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Measuring the performance of collaborative networks: a value network analysis

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ABSTRACT

In the context of increasingly complex and interdependent business environments, collaborative networks among organizations have emerged as strategic tools for value creation and competitive advantage. However, performance measurement within such networks remains a challenge, particularly due to the predominance of intangible exchanges and the dynamic nature of inter-organizational relationships. This article investigates how performance can be effectively measured in collaborative networks, applying the Value Network Analysis (VNA) methodology to a study case: an international cosmetics cluster headquartered in Spain. Using a mixed-methods approach, this research identifies and categorizes intangible assets exchanged within the network into three main dimensions: *human capital*, *relational capital*, and *structural capital*. Findings emphasize that mature collaborative environments are characterized by shared strategic objectives, strong relational trust, and an institutional culture that promotes open knowledge exchange, while barriers were identified as geographical distance, lack of trust, and limited engagement in collaborative activities.

Nel contesto di ambienti aziendali sempre più complessi e interdipendenti, le reti collaborative tra le organizzazioni sono emerse come strumenti strategici per la creazione di valore e per il vantaggio competitivo. Tuttavia, la misurazione delle prestazioni all'interno di tali reti rimane una sfida, in particolare a causa della predominanza degli scambi immateriali e della natura dinamica delle relazioni inter-organizzative. Questo articolo indaga come le prestazioni possano essere efficacemente misurate, nelle reti collaborative, applicando la metodologia della Value Network Analysis (VNA) a un caso di studio: un cluster internazionale della cosmetica con sede in Spagna. Utilizzando un approccio a metodi misti, questa ricerca identifica e categorizza gli asset intangibili scambiati all'interno della rete in tre dimensioni principali: *capitale umano*, *capitale relazionale* e *capitale strutturale*. I risultati sottolineano che gli ambienti collaborativi maturi sono caratterizzati da obiettivi strategici condivisi, forte fiducia relazionale e una cultura istituzionale che promuove lo scambio aperto di conoscenze, mentre le barriere sono state identificate come la distanza geografica, la mancanza di fiducia e l'impegno limitato nelle attività collaborative.

Keywords: collaborative networks, value network analysis, performance measurement systems, study case, intangible assets, inter-organizational relationships, cosmetic industry

1 – Introduction

Globalization of markets, technologies and workers' attention encouraged companies and scholars to shift their attention from the internal perspective of performance measurement and the product centered approach to an external perspective in which the focal points are stakeholders and customers (Bititci *et al*., 2007; Hansen & Birkinshaw, 2007; Johnson & Broms, 2000; Pisano & Verganti, 2008). To survive in such a competitive environment, companies have to collaborate with one another, focusing on meeting customers' needs more effectively and efficiently (Pekkola & Ukko, 2016). As a result, stable collaborative agreements and partnerships are being promoted, while stakeholders become more and more influential actors inside the organizational structure (Jonas *et al*., 2018). The information and knowledge-based economy has accelerated the need to better understand the development of strong and flexible relationships not only with customers, but also with other members of the supply chain (Terziovski, 2003).

In this context, networks are seen as the principal and the speediest source of value creation for markets (Snow *et al*., 2000; Wang & Cardon, 2019). In fact, recent research found that shared value creation can be achieved between collaborative networks and stakeholders by setting common goals between them (Benhayoun *et al*., 2021; Wenger *et al*., 2024). To create and sustain a competitive advantage through collaboration, companies must fully understand and manage the structure of their networks (Verdecho *et al*., 2009). Therefore, recently the networks' ability to succeed in their tasks has been receiving considerable attention (Bititci *et al*., 2007; Laihonen *et al*., 2014; Varamäki *et al*., 2008). Companies within a collaborative network are usually focused on the associated benefits and costs, while investors are interested in the revenue opportunities it presents. Customers in the value chain are concerned with the network's ability to manage production tasks as effectively as, or better than, a single integrated company (Pekkola & Ukko, 2016).

Although research has been focusing on analysing the performance of these collaborative clusters (Chu & Yoon, 2020; Maffioli *et al*., 2016; Monni *et al*., 2017; Razminiene *et al*., 2016; Rezk *et al*., 2016), limited empirical research has been conducted on performance measurement systems specifically in small and medium enterprise networks (Benhayoun *et al*., 2021; Pekkola & Ukko, 2016). In addition, there is the need to explore performance management in collaborative networks, particularly paying attention to their evolving nature (Pekkola, 2013).

This study aims at analysing the performance measurement in inter-organizational networks and, more precisely, in collaborative networks, by identifying performance measures able to capture the value generated and shared in a collaborative network by answering to the following research questions:

RQ1. *How can performance be measured in collaborative networks?*

RQ2. *How can intangibles help in measuring the maturity of a collaborative network?*

To address the research questions, one of the most recognized global beauty clusters was selected as the focus of the study. A qualitative methodology was employed, incorporating semi-structured interviews and online questionnaires. This research offers both theoretical and practical-managerial contributions. It enhances understanding of how network behaviors can be identified and assessed. The study introduces an "intangible maturity matrix" that enables researchers to classify networks based on the stated importance of intangible assets. From a practical-managerial perspective, the paper presents adaptable performance measurement systems designed to capture the value generated and shared within collaborative networks.

