

Foundations, mapping and trends of the DART Model for value co-creation: A scientometric analysis

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Abstract

A growing interest has been seen in the DART Model in recent years as a basis for co-creating value through its four variables: Dialogue, Access, Risk assessment and Transparency. This has led to an increase in scientific production not only because of its explanation but also because of its versatile application. However, it remains an underdeveloped research topic that deserves to continue accumulating empirical evidence. In this sense, this work contributes to the existence of greater knowledge of this model, from a review and analysis of the literature housed in the Web of Science (WoS) and Scopus databases from 2014 to 2020. Scientometric techniques were then used to generate a scientific mapping to determine the main authors, countries, journals, languages of publication and groups related to the topic. Additionally, the Tree of Science (ToS) tool was used to organize the records into three document categories: classical (root), structural (trunk) and trending (leaves). The results point to three areas in which various practices can be undertaken with the DART Model: educational, social/entrepreneurship and innovation/strategy, as well as one focused on its theoretical foundations. This encourages those researching the issue of measuring value co-creation, due to the multiple combinations that the model allows, in addition to the fact that it can be applied in different types of organizations.

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Bases, mapeo y tendencias del Modelo DART para co-crear valor: un análisis cientiométrico

Resumen

El creciente interés que en años recientes ha presentado el Modelo DART como base para co-crear valor a través de sus cuatro variables: Diálogo, Acceso, evaluación de Riesgos, y Transparencia, ha permitido un incremento en producción científica no solo en su explicación, sino también en su aplicación versátil; no obstante, sigue siendo un tema de investigación subdesarrollado que merece seguir acumulando evidencia empírica. En este sentido, el presente trabajo contribuye a que exista un mayor conocimiento sobre este modelo a partir de una revisión y análisis de la literatura anidada en las bases de datos *Web of Science* (WoS) y Scopus entre los años 2014 y 2020. De esta manera, se utilizaron técnicas cientiométricas para la generación de un mapeo científico con el fin de establecer los principales autores, países, *journals*, idiomas de publicación, y *clusters* asociados al tema. Adicionalmente, se recurrió a la herramienta *Tree of Science* (ToS) con el fin de organizar los registros en tres categorías de documentos: clásicos (raíz), estructurales (tallo) y tendencias (hojas). Los resultados apuntan a tres tipos de áreas en las cuales se pueden realizar diversas prácticas con el Modelo DART: educativa, social/ emprendimiento, innovación/estrategia, además de una enfocada en sus bases teóricas. Esto insta a investigadores en el tema de medición de la co-creación de valor debido a las múltiples combinaciones que el modelo permite, además de que puede ser aplicado en distintas clases de organizaciones.

Palabras clave:
Modelo DART, Co-creación de valor, Análisis cientiométrico.

Introduction

Since Prahalad & Ramaswamy (2004a; 2004b) created the DART Model with its four key building pillars (**D**ialogue, **A**ccess, **R**isk assessment and **T**ransparency) to achieve Value Co-creation, the willingness to apply it has increased, not only among those who work in academic and scientific fields but also among people in the business realm, since it is at the organizational level where this strategic process gains interest, importance and usefulness. The reasons why the DART Model has trended toward greater application include the varied combinations that it may have depending on organizational contexts. In this sense, Prahalad & Ramaswamy (2004a) argue that, by implementing these combinations, new relevant functions can be obtained such as: i) an interaction objective characterized by attractive co-creation and, therefore, economically valuable experiences; ii) places and times of continuous and recurring interaction within the value chain; iii) an organization–customer group relationship focused on co-creator experiences; iv) a co-creation experience based on interactions across multiple channels, options, transactions and a price–experience relationship; v) an active pattern of interaction between both the organization and stakeholders; and vi) a focus on quality tied to interactions that co-create value.

According to these authors, the changing and cumulative nature of value co-creation has also caused many companies and industries to avoid applying the model because it challenges their traditional roles in the market since, instead of sustaining an interaction between an organization and its stakeholders, what they do is maintain a one-way relationship where the passive role is played by customer groups. Therefore, although there are organizations that have experienced the DART Model, there is still immaturity in the literature, so it is necessary to continue developing research that provides theoretical

and practical work in this field, following the suggestions offered by previous authors.

As a result, in order to address those recommendations, this work contributes to broaden knowledge about the DART Model using scientometric techniques, a scientific mapping and the Tree of Science (ToS) tool, which facilitate a review and analysis of the literature contained in the Clarivate Analytics Web of Science (WoS) databases and those of the Scopus databases of the Elsevier group, covering the years from 2014 to 2020. In this way the authors, countries, journals, publication languages and most relevant clusters are established, along with the organization of the documents in three categories: classic or seminal (root), structural (trunk) and perspective or trend (leaves). The results show four areas in which the records in the databases consulted are concentrated: one related to the theoretical foundations of the DART Model, and the other three associated with trends in applying the model (educational, social/ entrepreneurship, innovation/strategy), inviting academics and researchers to further develop the topic of understanding and measuring value co-creation, keeping in mind the combinations that the Model makes possible in different organizational contexts.

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This document is divided into the following sections: the theoretical foundations, applications and variables composing the DART Model; the methodological process by which the search, review, selection and analysis of the most relevant publications was conducted from the respective scientific mapping using scientometric techniques; the results of bibliometric and network analyses; and conclusions with a focus on future research.

Theoretical foundations of the DART Model

The authors Prahalad & Ramaswamy (2004a) originated the concept and deployment of the DART Model, whose acronym alludes to the four dimensions or variables through which value is co-created: **D**ialogue, **A**ccess, **R**isk assessment, **T**ransparency. This is mainly because their argument has focused on how value co-creation is something that should not depend on a competitive advantage (designed by the organization) for the product or service, while customers and other stakeholders are merely passive recipients. The authors emphasize that it is no longer the companies that fully adopt a thinking-active role to seek a successful increase in transactions, but rather it is the stakeholders who, in a joint effort, co-create value by interacting with “customer communities” and “networked companies” to seek their satisfaction. They also mention that there is an evolution toward “meaningful/integrated dialogues” where the focus of attention is no longer exactly the company, especially when development and advances in technology have pushed customer groups toward greater knowledge and access to information. As shown by Schiavone, Metallo & Agrifoglio (2014), the DART Model is one of the few theoretical references in the marketing literature that supports organizations in the management of value co-creation processes (Payne, Storbacka & Frow, 2008).

