both of them, which is co-opetition strategy. They concluded that co-opetition strategy underlines the highest strategy for the highest profit for this type of supply chain. In

2018, Luo et al. (2018) evaluated the co-opetition strategy related to farmers and rural official organizations in terms of sharing benefits. Furthermore, the authors used an agent-based simulation to compare the situation of straw farmers and rural organizations in supply before and after co-opetition strategy. Moreover, Asadabadi and Miller-Hooks (2018) developed an optimization model, which aims to minimize transportation cost under co-opetition strategy and to maximize overall output in Maritimes. Another carbon emission under co-opetition strategy has been conducted by Jiang et al. (2019) investigated the profit distribution and carbon reduction decisions under co-opetition strategy via an integration of game theory and Shapley value method in supply chains. In the same year, Niu et al. (2019) considered air cargo carriers' big data investment and demand signal sharing decisions under co-opetition strategy and it has been seen that under co-opetition strategy, these firms can make more profitable works since each firm uses stronger part of another firm.

As the latest studies, Niu and Mu (2020) considered the game theory application for evaluating the effects of co-opetition on manufacturing costs and logistic costs under turnkeys and environmental effects of such collaborations. Zhang and Yang (2020) tried to understand the fact that co-opetition model for banking sector may be beneficial for payment systems by an incumbent downstream competitor. Wu et al. (2020) underpinned the co-opetition strategy between different regions of China aligned with haze-emission efficiency by applying co-opetition data envelopment analysis modelling. The authors compared classical data envelopment analysis and co-opetition data envelopment analysis models and concluded that regions have a higher haze-emission efficiency when the municipalities' transportation systems are integrated. At the same year, Boztoprak et al. (2020) extended their research to evaluate two different construction sector co-opetition strategy in terms of population-ecology approach for measuring if different population sizes in these examples have an important effect on co-opetition strategy or not. Liang et al. (2021) used a fuzzy measure approach for maximizing

overall benefits for companies in terms of two-stage co-opetition model. They mainly pointed out that a broader partnership is affected by information technologies and negotiation cooperation model. Jost (2021) argued that partner selection has always been a debatable topic in entrepreneurship firms and firms applying co-opetition for increasing their abilities and technological improvements, especially for service and manufacturing firms by using game theory.

Moreover, in 2021, Kallmuenzer et al. (2021) undertook medium-sized enterprises working in hospitality to find out the effects of co-opetition strategy in economical and different environmental aspects. Moreover, Le Roy et al. (2021) evaluated oligo-coopetition strategy under innovation ecosystem for more than two firms and focused on the design of the relationship between the firms considering shareholder co-opetition, vertical co-opetition and combined vertical and horizontal co-opetition. Kumar et al. (2021) enclosed the relationship between sustainability and three crucial dimensions of co-opetition including competition driven, commonality driven and collaboration driven via a qualitative approach in 215 firms and 11 different sectors which two of them are manufacturing and supply chain firms. In game theory area, Fiara (2021) highlighted that co-opetition should be investigated in terms of networks in sequential and simultaneous forms for an effective managerial application as they combine interconnections and out of networks. Lin et al. (2021) focused on value capturing, creation and dynamics effects between them for a sustainable supply chain management by considering co-opetition effect. In service area, Köseoğlu et al. (2021) investigated the effects of co-opetition strategy in hotels which provides that coopetition can be achieved as a strategic approach allowing hotels to have collective actions around competitive intelligence if and only if they share a sister competitiveness, which targets the same customer cluster. Furthermore, the authors created an interview for logistic and supply chain sectors in a case study format to

ensure that ecosystem structure related to co-opetition strategy is very important for transportation, manufacturing and company dynamics.

Considering this type of dynamic situations, Xu et al. (2021) evaluated the dysfunctionality of co-opetition strategy if the tension exists between interfirm issues including knowledge, information flows and external issues such as environmental co-opetition dynamics. Struckell et al. (2021) evaluated smart home ecosystems under entrepreneurial concept and deducted that matching life cycle stage with coopetition strategy can be necessary based on the population and manufacturing. Crick and Crick (2021) validated statistically that the past experiences are very important for a successful co-opetition strategy and the coopetition-performance relationship is directly related to unpacking due to moderating influences.