Thus, this study aims to offer insights into the synergies that networks can produce highlighting the role of performance indicators in managing and evaluating inter-organizational collaboration.

The paper is organized as follows: *Section* 2 presents the literature review on collaborative networks, performance measurement in networks and value network analysis. The adopted methodology is presented in *Section* 3. Results are presented in *Section* 4, followed by the discussion, carried out in *Section* 5. Conclusions, also including the paper's implications and limitations, are discussed in *Section* 6.

2 – Literature Review

2.1 – *Collaborative networks*

Inter-organizational relationships can take various forms, among which collaborative networks have reached a rapid diffusion, awareness and acceptance throughout the business community in recent years (Graça & Camarinha-Matos, 2015). Although collaboration can be defined in many ways, it generally means working together for mutual benefits and broadly defines the closest relationships between partners (Golicic *et al*., 2003; Pekkola & Ukko, 2016). Collaborative networks shift from simple collaborative agreements involving initially few partners to complex clusters of a combination of highly specialized large and small organizations working together to strengthen their competitive forces and generate added value (Benhayoun *et al*., 2021; Senge *et al*., 1999).

The main objective of the collaboration is to overcome common weaknesses and strengthen expertise through better-integrated services that might allow them to gain competitive advantage (Camarinha-Matos & Afsarmanesh, 2005). In fact, the concept of "network resources" and network capital is also recognized as crucial to understanding how value is created within the network (Mancini & Pisticelli, 2018). Adding to this, recent research by Yadav *et al*. (2022) emphasizes that well-organized networks create value through effective governance, resource integration, and alignment of shared goals.

Collaborative networks are constituted by a variety of entities, such as organizations and people, that are largely autonomous, geographically dispersed and heterogeneous in their ways of operating, in terms of culture, capital and goals (Camarinha-Matos & Afsarmanesh, 2005). According to Mancini and Pisticelli (2018), relationships within these networks can take various forms, such as bureaucratic, proprietary, and social ties. The number of collaborative initiatives has been steadily increasing, driven by the perceived benefits of resource sharing, information exchange, market expansion, and the pooling of skills and knowledge (Parung & Bititci, 2006). As Huxham (1996) noted, collaborative networks offer a strategic means for organizations to achieve goals that would be difficult to accomplish independently.

Expanding on this perspective, Bititci *et al*. (2003) identified several defining characteristics of collaboration, emphasizing the cluster mutually beneficial relationship among organizations that maintain their autonomy, integrity, and distinct identities. Effective collaboration involves joint planning, coordination, and the integration of processes across suppliers, customers, and other partners in a network, underpinned by shared strategic decision-making. By exchanging information, aligning activities, and sharing resources, partners enhance each other's capabilities to co-create products or services, while also distributing risks, responsibilities, and rewards (Pekkola, 2013).

Moreover, collaboration can be classified differently according to various factors such as its intensiveness, actors' roles, and individual contribution of participants. In fact, various definitions of networking can be found in the literature depending on these factors, as Pekkola *et al*. (2013) identify several forms, including "collaborative networks," "extended enterprises," "clusters," and "strategic networks".

While collaborative initiatives offer numerous benefits, sustaining these partnerships over time present several challenges. Studies have identified common obstacles, such as difficulties in coordinating management teams, establishing effective working processes, and maintaining or building trust between partners (Elmuti & Kathawala, 2001; Huxham & Vangen, 2000). According to research conducted by Yi *et al*. (2021), collaborative networks can lower expenses associated with coordination, negotiation, monitoring and enforcement but risks of unstable relationships and lack of certainty can be critical for organizations. Hence, understanding the different levels and forms of networking is essential for managing these challenges effectively (Camarinha-Matos *et al*., 2009). To further understand and facilitate such complex forms of cooperation, the Institutional Collective Action (ICA) framework offers a valuable perspective. Drawing on Scharpf's actor-centered institutionalism and Ostrom's institutional analysis and development (IAD) framework, the ICA outlines four mechanisms that enable collaboration: regional organizations, cooperation groups, contract networks, and policy networks. According to this framework, collaborative networks are primarily driven by two motivations: reducing transaction costs and managing cooperation-related risks among diverse actors (Yi *et al*. 2021).