Figure 1 shows the blocks or pillars of the DART Model as the foundation for generating value co-creation, where the symbiosis between managers and stakeholders turns them into partners in the process (Prahalad & Ramaswamy, 2004a; 2004b), especially given the leading role now played by technology.

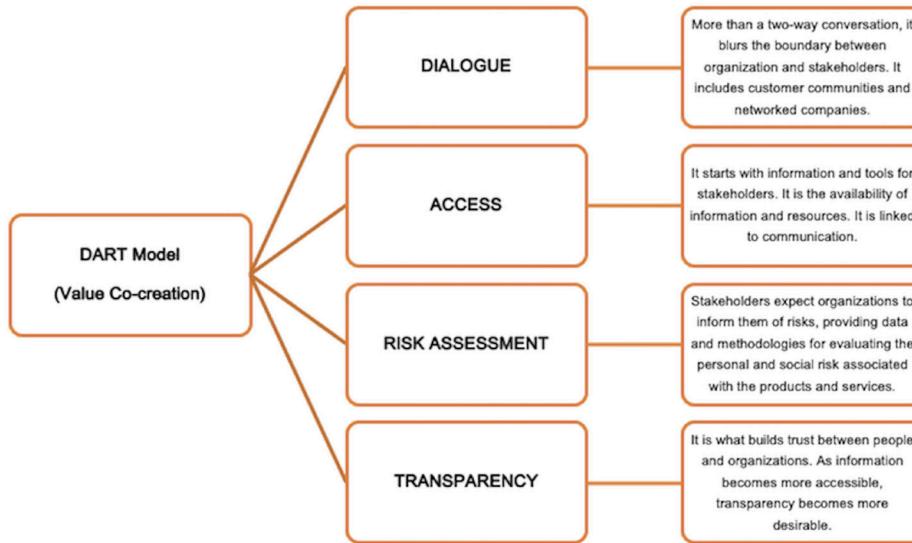


Figure 1. Pillars of the DART Model
Source: Prepared by the authors (2022) based on Prahalad & Ramaswamy (2004a; 2004b)

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In this sense, the work developed by Skaržauskaitė (2013) stands out. He argues that, with the exception of the DART Model, the general description of other models has shown a gap at the theoretical level and in the empirical evidence on the role of the organization in the process of joint or collaborative creation, reasons why more research is needed to help managing value co-creation, understanding that achieving this requires the effective will from each participant, including: i) active participation; ii) integration of resources that create mutually beneficial value; iii) willingness to interact; and iv) a range of possible forms of collaboration. Table 1 shows the conceptual models for co-creation in organizational and management contexts prepared by Skaržauskaitė

(2013) and by Durugbo & Pawar (2014), where it can be seen that there is little literature on the performance of organizations and related implications for management, in light of the variety of tools that measure consumer performance.

Table 1. Conceptual models related to value co-creation

Authors	Year	Focus of the study	Practical implications
Walter, A.; & Ritter, T.	2003	Value-creating functions of customer relationships	Theoretical framework for value drivers through discussion of the impact of adaptation, trust and commitment on value-creating functions.
Prahalad, C; & Ramaswamy, V.	2004	DART Model building blocks	The origin of change lies in the increasing bargaining power of buyers due to the increased communication between stakeholders.
Tapscott, D.; & Williams, A.	2006	Internal organizational factors fostering co-creation	Proposed set of internal attributes (appropriation of culture, good overview and planning, correct abilities and skills) that could create a co-creation mentality in the organization and successful outcomes of the process.
Payne, A; Storbacka, K; & Frow, P.	2008	Centrality of processes in value co-creation.	Conceptual framework consisting of 3 main components: (1) customer value-creation processes; (2) supplier value-creation processes; and (3) encounter processes. It can be used to map end user processes and practices so organizations may identify opportunities for communication, service and usage encounters that support joint value creation.
Andreu, L; Sánchez, I; & Mele, C.	2010	Focused on processes and roles emphasizing the importance of combining value creation processes between supplier and customer, with roles value promotion and creation.	The benefits of value co-creation are derived from interactions between suppliers and customers to access knowledge and resources.
Ng, I; Nudurupati, S; & Tasker, P.	2010	Value Co-Creation in Business-to-Business Service	They present 7 generic value co-creation attributes essential for the ability to deliver value-in-use, in B2B contexts.

Authors	Year	Focus of the study	Practical implications
Gebauer, H; Johnson, M; & Enquist, B.	2010	Activity focused on describing possibilities for customer participation, co-design, problem solving, customer experience and self-service.	Co-creation increases the success of operations through the co-optimization of customers for sharing knowledge about experiences.
Tynan, C; McKechnie, S; & Chhuon, C.	2010	Customer-centered value co-creation to reflect its useful, symbolic, hedonistic, relational and cost possibilities, which can be self-centered or outward oriented.	Value co-creation involves complex interactions and dialogues that require innovative networks.
Edvardsson, B; Kristensson, P; Magnusson, P; & Sundström, E.	2012	Service orientation sheds light on how to integrate customers through the acquisition and use of information.	The use of situations and resources in context plays an important role in shaping the value co-creation dynamics of services.
Grissemann, U; & Stockburger-Sauer, N.	2012	Customer co-creation in travel services	They examine company support as a co-creation driver, customer support and customer spending as selected outcomes of co-creation.