By focusing on the definition of co-opetition, Rai and Surana (2022) defined the co-opetition by a different point of view indicating that co-opetition can be 'Coalignment of Alliance Governance Mechanisms' in high-intensive technology firms. Zhang et al. (2022) evaluated low-carbon products under different strategies and concluded that market competition affects on manufacturers for any kind of product by using Game Theory. At the same year, Hafezi et al. (2022) modelled innovation effects on co-opetition for duopoly markets by the aid of Game Theory and it has been understood that co-opetition strategies, which is especially cooperation-based co-opetition strategy, has a positive effect on manufacturing more qualified product. Again, in game theory area, Rategh et al. (2022) modelled a dynamic game model to show that oligopolistic transportation market cannot be easily understood under co-opetition strategy as non-pricing strategies and the satisfaction of passengers cannot be satisfied for the incumbent operators' survival.

There exist another field that co-opetition relationship has been investigated. For example, in airport performance and supply chain management, Peng and Lu used two indices which are Herfindahl-Hirschman index (HHI) and Entropy Index (EI) to measure co-opetition efficiency in an Asian Airport. Roumboustsos et al. (2022) evaluated the influence of innovation technologies based on supply chain networks in ports by using a fuzzy qualitative approach considering the maritime ecosystem with co-opetition strategy. In energy manufacturing area, Zhao et al. (2022) pointed out that renewable energy trade and manufacturing in renewable energy can be easily achieved by a win-win strategy including co-opetition strategy that allows the firms an easier policy implication. Moreover, Niu et al. (2022) evaluated supplier and governmental subsidies influences on the firms which have co-opetition relationships by a dynamic game theory model to evaluate green supply chains. At the same year, Smiljic et al. (2022) found out that the tensions existed during co-opetition strategy may lead firms to be affected by performing, organizational and learning paradoxes at the first stages. Amata et al. (2022) evaluated tensions in co-opetition in terms of capacity sharing and capacity demands in manufacturing and supply chain collaborators as it arises from an unequal sharing of capacity.

Moreover, Monticelli et al. (2022) applied a case study in order to understand whether governments in developing countries have negative or positive impacts on co-opetition strategy of firms, including manufacturing and supply chain firms, by a qualitative study. Molling et al. (2022) realized a case study via statistical analysis for explaining that merging and acquisition strategies in manufacturing firms may have an effect on co-opetition strategy and innovation developments. Su et al. (2022) applied a game theory approach for dynamic conditions between manufacturers and remanufacturers for understanding the co-opetition strategy between them. Furthermore, the authors pointed out that re-design between these elements of co-opetition can be easier as recovery rate, the price and the level of remanufacturing design are easily

perceivable. Yang et al. (2022) evaluated the relationship between original equipment manufacturers and manufacturer of a proprietary component in terms of supply chains co-opetition strategy with the aim of determining which optimal strategy can be used for product quality. Furthermore, this optimal strategy has been found as dependent upon cost differentiation, new customers arriving late and third-party supplier existence.

In the same area, Shamout (2022) integrated structural equation modelling and fuzzy sets for measuring the ambidexterity of co-opetition strategy in supply chains and determined that co-opetition strategy has a positive effect in supply chain efficiency on the performance of firm but the ambidexterity of supply chain does not have an effective result on firm's performance as much as supply chain ambidexterity.

Gao et al. (2023) modelled by using network modelling that tries to understand co-opetition strategy effect on renewable energy for Belt and Road Initiative countries and recommended that sustainable energy can be easily achieved under co-opetition strategy because of the novelty of co-opetition strategy. For EV charging stations and electricity production, Caplan (2023) covered co-opetition strategy between two rival firms cooperating in electricity market and their utilities.

The literature review section shows that game theory and modelling applications based on the dyadic relationship of co-opetition have been widely used. The next section indicates the qualitative approaches in the literature of co-opetition.

3.2. Qualitative Approach in Co-opetition

Qualitative approach by using interviews, surveys and questionnaires has been widely used in co-opetition research. To begin with, Gnyawali et al. (2011) investigated co-opetition strategy between large firms in terms of evolution, influence and benefits in Samsung

Electronics and Sony Corporations, which are big companies in manufacturing and concluded that co-opetition strategy has a big positive impact on technological innovations around innovation ecosystems. Around manufacturing and supply chain management, Schiavone and Simoni (2011) stated that co-opetitive relationships in this type of systems can be obtained in different forms and the co-opetitiors are supposed to share different specific experiences for co-opetition strategy.