2.2 – *Performance measurement in networks*

Neely *et al*. (1995) define performance measurement as the process of quantifying the efficiency and effectiveness of actions, setting a set of indicators to assess performance operating on three levels:individual measures, organizational performance, and the supporting infrastructure for data handling. Parung & Bititci (2006) applied this definition to collaborative networks, emphasizing that actions are jointly produced. Differently from individual enterprises, in which the focus of performance measurement is on the efficiency and effectiveness of actions through variables like cost, quality and time, in the collaborative networks there is still a lack of empirical and generally accepted research that explores the performance measurement and management of the complete collaborative system (Pekkola, 2013). Collaborative networks show a higher complexity than individual enterprises, and, for this reason, they require *ad-hoc* tools to define and collect the necessary information to measure and manage the performance of the whole system of enterprises (Tsai *et al*., 2009; Weber & Heidenreich, 2018). As the network evolves and the interdependency among its members becomes more intensive, the need to control, measure and manage the collaboration becomes fundamental (Bititci *et al*.,1997). Indeed, as much as the collaborative network is large and fragmented, it is difficult to find a suitable performance management system to analyse the whole complex (Bititci *et al*., 2005; Busi & Bititci, 2006). In fact, lack of understanding of collaborative structure and further dynamics is one of the reasons why collaborative initiatives tend to fail (Busi & Bitici, 2006). Despite this, findings reflect that the effectiveness of collaborative networks largely depends on the number of participants improving their management performance. This is because collaboration directly enhances shared resources and innovation, thereby increasing collective benefits across the network (Yi *et al*., 2021). However, De Noni *et al*. (2018) suggest that openness was more important than network size, as it provided greater access to knowledge exchange and spillovers over time.

Performance measures have been used to explain complex systems (Waal, 2007), but the availability of such a large variety of performance models makes the selection of suitable measures even more difficult. As organizations grow, it becomes essential for them to open their boundaries and broaden their business horizons by forming long-term relationships and engaging in collaborative supply chains or networks (Laage-Hellman *et al*., 2018; Roth *et al*., 2019). Effective governance structures play a crucial role in these networks, as they help evaluate performance, which can be shaped by political influences and institutional factors (Yi *et al*., 2021). Similarly, inter-organizational collaboration is often driven by policy implementation, which helps align partners around shared objectives (De Noni *et al*., 2018).

In this context, digital technologies such as IoT, blockchain, and data analytics, as highlighted by Mancini and Piscitelli (2018), are increasingly central to the formalization and governance of networks. These tools enhance coordination by fostering transparency and building trust among network participants, strengthening collaborative efforts.

2.3 – *Value Network Analysis*

Most traditional performance measurement systems have struggled to analyze value networks effectively mainly because they often overlook the importance of knowledge and intangible value exchange focusing mainly on the boundaries between internal and external organizational information (Allee, 2000a; 2000b). As interest in networked organizations has grown, researchers have increasingly studied the dynamics and management of these new forms of business relationships, setting as a goal to understand how value is created within these networks. The Value Network Analysis (VNA) offers a useful approach for assessing intangible exchanges in such networks. It is based on the idea that a company's success depends on how efficiently it can turn valuable assets into meaningful outputs. VNA provides tools to analyze, evaluate, and improve how organizations convert both tangible and intangible assets into negotiable forms of value (Allee, 2008). It emphasizes the strategic management of intellectual capital and the importance of strong, dynamic relationships between network members to increase overall system value.

Allee (2000a) argues that relying only on monetary asset evaluations gives an incomplete picture of an organization's potential. In the knowledge economy, the key question becomes: How is value created? A major challenge for today's organizations is shifting from the traditional value chain model to the more flexible and interconnected value network structure (Allee, 2000a). The first step in applying VNA is "mapping" the network visually representing the organization as a living system. This involves creating a flow diagram that captures all tangible and intangible value exchanges and interactions across the network (Allee, 2002). Once the network is mapped and critical roles are identified, the VNA process unfolds in three main phases (Allee, 2008):

– *First Phase - Exchange analysis* which assesses the value dynamics, the level of health and the value conversion capability of the whole system;

– *Second Phase - Impact Analysis* which analyses the impact that each value input has on the transaction participants in terms of value realization;

– *Third Phase - Value Creation Analysis* which determines how the roles involved in a transaction are managing the output by adding value, extending it to other roles or converting that value into another one.

3 – Methodology

In this study, the VNA has been applied to a real case study. The VNA has been selected due to its flexibility in adapting to different types of collaborative businesses and to its easiness of comprehension and implementation towards an holistic understanding and explanation of complex phenomena (Yin, 2009). The case study has been selected as it is one of the most accredited global beauty clusters. It represents an international cluster, founded in 2014 by 13 companies of the cosmetic industry, with the headquarters in Spain. The cluster is managed as a private association that promotes collaboration with the purpose of promoting sustainable development and competitiveness in the cosmetics, perfumery and personal care sector value chain. One of the main cluster's richness consists in its horizontal and vertical integration. The cluster is horizontally spread as members operate in many different fields of the cosmetics industry -such as cosmetics, fragrances, healthcare and hygiene. The cluster includes a wide range of participants across the entire value chain, from upstream (e.g., raw materials) to downstream (e.g., manufacturing and distribution). Additional descriptive statistics can be found in APPENDIX A.

3.1 – *Data Collection*

The data collection process has been developed in two main phases, in line with the triangulation strategy for case studies (Patton, 2002).

First, primary data have been collected through:

– A semi-structured Computer Assisted Personal Interview (CAPI) with the Innovation manager of the cluster;

– A semi-structured Computer Assisted Web Interview (CAWI) via an open questions questionnaire addressed to the cluster Manager;

– A structured Computer Assisted Web Interview (CAWI) via an online survey addressed to the cluster members.