Source: Prepared by the authors based on Skaržauskaitė (2013) and Durugbo & Pawar (2014)

From the works shown in Table 1, one can understand the importance for the community interested in topics related to Value Co-Creation and Marketing to continue carrying out research on the DART Model, in order to produce greater theoretical and methodological contributions that allow, in various contexts, the application of the acquired knowledge. These will form the basis for future academic, business and scientific study opportunities, keeping in mind that the main objective is to contribute to better organizational performance whose results will be directly reflected in society.

DART Model Applications

Table 2 presents different applications of the DART Model, since its structure facilitates different combinations in different organizational contexts depending on the needs presented (Prahalad & Ramaswamy, 2004a).

Table 2. DART Model Applications

Authors and year	Application context	Purpose of the study	Conclusions
Moeinzadeh Mirhosseini, S.S. (2013)	Logistics and Transportation Sector	To investigate value co-creation and mediating effects of logistic innovativeness influencing logistics performance and the market performance of logistics service providers.	The DART Model for value co-creation was positively significant in the capabilities and performance of innovation in logistic services. It also provides empirical findings on the DART Model in the logistics sector, filling a gap in the existing literature in the field.
Schiavone, F; Metallo, C; & Agrifoglio, R. (2014)	Social Networks	To expand the traditional DART framework by proposing a fifth dimension: technology management (DARTT).	Technology management plays a fundamental role in the effective use of social networks, where it is necessary to understand how to attract groups of customers, how to encourage their active participation and what events to organize during the value co-creation process.
Becker, L; Dos Santos, C; & Nagel, M. (2016)	Health and Beauty	To analyze the relationship between the elements of DART co-creation, satisfaction and trust in services with credibility qualities (medical services) versus services with experience qualities (hairdressing services).	It was found that satisfaction measures the relationship between dialogue, access and transparency with trust, and these relationships are stronger for medical services (accredited services) than for hairdressing services (experience services).
Taghizadeh, S; Jayaraman, K; Ismail, I; & Rahman, A. (2016)	Management	To validate measurement of the DART Model in the value co-creation process, to understand its effect on innovation strategy.	The implementation of the value co-creation process enables companies to formulate an innovation strategy that significantly improves market performance.

Authors and year	Application context	Purpose of the study	Conclusions
Albinsson P; Yasanthi, B; & Sautter, P. (2016)	Institutional around Service experience	To provide, using the DART Model, a valuable tool for organizations undertaking a co-creation effort of strategic value.	Value co-creation requires a change in organizational operations, by moving from indoor-centric closed systems to more collaborative environments dedicated to value co-creation for their network of value partners and stakeholder communities.
Solakis, K. (2018)	Hotel Sector	To examine the impact of value co-creation procedures, developing a measurement scale based on the DART Model.	The core components of Transparency and Access partially have positive impact on customer experience, while Dialogue and Risk assessment do not affect the positive experience of customers.
Grieco, C; & Cerruti, C. (2018)	Innovative business models on collaborative economy platforms	To analyze the cases of three collaborative economy platforms, using DART, chosen based on how innovation driven by co-creator processes was evident in the value proposal, in the benefit formula or in the key processes and resources.	The analysis shows a link between the kind of innovation and the co-creation dimension, and facilitates understanding the dimensions of co-creation (DART) that are particularly relevant in collaborative economy platforms, where business model innovation is based on customer involvement.
Dziewanowska, K. (2018)	Higher Education	To research the attitudes of students divided into five segments toward the value co-creation and its consequences for academic experience.	Students are focused on diverse aspects of the academic experience, depending on the segment to which they belong. It is shown that being a student is no longer a primary occupation for young people. Rather, it is an addition to their private and professional life that can affect their willingness and capacity to actively participate in the value co-creation process.

Authors and year	Application context	Purpose of the study	Conclusions
Saha, V; & Goyal, P. (2019)	Utilities Management	To examine the mechanism through which value co-creation can be used to drive the success of development initiatives in the public services sector, leveraging the knowledge of the business world on value co-creation for integration with that sector.	The study contributes to the theoretical development and conceptual enrichment of the literature on public management and shows the parameters for success of the co-creation strategy that policymakers can use to implement any public services initiative.
Nogueira-Pellizzoni, L; & Baldanza, R. F. (2019)	Conventional businesses and Collaborative businesses	To understand how the willingness of the customer to co-creation varies between conventional and collaborative fashion businesses.	There are differences in the two types of business around predisposition for co-creation, finding that conventional businesses show greater predisposition toward co-creation than collaborative businesses.
Mai, S; Su, S; & Wang, D. (2020)	Medical Care	To develop and evaluate the psychometric properties of a scale measuring value co-creation behavior of the patients based on the DART Model.	The psychometric properties of the value co-creation scale for patient behavior based on the DART Model were satisfactory, providing a reliable tool for accurately assessing the value co-creation behavior of the patient.
Klafke, R; Picinin, C; & Chevarria, D. (2021)	Non-profit Organizations (NPOs)	To examine the phenomenon of strategic donation (including fundraising and intention to donate) through value co-creation in NPOs before and after the COVID-19 outbreak.	NPOs use a variety of strategies, including value co-creation activities, to affect commitment and donations. It was shown that after the start of the pandemic, DART elements predicted on-line interaction and intention to donate. The actions and comments have a weak R ² before the outbreak and a strong R ² afterwards which is due to people spending more time on-line after the outbreak.

Source: Prepared by the authors (2022)

DART Model Variables

As mentioned before, the DART Model consists of four pillars of interaction (Prahalad & Ramaswamy, 2004a; 2004b), that, being superior and of high quality, drive sources of innovation and competitive advantage to co-create value and unique design solutions and experiences with the organization. Table 3 presents the variables of the model with the definitions offered by some authors, in addition to items that have been used, generally, in information gathering instruments by researchers in the applications they have carried out, several of which are adapted from previous studies.