Furthermore, Ritala and Tidström (2014) conducted a longitudinal case study related to the value creation and value appropriation of co-opetition strategy in order to analyze the relational levels and summed up that overall network, co-opetition strategy has different levels and understandings as it is very dynamic strategy especially in manufacturing and supply chains.

Parallelly, Tidström (2014) evaluated the tensions especially in firms included in co-opetition upon strategy management levels and showed that specific outcomes of these tensions may occur in different levels. A similar study was conducted by Raza-Ullah et al. (2014) indicating that the complexity of the relationship between value capturing and value creation in manufacturing and supply chain firms, which may bring about tensions and these tensions may lead companies to positive or negative consequences simultaneously. Kossyva et al. (2015) implied that co-opetition may be an effective strategy for economic crisis periods as it includes different types of partnerships forcing companies to compete and collaborate in manufacturing. As well, Alves and Meneses (2015) undertook a qualitative research on partner selection in co-opetition by integrating four domestic cases and eight companies with a semi-structural interview series. In this sense, the authors also evaluated by clarifying that task-related criteria which are technological, financial and managerial capabilities of the company and partner related criteria based on the compatibility of the company, structural or strategic fitting.

In the latest years, Mariani and Belitski (2022) conducted a survey for understanding co-opetition topology in the UK by taking into consideration of innovation systems, first mover advantages and the relationship between them. As well, Greven et al. (2022) provided not only a conceptual framework but also a statistical evidence for the fact that the firms' long-term orientation and the propensity in co-opetition activities are positively correlated. Le Roy et al. (2022) conducted a survey for comparing the market share change in horizontal and vertical co-opetition strategy by concluding that Vertical coopetition has neither positive impact nor a negative impact on the market performance in terms of radical and incremental innovation while horizontal co-opetition is beneficial for the companies. Crick et al. (2022) combined the theories of Resources Based and the Relational View to understand that co-opetition strategy can be effective for under-resourced firms in order to penetrate the market and adapt the forms of market orientation.

It has been that qualitative approaches have been also preferred by the scholars working in the area of co-opetition as well as conceptual framework and comparative case studies given in the next section.

3.3. Conceptual Framework and Comparative Case Studies in Co-opetition

In 2009, Cassiman et al. enclosed the tension affecting value capturing process and value creation process in a microelectronic company by using R&D projects and the tension between them is affected by many factors including managerial, network or R&D process. Ehrenmann and Reiss (2011) conducted a survey analysis about the paradigms of manufacturing networks in terms of co-opetition threats and advantages including benchmarking for comparing evolution in manufacturing companies of Stuttgart, Germany. Another study conducted by Li et al. (2011) at the same year showed by using a questionnaire that manufacturer and distributor's efficiencies are directly related to knowledge acquisition on co-opetition concept.

In 2014, Bunger et al. (2014) analyzed the co-opetition strategy in the child-serving sector and evaluated the efficiency of the relationship between private child welfare agencies and governmental child welfare agencies under co-opetition strategy. As a conceptual framework, Pathak et al. (2014) discussed 4 main objectives of supply chains, consisting of network-level objectives, firm-level objectives, between firms' objectives and interrelated objectives under co-opetition strategy by explaining supply chain network archetypes. At the same year, Dahl (2014) explained the process framework for co-opetition including three different scenarios and further, defined the co-opetition strategy as a sequence of different experiences along changes in firms. Fernandez et al. (2014) tried to frame co-opetition concept in different levels including intra-organizational, inter-individual and inter-organizational and tensions between different sources in the telecommunication satellites manufacturing companies and offered important implications to fill the gap of dilemmas in manufacturing processes.

Furthermore, Kumar et al. (2020) considered sustainability dimensions in co-opetition via interviews in Australia in the frame of thematic content analysis including collaboration-driven, commonality-driven and competition-driven and found out that co-opetition strategies support manufacturers' sustainability performances positively.

In manufacturing area, Harjai and Blankenship (2022) constructed a frame for co-opetition which lies in business theory for a device development, which implies that co-opetition effect can be beneficial for disruptive innovation ecosystem in a new device creation. In pharmaceutical area, Bhasin and Kumar (2022) evaluated not only co-opetition strategies but also co-operative strategies in a pharmaceutical considering the factors of co-operation in supply chain management, complementary goods manufacturers and division of markets. Also, the authors enlightened the duopoly system in order to divide the market.

In a different area, Ziyae et al. (2022) evaluated cities in terms of economic development linked to co-opetition strategy and they stated that cities have more effective value-creation processes in manufacturing since co-opetition strategy provides an entrepreneurial ecosystem in the urban environment.