While the semi-structured interviews aimed at collecting the managerial point of view, the online survey aimed at collecting the members' point of view about the dynamics of the network. The protocol used during the semi-structured interviews can be found in APPENDIX B.

Second, secondary sources have been collected through different data sources (website; blog; European Cluster Collaboration Platform website ; websites and social media pages of all the cluster companies) to get first initial knowledge about the case study and to understand if it could have been suitable for the purpose of this work (Lillis & Mundy, 2005). In a subsequent moment, secondary sources have been useful to triangulate the information obtained from the primary sources (Modell, 2005). According to Yin, the validity and reliability level of direct interviews is subject to the correctness of the information provided by the person interviewed and this risk can be reduced by using multiple sources of information (Yin, 2017). As intangibles may overweight tangibles in a collaborative network (Mazur-Łukomska, 2007), the main aim of data collection is to allow an accurate mapping of the involved intangibles.

3.2 – *Data Analysis*

First, primary data have been used to better understand the current state of development of the cluster and to collect crucial insights for the purpose of this analysis. These data have been

collected through an online survey and two semi-structured interviews. Subsequently, secondary sources have been useful to integrate the information obtained from the primary sources in order to obtain additional official information about the cluster.

All the collected materials have been equally used for the development of the VNA. In particular, in order to assess the overall pattern of value exchanges, the key questions of the exchange analysis have been reviewed by one of the managers in the cluster through a written open-questions interview, while the value creation and the impact analysis table has been produced based on the information collected during the online interviews and from the replies to the online survey.

4 – Results

A total of 20 replies have been collected during the period of analysis (November 2017- January 2018) with a response rate of 17%, which is in line with similar studies in the field of performance measurement (e.g. Burritt *et al*., 2010; Panno, 2019; Robinson *et al*., 2005). The results are organized into four categories: network analysis, exchange analysis, impact analysis, and value creation analysis.

4.1 – *Network Analysis*

Mapping a Value Network involves diagramming goods/services & revenues, knowledge and intangibles exchanges with each and every member of the business or organizational network. This paper data collection analysis has concentrated on mapping accurately the typologies of intangibles involved in a collaborative network, more than focusing on the values-exchanges directions.

This has been perceived as providing more generalisable and valuable information for this specific case. Intangibles emerging from the focus group with companies have been reorganised into three macro-areas: human capital, relational capital and structural capital (Table 1). Relevance has been calculated as a ratio between the frequency of answers and the total number of mentioned intangible assets (26). Know-how is the primary resource expected within a collaborative network, followed by business partnerships. As emphasized in the work of Parung and Bititci (2006), the advantages of resource sharing and information exchange play a crucial role in driving the increasing prevalence of collaborative initiatives.

Table 1 - Network analysis relevant intangible capital (*Source*: Authors' own work)

Human Capital	Relevance	Relational capital	Relevance	Structural capital	Relevance
Work-related knowledge and competencies	38,46%	Business collaborations	53,85%	Know-how	61,54%
		Distribution channels	34,62%	Changeability	38,46%
Proactive and reactive abilities	38,46%	Networking systems	34,62%	Innovativeness	38,46%
		Favourable contracts	23,08%	Brands	26,92%
Entrepreneurial style	38,46%	Customer loyalty	19,23%	Company name(s)	19,23%
Education	30,77%	Financial relations	11,54%	Corporate culture	19,23%
Management philosophy	19,23%	Licensing agreements	11,54%	Management processes	19,23%
Vocational qualification	7,69%	Franchising agreements	3,85%	Information systems	15,38%
Psychometric assessments	7,69%			Intellectual property	7,69%
Occupational assessments	3,85%			Backlog orders	3,85%

4.2 – *Exchange Analysis*

Dynamics of value flows follow mainly a geographical and industry similarity coherence. Indeed, most of the cosmetics sector in Spain is located in Catalunya and Mediterranean and the wider part of cluster's members come from that area, especially from Barcelona and Valencia.

Moreover, the transfer of tangible and intangible resources is more intensive when collaborative network members operate in the same industry. For example, the University of Barcelona is in close contact with research and IT companies in order to facilitate the transfer of innovations and technology. It is not easy to measure effectively the prevalence of one type of exchange with respect to the other. Anyway, tangibles and intangibles seem to compensate for each other, even if the cluster tends to promote the exchange of intangibles resources because it is more difficult to achieve, especially by smaller organizations. Intangibles flow from the cluster management to the members, therefore it is difficult to determine a real pattern of reciprocity, even if members respond to the cluster's initiatives with their participation and an annual fee for the development of the cluster activities. Considering exchanges between companies, usually they are reciprocal and both the partners gain from the exchange. In addition, as in many evolving clusters, there are some difficulties in creating a dynamic flow of exchanges with those companies that request too much time and effort to provide an outcome that usually is a long-term return.