Table 3. DART Model variables, definitions and items that have been used

DIALOGUE
Definitions:
Company and customer must become co-problem solvers to obtain an active dialogue and a shared solution (Prahalad & Ramaswamy, 2004a).
Proactive dialogue, prior to negotiation, increases the willingness of the customers for collaboration to co-create value, so that promises are fulfilled more effectively (Kowalkowski, 2011).
Dialogue and interpersonal interactions are key elements in value co-creation. This component refers to close interaction, deep commitment and the capacity and willingness to act of both parties (Mirhosseini, 2013).
Dialogue refers to the process of communication and knowledge exchange between customers and suppliers (Mai et al., 2020).
Dialogue means information exchange and fosters constructive interaction (of knowledge and experiences) and the development of shared beliefs (Gummesson & Mele, 2003, cited in Klafke et al., 2021).
Elements that have been used in information-gathering instruments:
The organization and stakeholders maintain an active dialogue about how to add value to the product/service experience.
The organization and stakeholders enter into a clear dialogue to learn more about each other's requirements, share knowledge and improve experiences.

A multi-channel dialogue is maintained with stakeholders that makes them participants in the organization processes.

An interactive dialogue is maintained with stakeholders to foster their preference for the goods and services of the organization above those of the competition.

Stakeholders actively participate in the Internet forums and social networks of the organization.

The credibility of the organization is improved by maintaining a sincere dialogue with customer groups who are dissatisfied with the goods/services.

Stakeholders are encouraged to communicate with the organization about any and all aspects of the experience with the good/service.

Stakeholders have many opportunities to share their ideas with the organization on how to add value to the service experience.

The organization emphasizes the individual efforts of its employees toward the customer.

The organization promotes active dialogue with stakeholders to learn more about their reactions to the product/service experience.

The organization appears open to suggestions from its stakeholders on how to improve the service experience.

There is interest on the part of the organization in communicating with its stakeholders about the best ways to plan and provide a high-quality service.

ACCESS

Definitions:

Access means the development of communication channels between the organization and the market, which must be carried out in a way that promotes customer participation and involvement in this interactive environment (Callegare & Brasil, 2012).

It is the first condition for stakeholders to access information. Co-creation would be ineffective if stakeholders could not access critical information about the products (Schivone et al., 2014).

The ability of customers to access the service processes provides them with the opportunity to participate in the design, development, pricing and quality processes across the value network (Ramaswamy, 2005, cited in Taghizadeh et al. 2016).

Access facilitates dialogue and requires companies to optimize when, where and how stakeholders are given the opportunity to co-create value, that is, facilitate access to the processes and resources used in delivery of products/services (Albinson et al., 2016).

The Access component refers to the opportunity provided to users to access information and tools, linking their participation to the process of creating products/services, and responding to the need to ensure that knowledge and resources are homogeneous and clear so that their performance can be as effective as possible (Grieco & Cerrito, 2018).

Elements that have been used in information-gathering instruments:

Advances in Information and Communication Technologies (ICT) have increased access to information.

Active participation of stakeholders has improved the organization service provision process.

The adaptation of goods and services to customer expectations has positive impact on the implementation of the organization quality proposal.

The organization has the ability to provide added value to stakeholders rather than just offering only goods and services.

The organization responds immediately to questions and comments from stakeholders.

Posting information about the organization on third-party websites is supported.

Stakeholders can easily communicate with the organization.

Customer groups have various options to choose from how to experience the goods/services offer.

It is easy for customer groups to be offered services when, where and how they wish.

More emphasis is placed on delivering experiences to stakeholders than on product ownership.

The company (organization) presents several options for society to decide how to participate.

RISK ASSESSMENT

Definitions:

Co-creating stakeholders have a clearer understanding of the organization products through dialogue, access and transparency. Therefore, they can much better assess the potential risks of goods and services much better (Schivone et al., 2014).

An effective risk assessment provides stakeholders with complete and accurate information on costs and benefits to facilitate informed decision-making on the associated risks, since value co-creation requires companies to treat participants as honorable, trustworthy partners that work toward a shared goal (Albinson et al., 2016).

Risk assessment guarantees consumer safety in the co-creation process, since as consumer participation in this process increases, they may be willing to assume additional responsibilities, as long as the organization provides information on the risks or benefits associated to the delivery and the production of goods and services (Taghizadeh et al., 2016).

Risk assessment refers to both the involvement of stakeholders in taking responsibility for potential risks and the degree to which they are informed about them (Grieco & Cerritu, 2018).

Elements that have been used in information-gathering instruments:

Maintaining open dialogue on the options the organization offers, gives stakeholders a certain degree of control over risks.

Stakeholders are active co-creators and take responsibility for risks together with the organization.

As value co-creators with other organizations, stakeholders request more information on the potential risks of goods and services.

The organization broadly presents the dissemination of risk information to stakeholders.

All relevant information about the organization products/services is provided to stakeholders, so that they can assess risks for themselves.

Stakeholders are encouraged to be aware of safety warnings and other types of risks arising from the use of the products/services.

The organization provides the necessary tools and support for stakeholders to make fully informed decisions about their participation with the service experience.

The organization encourages customer groups to become familiar with the risks associated with the service experience.

The changing dynamics of the needs and expectations of the customer group are recognized.

Complaints or suggestions of stakeholders regarding the organization of products are accepted.

The organization provides advice/suggestions on how to use the products/services.

TRANSPARENCY

Definitions:

Transparency refers to the exchange of information, information symmetry between the organization and customer groups. Transparency is a required precondition for dialogue and access to information (Schiavone et al., 2014).

In value co-creation, successful organizations transparently share information that previously may have been considered confidential. The information shared can be diverse; it may even seem counterproductive for gaining stakeholder loyalty and generating competitive advantage (Albinson et al., 2016).

Transparency is based on the fact that co-creation leaves aside the traditional information asymmetry that usually benefits companies. Along these lines, when stakeholders are highly involved, information about products, technology and business systems, as well as prices, costs and profit margins, must be clear and easily accessible (Grieco & Cerritu, 2018).