4. Synthesis of the reviewed studies and Future Agenda

In the co-opetition strategy, it is vital to create a value and to understand how to create this value (Mariani and Belitski, 2022). As organizational strategy has three dimensions of social, environmental and economic to achieve companies' goals. Co-opetition creates a sustainable environmental to pave the way of these companies' goals easily. In that sense, Table 4.1 summarizes the value creation types for co-opetition strategy.

Table 4.1. The value creation types under co-opetition strategy for the reviewed studies

Examples of Authors in the reviewed studies	**Value Type**	**How to Create Value by co-opetition?**
	Environmental Value	
Zhang et al. (2022)		Low carbon emission can be easily achieved by co-opetition strategy and it provides an environmental sustainability.
Zhang et al. (2021)		As companies have a lower tax under co-opetition strategy, it is seen that carbon emission goals can be provided and it creates a more profit and a lower carbon emission for those who manufactures.
Hafezi et al. (2021)		Companies can manufacture more sustainable products since co-opetition strategy creates a greener product.

Jiang et al. (2019)		As taxes decrease under co-opetition strategy, the companies use their strategies commonly in order to decrease carbon emission and to create more sustainable manufacturing processes
Zheng et al. (2016)		Co-opetition can lead to more profit and less carbon emissions based on higher product prices and increased unit carbon emissions.
Kumar et al. (2022)		The effect of co-opetition between sustainability and manufacturers can create tensions but evidently sustainability strategies in manufacturing can be developed by co-opetition
	Economic Value	
Kossyva et al. (2015)		Co-opetition could be an appropriate business strategy for SMEs in difficult economic conditions as it creates a sharing of economic conditions between two or more companies
Lin et al. (2021)		mutual facilitation between platform and business ecosystem in companies and strategic alignment among the structural elements; and a sustainable element creates a more sustainable and economic configuration in companies
Kallmuenzer et al. (2021)		For an economical value capturing and value creation, coopetition strategy leads companies to economic benefits and destination networks.
Gurnani et al. (2007)		As indicated by Gumani et al. (2017), firms can decide the effect of timing of price commitment decisions on the investment decisions together and it is less costly for these companies. Furthermore, more profits for the two firms.
Zhang et al. (2017)		The co-opetition strategy between farm companies brings highest profits for the plant and supply chain in which they engage.
Chen and Hao (2013)		Even in partial co-opetition strategy, companies increase expected profits by increasing their service levels in manufacturing and supply chain management.
Cassiman et al. (2009)		Research and Development project outcomes and goals can be easily achieved by co-opetition strategy

Su et al. (2022)		The price, the remanufacturing rate and the recovery rate increase parallelly the profit under co-opetition strategy since this strategy creates a remanufacturing alignment between firms.
	Social Value	
Kumar et al. (2020)		Co-opetition can be taken into consideration as a crucial strategy to develop the performance across social engagement in companies and social responsibility.
Kumar et al. (2021)		Co-opetition strategy helps companies validate a new instrument to measure the multi-dimensional nature of co-opetition in corporate responsibility.
Roumboustsos et al. (2022)		Maritime innovation systems in co-opetition make the knowledge and social flow easier.
Alves and Meneses(2015)		Prior personal relationships between decision-makers are easier when co-opetition strategy is implemented through the partnerships with competitors.
Jost (2021)		The knowledge transfer between collaborating partners under co-opetition strategy is seen as complete since the stable entrepreneurial network is achieved by the process of one collaboration of each entrepreneur for entrepreneurship ecosystem

Furthermore, as the complexity of co-opetition strategy creates many problematics in theoretical studies and in practical fields and since the tensions in strategic, operational and management levels may pave the way to a dilemma that co-opetition may make a firm vulnerable. Thus, it is very crucial to comprehend the balance between making profits and not damaging to any company included in this strategy. Thus, the tensions should be better analyzed in the literature. Table 4.2 shows the possible tensions under co-opetition strategy in supply chain management and manufacturing