Although the value flow goes mainly from the cluster management to its members, the overall pattern of exchanges appears mostly fair and balanced, with a substantial equilibrium between tangible and intangible resources. Today the cluster is still in a growing and evolving phase, therefore even if the cluster management works to guarantee effective value exchanges for all the members, there are still some "dead links" that have not yet found the way to flow.

4.3 – *Impact Analysis*

Table 2 displays that three key areas - training, networking and visibility - receive the highest impact from the cluster's inputs. Generally, funding and financial support opportunities does not appear as a central topic of the cluster initiatives, since the only source of external investment is the Agency for Business Competitiveness, whose opportunities, until today, have not been very much exploited. However, the cluster's members provided positive feedback to the cluster's initiatives in in terms of both participation (especially in social events) and satisfaction.

Table 2 -- Impact Analysis - "As-Is" (*Source*: Authors' own work)

Input	Comes from	Tangible Impact	Intangible Impact	Answers (%)	Average grade [scale: 1 -5]
Seminars	Cluster management	- Cost of companies staff training (working-hours)	- Strengthening theoretical knowledge - Information on new trends - Expansion of the field of interest - Know-how	67%	4.3

			- Tips and problem solving methods		
Working groups	Cluster management	- Practical competencies - Coworking efforts	- Business collaborations - Networking - Proactive and reactive abilities - Practical competencies	61%	4.3
Beauty Innovation Day	Cluster management	- Expansion of the distribution and supply channels - Financial relations	- Business collaborations - Innovation - Networking - Brand awareness - Visibility	100%	4.3
Cocktails and Parties	Cluster management	- Expansion of the distribution and supply channels	- Networking - Business collaborations - Innovation - Visibility - Stakeholders loyalty	83%	4.3
Training sessions	Cluster management	- Hands-on experience - Experienced employees - Cost of companies staff training (working-hours)	- Digitalization - Professional expertise - Business processes improvement	56%	4.3
Exhibitions	Cluster management or Partners	- Expansion of the distribution and supply channels	- Networking - Visibility - Brand awareness	44%	4.3
Funding	Acciò (Agència per la competitivitat de l'empresa)	- Financial support - Projects funding opportunities	- Business expansion - Projects realization	30%	Not available

4.4 – *Value Creation Analysis*

The analysis confirms the relevance of the areas identified by the impact analysis - training, networking and visibility - and it identifies some shared constraints - geographical distance, lack of trust and fear to share, and lack of interest or usefulness - that limited the participation in initiative and events or the usage of the tools offered by the cluster (Table 3).

Table 3 – Value Creation Analysis - "As-Is" (*Source*: Authors' own work)

What the cluster outputs	Goes To	Value added	Limitations	Benefits
Seminars	Cluster Members	- Know-how - Thematic insights	- Geographical distance - Lack of time - Lack of interest on the topic	- Knowledge and skills acquisition - New trends updates
Working groups	Cluster Members	- Socialization with other members	- Geographical distance	- Networking

		- Knowledge sharing	- Fear to share own knowledge - Different working methods	- Opportunity to share own experiences - Learn by others
Beauty Innovation Day	Cluster members and International Beauty Industry Experts	-Direct contacts with potential partners and experts of the beauty industry -Innovative insights	- Geographical distance (usually these events are located in Barcelona) - Low participation of specific target companies (like start-ups)	- Networking - Opportunity to establish business collaboration Updates on new trends and Innovations - Brand awareness
Cocktails and Parties	Cluster members and partners	- Informal direct contacts with potential partners - Knowledge and Experience sharing	- Lack of a formal environment to establish business collaboration - Lack of time and distance - Fear to share own knowledge with potential competitors	- Networking - Opportunity to talk about collaborative relationships - Visibility - Increase members engagement - Strengthen cluster culture
Training sessions	Cluster members	- Work- related knowledge - Know-How - Practical insights to improve business management	- Time and distance - Cost of staff training in terms of working hours	- Improvement of business processes - Improvement of the managerial style - New skills
Exhibitions	International or regional audience	- Word and regional exposure - Socialization	- Time and money requirement - Bad reputation risk at global level	- Opportunity to expands own network of collaborations - Brand Awareness
Beauty Innovation Watch	Cluster members	- Online Updates on new events and opportunities - Insights on Innovative trends	- Low usage level - Members can acquire the same information in meetings or through other channels	- Online updates, no need to be physically present at meetings - Scheduling on future events
Beauty Cluster Barcelona App	Cluster members only	- High level of usability everywhere - Smart tool of communication	- Exclusivity of cluster members - Need of a suitable device to use it and good connection	- Improvement of members engagement - Easier way of communication and updates
Beauty Cluster Barcelona Blog	World visibility	- Brand awareness - Knowledge acquisition thought content publication	- Members can acquire the same information in meetings or through other channels	- Visibility - New trends and cluster initiatives contents

Additionally, performance measures for initiatives and tools based on the results are indicated with a check mark in Table 4. Results show that performance measures related to the training, users' engagement and with an economic impact should be monitored in order to exploit potential benefits and/or limitations related to initiatives and tools.