Transparency means offering consumers information about business operations. In strategic co-creation, companies share data considered confidential, as it reveals aspects of internal operations (Nogueira-Pellizzoni & Baldanza, 2019).

Elements that have been used in information-gathering instruments:

Information transparency is necessary for building trust between the organization and stakeholders, allowing for greater knowledge.

The organization has achieved effective two-way communication with stakeholders.

No information access restrictions are imposed on stakeholders regarding the prices of products/services and costs incurred.

Partner relationships with stakeholders encourage providing them with information that can increase their experience.

Stakeholders have free access to information that can be useful in improving the overall design and delivery of the service experience.

The organization builds trust among stakeholders through the use of transparent information.

Stakeholders and the organization are treated as equal partners in the exchange of information needed for achieving a successful experience with the product/service.

Customer groups feel like equal partners in the exchange of information.

Information provided by the organization to its stakeholders is always up to date.

The information offered by the organization regarding its product/service is clearly understood.

The organization is willing to provide more information about the product/service if any stakeholder requests it.

Source: Prepared by the authors (2022) based on the works of Moeinzadeh Mirhosseini, S.S. (2013); Mazur & Zaborek (2014); Becker et al. (2016); Taghizadeh et al. (2016); Solakis, K. (2018); (Grieco & Cerritu, 2018); and Nogueira-Pellizzoni & Baldanza, 2019).

Methods

The process through which the methodology of this study was developed was structured in two main stages based on the use of scientometric techniques: i) a scientific mapping requiring bibliometric analysis carried out with documentary records found in WoS and Scopus, using defined search criteria in both databases; and ii) a network analysis whose results allow defining the most relevant publications on the topic of the DART Model associated with value co-creation. In addition, the Tree of Science (ToS) metaphor was used not only to identify the most representative clusters that mark the research trends in this field of study, but also to reveal the theoretical foundations underpinning the Model, the applications that have been undertaken with it and the variables it comprises.

Results

Scientific Mapping

Scientometric techniques such as the analysis of: citation, co-citation, co-occurrence of words, co-authorship and bibliographic coupling (Zupic & Rater, 2015) were used to understand the scientific production of those who have researched the DART Model as the basis for co-creation of value. The Tree of Science (ToS) was also used as a Web-based tool to build networks of citations and to identify relevant literature over time (Valencia-Hernandez et al., 2020). Scopus and Web of Science databases were used for this purpose, as they are considered globally the main ones (Bar-Ilan, 2008; Zhu & Liu, 2020), which ensures a broad perspective on the published scientific information. The search criteria for the review are found in Table 4.

Table 4. Search criteria for review

Databases	Web of Science (WoS)	Scopus
Search equations	DART (All fields) AND co-crea* (All fields)	(ALL (dart) AND ALL (co-crea*))
Search fields	All fields	
Time consulted in years	2014–2020	2004–2020
Sources of documentation	Article, book, book chapter, conference paper	
Type of journal	All types	
Results	18	277
Total result	283	
Date of consultation	November 13, 2021	

Source: Prepared by the authors (2021)

The parameters shown in Table 4, in terms of the literature search, give total records equivalent to 18 for WoS and 277 for Scopus which, when overlapping and avoiding duplication using R *Bibliometrix* produces 283 results, that is, 4% overlap. This shows the importance of using both databases for the production analysis proposed in this article, since despite the fact that Scopus contains a greater number of records, it is noteworthy that it has 10 more years of publications (2004 to 2014) and, therefore, it is necessary not to downplay the growth of publications observed in WoS since 2014. Regarding production in terms of language, Figure 2 shows that English is the language most used, with 97% of publications in the field, corroborating its dominance and preference among researchers, given that their scientific and academic publications have greater practicality (Vera-Baceta, Thelwall & Kousha, [2019](#)). However, it is worth noting that French and Portuguese, each with a 1% share, are languages

in which the DART Model in Value Co-creation has been addressed. Likewise, it is also worth noting that Indonesian and Spaniards are already beginning to have productive participation, with 0.5% in each case.

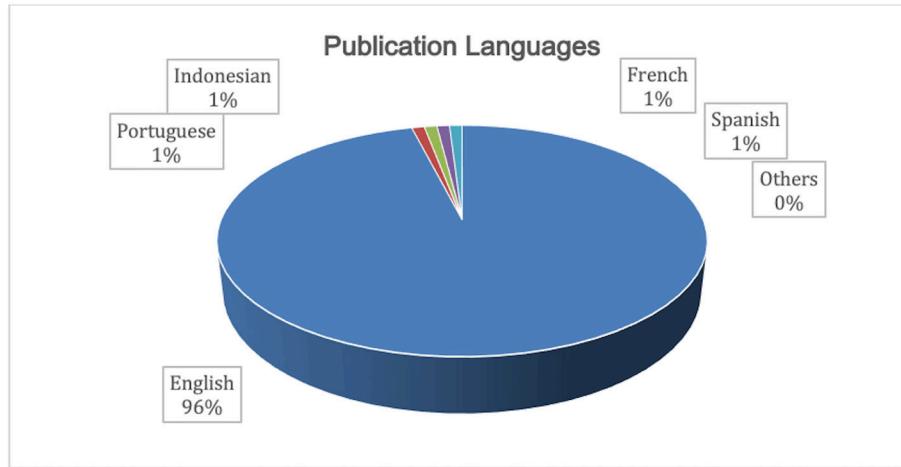


Figure 2. Languages appearing in review
Source: Prepared by the authors (2021)

Network analysis

By merging the records taken from the WoS and Scopus databases, duplication was avoided by using the R statistical program, which led to the use of the Tree of Science (ToS) tool to build the corresponding citation network based on literature relevant to the topic addressed (Valencia-Hernandez et al., 2020). According to Valencia-Hernandez et al. (2020), ToS organizes the data produced "in a tree where the articles located in the roots are the classic ones, in the trunk are the structural publications and the leaves are the most recent

articles” (p. 1). In this way, the knowledge network in the area is produced, where the composition is determined not only by the set of data collected through the databases used, but also by the references that emerge from them, that is, the network also incorporates other sources of information with scientific production. The graphic part of the knowledge network of the DART Model (Figure 5) is obtained from the information previously processed in the R software.