Table 4.2. The tensions under co-opetition strategy for the reviewed studies

Author	Year	Tensions explained in the studies
		Networking and people
Fernandez et al.	2014	Manufacturers and suppliers' problems in co-opetition can generally arises from the equal profit maximization at organizational and strategic levels.
Smiljic et al.	2022	Coopetitive tensions generally occur at the beginning of common project phases as it contains an uncertainity in terms of knowledge, information and networking.
Tidström	2014	As various kinds of coopetitive relationships includes a networking phase, it creates a tension in terms of goals and it is not always clear how the management of the different tensions produces specific outcomes.
Henriksson and Tidstrom	2021	It is not easy to handle or to cope with perceived coopetition tensions on the individual level for more than two firms. Because perceived coopetition tensions may be subjective.
Zhang et al.	2011	Strategic alliance can create more than one tension in co-opetition strategy in the form of supply chain partnership with a competitor because of not well-defined relationship and partnership.
Gnyawali and Park	2011	Co-opetition between a small firm and a giant firm may produce a tension in terms of technological innovation since an equal distribution of innovation cannot be easily provided.
		Strategic
Cassiman et al.	2009	Organising R&D Projects at the beginning can start with a tension related to innovation systems because of unequal sharing of innovation in projects

Raza-Ullah et al.	2014	Managing the tensions related to the tenures are more likely to become hierarchical, which means the highest level of organization, the highest tension existence.
Yang et al.	2020	Co-opetition strategies in supply chains has a possibility of creating tensions with strategic customers.
Kumar et al.	2021	To cope with the tensions in companies under co-opetition strategy, the definition of equal sharing in corporate responsibility and sustainability should be well-defined.
Ziyae et al.	2022	For a sustainable city in terms of innovation and entrepreneurship, the complexity of relationship can pave the way to have a tension at strategic level for decision makers.
Amata et al.	2022	Capacity demand, Capacity allocation and sharing the capacity between firms can create an important tension.

As supply chain and manufacturing systems are not only interdisciplinary area for many fields including economics, industrial engineering, marketing and business, journals are mainly belonging to these indicated areas as well. According to the reviewed articles, some gaps can be sequenced as follows. These questions can be also considered as a future agenda.

1. There is a real gap in dynamic factors of manufacturing such as cost, logistic and people in the firms and these factors create uncertainty which brings about tensions especially in strategic level,
2. The authors have not decided to use any analytical methods to prioritize the important factors such as networking, targeting, clustering, strategy or to select

best alternatives in manufacturing and supply chain areas as analytical approaches can be more applicable and deterministic.

3. Interrelating theoretical approaches and applied science may be more effective to evaluate the efficiency of manufacturing systems and supply chains. Thus, although there exist other optimization methods in applied business science, the authors only used game theory approach to investigate profit maximization or cost minimization in articles.
4. It is seen that game theory is widely used in the co-opetition area as it aims a win-win strategy but this method ignores the possibility of tensions that can be created during networking and collaborating. There is not certain study including game theory approach, which proves that the firms have exactly the same profit for each company but taking into consideration of tensions. Thus, most of the papers ignores the tensions that can exist during this type of collaborating.

5. Conclusion

In this study, it is aimed to conduct a literature review for co-opetition strategy in manufacturing and supply chain area. In the reviewed articles, it has been seen that dynamic game theory approach has been used as interdisciplinary research. Furthermore, as co-opetition has theoretical and business sides too, the authors conducted conceptual frameworks for theoretically understanding co-opetition strategy. Furthermore, in the supply chain and manufacturing area, the value creation can change based on the firms's co-opetition strategy, including environmental, social or economic value creation based on the alliance between companies. Thus, a value creation concept has been presented related to the reviewed studies.As long as a value for the firms is created, the tensions can exist during the process that may result

in an paradoxical relationship. In order to better compherend, the tensions that might be occurring have been briefly explained.

Based on the research questions, it has been seen that game theory and conceptual framework are the most used methods as a modelling approach and qualitative approach. Another result is that China and USA are the countries where the co-opetition in the field of manufacturing and supply chain management literature has been investigated respectively. We have also seen that different manufacturing sectors such as pharmaceutical, forestry and wine were involved in co-opetition area. The result indicates that co-opetition strategy is not restricted to a limited manufacturing or supply chain area, which can be seen in different forms of manufacturing and supply chain types. Another important result obtained by the literature review can be explained as co-opetition strategy creates different types of values contributing to environmental, social and economic sustainability.

For future studies, the number of articles can be increased to deeply comprehend the co-opetition strategies in manufacturing and supply chains. Furthermore, for the synthesis, any other approaches can be included in the analysis. As a limitation, more databases can be involved in data search query such as Scopus, Ebsco, and Jstor. As the study includes only Google Scholar and Web of Science databases, the studies can be used to enrich literature review and content analysis section.

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