5 – Discussion

Based on the recent stream of studies on collaborative networks (Camarinha-Matos and Afsarmanesh, 2005; Pekkola, 2013, Benhayoun *et al*., 2021) and the growing interest on the role

of intangibles in the business success of modern organizations (Chen *et al*., 2018; Clausen and Hirth, 2016; Tahat *et al*., 2018; Weqar *et al*., 2020), the present study is aimed at understanding perceptions of participants in order to have a better understanding of how can performance be measured in collaborative networks. Results of this study are aligned with that stream of the literature according to which the interdependencies and the value sharing among clusters' members contribute to create common interests and a unanimous network culture in order to achieve predetermined objectives, that will strengthen their ability to generate value, expanding their competitive advantage against competitors (Tallman *et al*., 2004).

Table 4 – Performance measures for initiatives (indicated with a check mark) (*Source*: Authors' own work)

	Training Completion Percentage Rate	Cost of staff training/Total costs	N. of new contracts/N. of active contracts	N. of new collaborations/N. of active collaborations	N. of participants /N. of targeted employees	N. of projects presented	N. of projects financed/ N. of projects presented	Retention rate	N. of users/N. of employees
Seminars	✓	✓							
Working groups	✓		✓	✓					
Beauty Innovation Day			✓	✓	✓				
Cocktails and Parties			✓	✓	✓				
Training sessions	✓	✓							
Exhibitions				✓	✓				
Funding				✓		✓	✓		
Beauty Innovation Watch	✓							✓	
Cluster App								✓	✓
Cluster Blog	✓								✓

By further expanding the interaction maturity level matrix developed by Pekkola and Ukko (2016), this paper develops an intangibles maturity matrix (Table 5). Through this matrix, companies are able to understand which are the most relevant intangibles for different levels of integration and interaction - from networks to collaborative networks. When moving towards upper levels of integration and interactions, companies need to adapt to each other: from sharing entrepreneurial styles to sharing corporate culture. The colour intensity is built on the results obtained from Table 1 and thus represents the assigned relevance. By combining expected relevance with intangible maturity matrix, observers will be able to assess the maturity level of the network. In this specific case, relevance is assigned to mature network intangibles, thus confirming the true collaborative essence of the sample cluster, which shares goals more than just information.

Participating in a collaborative network could be beneficial for firms for a variety of reasons. The areas that could be impacted are discussed below.

First, results show that *sharing objectives* and having a *common cluster culture* can be a supportive factor to strengthen the *competitive advantages* of the firm against competitors (Rathnasekara & Gooneratne, 2020). In addition, benefits in terms of networking and business

collaboration could be achieved as well (Rukanova *et al*., 2020), with a strong preference for *social and networking initiatives*. A common cluster culture and a higher level of *trust towards the network* is exactly what the management is determined to build for the next future of the case study (Budsaratragoon & Jitmaneeroj, 2019). This study affirms that, adopting the VNA approach, intangible exchanges in a newly born cluster, can bring the same benefits of a well-structured one.

Table 5 – Intangibles maturity matrix (*Source*: Authors' own work)

Integration/ Interaction	Informative	Cooperative	Coordinated	Strategic
Communication and information exchange	Networking systems; information systems			
Alignment	Distribution channels; entrepreneurial style	Psychometric assessment; Changeability; innovativeness; management philosophy		
Resource pooling (compatibility)	Education; work related competencies	Know-how; abilities; vocational qualification	Intellectual property	
Joint goals	Business collaborations; favourable contracts	Licensing and financial relation; backlog orders	Franchising; corporate culture	Management processes; brands; company name; customer loyalty

Second, this study confirms that organizations belonging to the *same industry* and performing similar activities may take advantage of *economies of scale and economies of scope* (Hindle, 2008). In particular, some partnership agreements between members of the same industry can be developed with the purpose of joining their resources in order to generate these advantages. Organizations, therefore, could be incentivized to build coworking projects to take advantage of the benefits of collaboration. This is consistent with that stream of the literature according to which by breaking down organizational barriers, collaborative networks will allow intellectual property, knowledge and information sharing, that will enable cluster members to access innovative projects, reducing the risks and investment costs (Chesbrough & Garman, 2009; Hansen & Birkinshaw, 2007; Yaqub *et al*., 2020; Benhayoun *et al*., 2021).

Third, results show that *information sharing* is essential as much as the promotion of innovative projects (Susanty *et al*., 2018; Yaqub *et al*., 2020). According to previous studies, the presence of mentor companies and incubators is aimed at providing business and financial support especially to start-ups and smaller companies by sharing the investment risks and costs. These results are confirmed also by the general positive aptitude of organizations in sharing their work-related competencies and their know-how with other partners.

Fourth, results of this study are aligned with that stream of the literature according to which by creating a solid *cluster awareness*, each member will be able to reinforce values, supporting one's identity and exploit co-branding opportunities (Allee, 2000a). In particular, this study confirms that one of the main advantages and reasons of being part of a collaborative cluster is the opportunity to gain visibility and to promote one's own brand among partners of the same industry.