Bibliometric analysis

The annual scientific production issued from the databases consulted is shown in Figure 3, taking into account that the records that appear over time cover the years between 2004 and 2020 in Scopus and between 2014 and 2020 in WoS, as mentioned above.

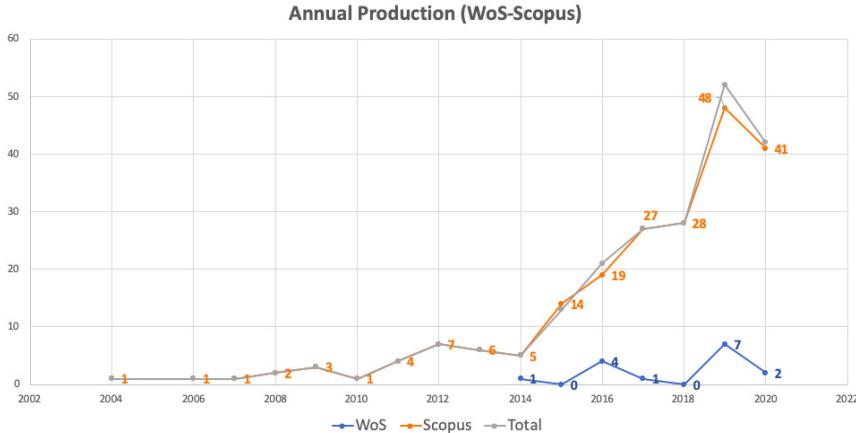


Figure 3. Annual scientific production
Source: Prepared by the authors (2021)

It is interesting to note that as of 2015, there has been a positive increase in the topic, due to the acceptance of the DART Model has had in the literature related to value co-creation, leading to the consolidation of an academic and scientific community whose interest is in making direct applications in different types of organizations, with the combinations that this model allows. It can be seen that the line corresponding to the total number of records overlaps with the one that shows the sources corresponding to Scopus, a database that houses the vast majority of the sources of knowledge in this field.

However, for the 10 countries with highest production, which represent 43% worldwide, it is seen that the United States, the United Kingdom and Australia are the leading regions in their contribution to the topic with 6% each which is shown in Table 5. It can also be observed that the continent with greatest production is Europe, reaching 15%, followed by America with a share of 13%, confirming the reasons why the most published language is English.

Table 5. Production of the 10 top countries

Country	Publications in WoS	Publications in Scopus	Total	% Participation
United States	2	17	18	6%
United Kingdom	0	18	18	6%
Australia	2	16	16	6%
Malaysia	1	13	13	5%
Italy	1	11	11	4%
Brazil	4	6	10	4%
China	2	9	10	4%
Spain	1	9	9	3%
Canada	0	8	8	3%
Poland	3	5	6	2%
Total	16	112	119	43%

Source: Prepared by the authors (2021)

Table 6 shows the ten most productive authors on the topic of the DART Model as a support required for value co-creation, also showing the number of documents published in each database, the number of citations received and the H index.

Table 6. Production of the 10 authors with the most publications

WoS Authors	Docs.	Citations	H Index	Scopus Authors	Docs.	Citations	H Index	Total authors	Total in Databases
Janet Davey (Australia)	2	524	10	Muriati Mukhtar (Malaysia)	8	1904	19	Muriati Mukhtar (Malaysia)	8
Raechel Johns (Australia)	2	795	14	Yazrina Yahya (Malaysia)	8	–	–	Yazrina Yahya (Malaysia)	8
Shu-Min Mai (China)	2	–	–	Wan Azlin Zurita Wan Ahmad (Malaysia)	6	47	5	Wan Azlin Zurita Wan Ahmad (Malaysia)	6
Jolanta Mazur (Poland)	2	–	–	Seyedeh Khadijeh Taghizadeh (Oman)	6	928	14	Seyedeh Khadijeh Taghizadeh (Oman)	6
Dong Wang (China)	2	6360	46	Syed Abidur Rahman (Oman)	5	1030	16	Syed Abidur Rahman (Oman)	5
Piotr Zaborek (Poland)	2	505	11	Ruzzakiah Jenal (Malaysia)	4	147	5	Ruzzakiah Jenal (Malaysia)	4
Rocco Agrifoglio (Italy)	1	713	13	Hazura Mohamed (Malaysia)	4	599	11	Hazura Mohamed (Malaysia)	4
Luis Fernando Aguado (Colombia)	1	700	14	Grisna Anggadwita (Indonesia)	3	1175	17	Grisna Anggadwita (Indonesia)	3
Dini Turipanam Alamanda (Indonesia)	1	426	9	Dimitrios Buhalis (United Kingdom)	3	48008	96	Dimitrios Buhalis (United Kingdom)	3
Pia A. Albinsson (United States)	1	1686	16	Samyadip Chakraborty (India)	3	325	8	Joanne T. Cao (United States)	3

Source: Prepared by the authors (2021)

It can be observed that Professors Muriati Mukhtar and Yazrina Yahya are the most relevant, with 8 articles each in Scopus, while the most prominent in WoS are: Janet Davey, Raechel Johns, Shu-Min Mai, Jolanta Mazur, Dong Wang, and Piotr Zaborek, each with 2 publications. In any case, it is important to note that these WoS authors do not appear in the total column, due to the fact that dissemination of the topic in that database has been much more recent as compared to Scopus, where the latter has a greater advantage since there is a publication timeline with 10 more years. In this sense, the independence presented in terms of publications on the topic in both databases can be noted.