Fifth, results provide evidence for the preference for *social initiatives* to boost the chance to exploit the brand and meet potential partners. Studies which affirm that the whole cluster will increase its speed in the value conversion of intangibles inputs into competitive assets (Allee, 2008; Bititci *et al*., 2012) have also found a justification in the results achieved. Data on intangibles value conversion speed are still not available given the young age of the cluster, but from the data analyzed it is possible to derive the important impact that intangible exchanges have on the valorization of the entire cluster on the regional cosmetic industry. The opportunity for networking to acquire visibility, even outside the regional boundaries, can be a strong advantage that can turn the intangibles exchange into a competitive asset. Results of this study are in line with the literature according to which members will be able to take advantage of skilled and qualified personnel within their own cluster, instead of outsourcing experts, gaining costs and expertise advantages against competitors (Saha *et al*., 2011; De Noni *et al*., 2018). In addition, this study confirms that seminars and training sessions have the scope to strengthen the competencies of cluster members on specific topics and to provide them with useful insights in innovation and new trends of the industry as well as suggestions to enhance the business and to increase the familiarity with digital tools. Moreover, results show that the exchanges of professional expertise are aimed at creating business collaborations within the cluster in order to build solid alliances to face the competition.

Finally, results of the study are in line with the stream of the literature according to which organizations may exploit the cluster value chain to build *exclusive agreements* that will cut off upstream and downstream competitors (Kramer and Porter, 2011). Results support previous studies which stated that the large advantage with respect to competitors allows companies to establish supply-distribution relationships within the cluster at favourable conditions. Evidence of these results have been given by an upstream/ downstream agreement(s) between a producer of raw materials and a company operating in the distribution industry. The results of this study are in line also with the stream of literature according to which exclusive agreements with cluster partners can also become a double-edged weapon, because the initial convenience of the agreement might turn, over time, in a restriction of the bargaining power of one of the two parts (Kramer and Porter, 2011). Even if there have not been examples of restrictive agreements between partners, the analysis underlined that large and multinational enterprises show a protective behaviour in sharing their resources or establishing collaborative relationships within the cluster because they fear the risk of losing their competitive position.

6 – Conclusions

This study advances some knowledge related to the identification of the performance measures able to capture the value generated and shared in a collaborative network. In particular, it provides further insights on the synergies that could be generated in the networks and it sheds some light related to the relevance of performance indicators in collaborative networks.

In line with applied research, this study is not without limitations. First, the empirical model proposed has been developed and applied only to a network whose operativity is concentrated in a specific region of Spain. The lack of a comparison with international collaborative networks could determine a different impact degree of the analysis. Further research could, therefore, concentrate on the comparison between geographically dispersed collaborative networks and local collaborative networks. Second, the model could be suitable for the analysis of both tangible assets and intangible assets. In this case the analysis has been performed mainly on intangibles values and focused only on a specific industry. Future research may extend the VNA to a homogeneous set of both tangible and intangible exchanges of a different industry. Third, the limited amount of responses obtained from the online survey can favour the quality and concentration of data but could exclude the network extremes. Further studies could base their analysis on a wider sample in order to verify if extreme cases may effectively affect the results. Fourth, the present study is based on the analysis of how value creating intangible exchanges can benefit collaborative networks performance measurement. Further research could therefore investigate if these benefits can be effectively translated in better performance results. Finally, it could be of some interest to perform the analysis on the cluster's intangibles value exchanges by using another evaluation method and compare the results against the VNA.

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APPENDIX A

Table A – Survey's descriptive statistics (*Source*: Authors' own work)

Sample description	**Sector**	**N**
	Cosmetics	11
	Consultancy	2
	R+D+I Tech Transfer	2
	Biology	1
	Communication	1
	Contract Manufacturing	1
	Engineering	1
	Packaging	1
	Country	
	Spain	19
	USA	1
	Size	
	Family firm	6
	Large firm	1
	SME	13
Expectations	**Reason to enter in the cluster**	
	Networking	11
	Improve knowledge of the sector	5
	Visibility	2
	Faster growth	1
	Inclusion in new projects	1
	Intangible resources expected to receive	
	Backlog orders	1
	Brands	7
	Business collaborations	14
	Changeability	10
	Company name(s)	5
	Corporate culture	5
	Customer loyalty	5
	Distribution channels	9
	Education	8
	Entrepreneurial style	10
	Favourable contracts	6
	Financial relations	3
	Franchising agreements	1
	Information systems	4
	Innovativeness	10
	Intellectual property	2
	Know-how	16
	Licensing agreements	3
	Management philosophy	5
	Management processes	5

	Networking systems	9
	Occupational assessments	1
	Proactive and reactive abilities	10
	Psychometric assessments	2
	Vocational qualification	2
	Work-related knowledge and competencies	10
	Possibility to realize Economies of Scale and Economies of Scope through co-working opportunities	
	I don't know, I never thought to reach economies of scale/scope through co-working	6
	No	1
	Yes	13
	Opportunities proposed by Acciò (Agència per la competitivitat de l' empresa)	
	No	14
	Yes	6
	Main limitation, disadvantage or risk of being part of a collaborative cluster	
	Lack of confidence	1
	None	4
	Refrain from sharing sensitive information with direct competitors can slow down innovation and collaboration opportunities	1
	Startups or spinoffs which are the target(s) are not close to the Cluster	1
	Agreement with the cluster three main objectives are: Innovation, Internationalization and Smart networking for the Beauty Industry	
	I partially agree	3
	I totally agree	17
	Which one of these objectives better represent your business?	
	Innovation	14
	Internationalization	5
	Smart networking for the Beauty Industry	7
	In your opinion, do you think that sharing objectives and having a common cluster culture might help you in expanding your competitive advantage against competitors?	
	No	1
	Yes	19
	Generally, how do you evaluate your experience with the cluster until today?	
	Positive	4
	Very positive	7
	Highly positive	9
Initiatives and tools	**In how many initiatives proposed by the cluster have you participated?**	
	From 5 to 10	7
	Less than 5	4
	More than 10	8
	None	1
	Which initiatives?	

	Beauty Innovation Day	18
	Cocktails or Parties	15
	Exhibitions	7
	Other	3
	Seminars	12
	Training sessions	10
	Working groups	11
	How do you evaluate the overall initiatives offer by the cluster?	
	Slightly suitable/useful for my business	1
	Suitable/useful for my business	6
	I appreciate	10
	I really appreciate	3
	What did you get from that experience or what do you expect to receive?	
	Expansion my field of interests	13
	Find partnership/ co-working opportunities	13
	Networking	16
	Opportunities to expand my business	12
	Opportunities to improve/support my business (advertising, communication, awareness)	12
	Share my experience with companies working in the same industry	9
	Strengthening my knowledge/ be informed on new trends of the field in which I operate	18
	Training / Acquisition of new practical	8
	Which one of these tools/ information channels proposed by the cluster are you using?	
	Cluster Blog	11
	None	3
	The beauty Innovation Watch	5
	Cluster App	3
	How do you evaluate the overall tools offer by the cluster?	
	Slightly suitable/useful for my business	2
	Suitable/useful for my business	18
	I appreciate	40
	I really appreciate	15
	Did any of the initiatives or tools offered by the cluster allowed you to start co-working opportunities?	
	No	4
	Not yet but I would like	9
	Yes	7

APPENDIX B

Table B– Semi-structured interviews protocols (*Source*: Authors' own work)

CAPI protocol	
General questions	● What is the overall pattern of exchanges and value creation in the system as a whole? Which is the exchanges path of the cluster, which kind of transactions occurs within the cluster? ● What about the interaction and exchanges among companies? ● In which way do you provide help to your members? In which way do companies help each other? ● Talking about funding, how is the cluster financed? ● Is the share of participation to the cluster initiatives and the overall level of engagement within the cluster depending by any particular factor? ● How do you think the cluster can help its members to have a competitive advantage with respect to their competitors? ● Talking about co-working, could you please provide an example? ● What are the main difficulties that are you finding in managing the cluster? ● What are your planning to the future and your future projects to include other organizations more actively?
CAWI protocol	
Exchange analysis	● What is the overall pattern of exchanges and value creation in the system as a whole? (Exchanges Map) ● In which business units of the BCB value chain there is the highest exchanges amount of value creating intangibles? ● In which business units of the BCB value chain is the exchange of value creating intangibles a factor of competitive advantage? ● Is there a coherent logic and flow to the way value moves through the system? (functions, geographical areas, etc.) ● Does the system have healthy exchanges of both tangibles and intangibles, or is one type of exchange more dominant? ● How well is the system converting intangibles into value? ● Which are the intangibles exchanges within the system? ● Do members exploit co-working or co-branding opportunities? Which ones? ● Is there an overall pattern of reciprocity or, for example, are there any roles providing several intangibles without receiving similar returns? ● Are there missing or "dead" links, weak and ineffective links, value "dead ends", or bottlenecks? ● Is the whole system optimized, or are some roles benefiting at the expense of others?

Impact analysis	• Which value inputs/output generated by exchanges can be considered a source of competitive advantage? Why? • What impact does each value input have on the roles involved in terms of value realization? • What impact do value inputs have on the roles involved in hindering the competition? • Are they generating actions, behaviours or stimulate decisions? • Which is the communication flow within the system? • What are the costs and risks of activities generated by received inputs? • What are the risks when handling this input or when not handling it well? • Might these costs and risks be causes of disadvantages with respect to competitors? • Which are the main intangible costs and benefits associated for the overall exchanged value inputs/outputs?
Value creation analysis	• Is it possible to create more value outputs utilizing the same assets? • Are the outputs providing value for the system as a whole? • Are resources adequate to achieve the outputs? • Are there some resource shortcomings affecting a participant's ability to create value? • Might this be a discriminatory factor with respect to competition? • What are the costs and risks of activities generated by outputs? • Are, in any case, these costs and risks causes of disadvantages with respect to competitors?