As for the production in scientific journals, Table 7 shows the ten most published journals on the topic, reaching 14% globally. *Sustainability* and *Business & Industrial Marketing* together represent 6% of production in the field of study. Their records are found in the Scopus database. Likewise, the position in quartiles of each publication in *Scimago*, their H index, the country and the editorial group to which they belong are shown.

Table 7. Production of the 10 top Journals

<i>Journal</i>	In WoS	In Scopus	Total	Percentage	Scimago Quartile	H Index	Country	Editorial Group
Sustainability (Switzerland)	0	9	9	3%	Q1	85	Switzerland	MDPI
Journal of Business and Industrial Marketing	0	8	8	3%	Q1	67	United Kingdom	Emerald
Brazilian Marketing Journal	2	0	4	1%	–	–	Brazil	COPE
Public Management Review	0	4	4	1%	Q1	68	United Kingdom	Taylor & Francis

Journal of Business Research	1	3	3	1%	Q1	195	United States	Elsevier
Journal of Marketing Theory and Practice	1	3	3	1%	Q2	44	United Kingdom	Taylor & Francis
International Journal of Environmental Research and Public Health	0	3	3	1%	Q2	113	Switzerland	MDPI
Journal of Strategic Marketing	0	3	3	1%	Q2	50	United Kingdom	Routledge
Jurnal Pengurusan	0	3	3	1%	Q3	13	Malaysia	Penerbit Universiti Kebangsaan
Management Studies	1	0	2	1%	Q4	12	Colombia	Universidad Icesi
Total	5	36	42	14%				

Source: Prepared by the authors (2021)

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Figure 4 shows the different networks formed around co-citation, collaboration and co-occurrence, making it possible to conduct a bibliographic analysis shown in the quadrants. The first of them refers to the network of co-citations between documents, in which two general themes stand out: one derived from seminal and structural authors on the topic of the DART Model linked to value co-creation, where Prahalad & Ramaswamy have the largest number of citations; and another that arises from the different applications of the model in various organizations and sectors, where it can be observed that various authors have a similar number of references. The same occurs in the collaboration network between authors, given that there is a close tie between those who focus on publications associated with the roots of the topic, and between those who have connections through applications and practices in different fields

and organizations. In this part, the participation of authors belonging to North American, European and Asian countries are highlighted. Finally, the word co-occurrence network reveals two strongly crossed grids, because of the close relationship existing between the DART Model and the various applications it can have, which is why the following fields stand out: education, health, technology, market & business, entrepreneurship and innovation.

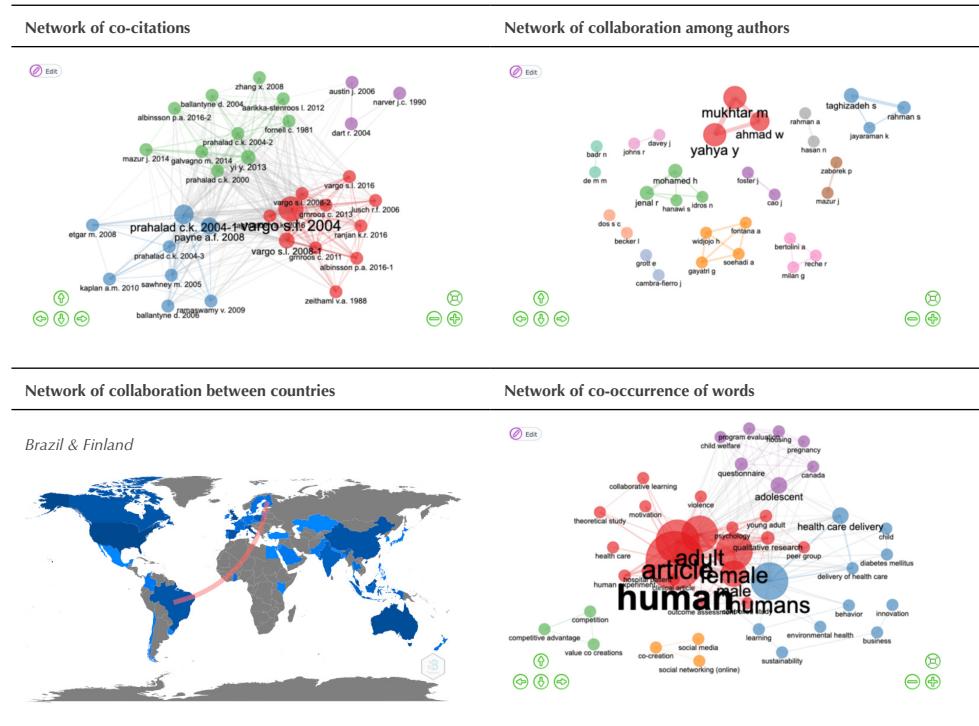


Figure 4. Networks of co-citations, collaboration and co-occurrence
Source: Prepared by the authors based on *Biblioshiny* (2021)

Analysis of networks and of the Tree of Science

The most relevant literature on the DART Model was found from the analysis presented here, in which those records with the most significant indicators were chosen. These were organized using the metaphor of the tree of science (ToS), obtaining 10 publications in the roots (classic/seminal authors), 3 in the trunk (structural authors) and 60 in the leaves (authors who set perspectives/trends). As explained by Robledo, Osorio & Lopez (2014), the methodology for this exercise is achieved:

(...) through analysis of the citation network, where the articles are evaluated according to three indicators: degree of input, intermediation and degree of output [...] adding a tree perspective that as of now has been called “*Tree of Science*” where the articles with a high degree of input and zero output have been called roots; articles with a high degree of intermediation have been called trunk; articles shaping perspectives have been called branches.

After cleaning the network data (Robledo, S. et al., 2021), a total of 1.962 nodes and 4.612 ends or links were obtained that, depending on the inflection point in *Gephi* visualization software, when data are exported from R, lead to the network in Figure 5, for which the Blondel et al. (2008) method is employed, consisting of establishing clusters related to the topic addressed. In this way, the different sub-topics are grouped, offering greater clarity in terms of research perspectives and that, for the present case, are 4 in total.

It is important to note that the word clouds that identify each of the clusters are displayed using the *Wordcloud* package and formed through text mining, specifically based on titles and key words used by the different authors related to the topic. In this way, those publications with highest *PageRank* (Page, L. et al., 1999), that is those with the highest quantitative score within a group or field of topics, according to the citations it has (Yan, Ding & Sugimoto, 2010) were selected. The following sections show the analysis of documents related to the DART Model, using the tree of science metaphor.

Root (classical/seminal authors)

Regarding the results of the Tree of Science (ToS), the work that initiated the topic of the DART Model was that by Prahalad & Ramaswamy (2004a), who created it with four dimensions based on: Dialogue, Access, Risk assessment and Transparency, which thus became the pillars on which value co-creation is built and which can be combined according to the requirements of the organization. Based on Prahalad & Ramaswamy (2004a), ten years later, Mazur & Zaborek gave the following description of the four constituent components of the DART Model: i) Dialogue represents interactivity between two problem solvers in equal conditions, both parties wishing to act and learn; ii) Access involves facilitating co-creation by offering appropriate tools for communication between customer groups and organizations; which also involves those marketing solutions that result in greater freedom of choice for stakeholders; iii) Risk assessment refers to the right stakeholders have to be fully informed of the risks they face in accepting the value proposal of the organization; iv) Transparency represents avoiding information asymmetry between customer groups and the organization to practice informational openness.

Prahalad & Ramaswamy (2004a; 2004b) argue that, to the extent that a company uses the DART model in its different forms, it can generate significant

functions, such as achieving continuous and sustained interactions based on attractive experiences, all through multiple channels and quality relationships for each of the parties involved. In this regard, Payne, Storbacka & Frow (2008) maintain that, beyond the DART Model, there is a profound lack of work aimed at providing frameworks to help organizations manage their value co-creation processes. Joint collaboration is one that offers an evolution and transformation of stakeholders, since they go from a passive role to playing active roles (Pralhad & Ramaswamy, 2000). Specifically, in reference to the concept of value, it is necessary to show that it is a concept that has been moving away from the industrial model that saw it as a creation of goods and services, toward a new concept where value is created and designed by experiences (Pralhad & Ramaswamy, 2004b). In the same way, and with concern, Payne, Storbacka & Frow (2008) infer in their study that, despite the business examples provided by the literature on value co-creation and the useful knowledge about what should be addressed, guidance on how this process should be undertaken is scarce.

Trunk (structural authors)

Next, articles related to the DART Model are found which provide a solid structure to the literature, and whose support is found in those seminal authors who gave life into this important topic. Such is the case of Becker, Santos & Nagel (2016) who established two currents for value co-creation according to their literature review. One current is based on Vargo & Lusch (2004) in terms of the customer always being a value co-creator to the extent that he or she employs resources such as physical and mental efforts to adapt to the acquired service. The other current is anchored in the vision of Prahalad & Ramaswamy (2004a) whose focus is on interaction, that is on the experience generated between the service provider and the service recipient. Therefore, they affirm that there will not always be value co-creation, given that this process will

depend on the degree of participation generated in each party, and this is what leads them to propose the DART Model as a framework of four dimensions that produce a synergistic interaction between different stakeholders. Along the same lines, Albinsson, Perera & Sautter (2016) state that “Value co-creation requires companies to exchange their closed, business-focused operating systems for more collaborative environments dedicated to creating reciprocal value for their network of value partners and consumer communities” (p. 1). Taghizadeh et al. (2016) add that, being value co-creation a relevant issue for competitiveness in organizations, studies on the DART Model are largely overlooked, even ignoring the adequate construction of the four dimensions composing it and whose approach allows organizations to evaluate their co-creation potential, to create value, promoting reflections on the use of structures and policies that offer a strategic environment for its application (Albinsson, Perera & Sautter, 2016).

Leaves (authors setting perspectives/trends)

Finally, within the trends of the DART Model there are various articles that offer different perspectives on contextual applications, taking into account that its four variables (dialogue, access, risk assessment and transparency) are those that constitute value co-creation (Prahalad & Ramaswamy, 2004a). For example, Nogueira-Pellizzoni & Baldanza (2019) highlight the benefits of this model in the business context (B2B) in a collaborative environment that generates competitive advantages. So, to the extent that its variables are understood, there will be preparation in companies for co-creation of value. On the other hand, the study conducted by Mazur & Zaborek (2014) takes a critical stance, since despite highlighting the theoretical attractiveness of the DART Model, they maintain that, as it was not invented with quantitative validation techniques, they based their research objective on the development of a measurement system with applications via surveys and thus demonstrate

its usefulness. For this reason, regarding the available empirical evidence, they argue that what is related to value co-creation and the DART Model is a clearly underdeveloped field.

This is not the case for the study conducted by Zhang et al. (2021), who provided the connotation of value co-creation behavior in the smart health industry based on the DART Model, enabling them to even lay the theoretical foundations for development of a measurement scale and their subsequent empirical research where they corroborated the advantages of the model. However, based on market performance in new services, Taghizadeh, Rahman & Marimuthu (2021) successfully examined the influence of the DART Model on value co-creation processes in a B2B context, and found that managers can improve the participation of customers in interactive processes to better understand their expectations for new services proposed.

Sithole, Mort & D'Souza (2021) focused their research efforts on demonstrating that interaction becomes the cornerstone for the co-creation of valuable experiences in the financial sector, showing that organizational philosophical principles influence the DART Model variables and finding that these experiences intervene positively in improving financial well-being. It can also be observed, through the work carried out by Schiavone, Metallo & Agrifoglio (2014), that the DART Model has even reached social media, where the model is recognized as a quite valuable theoretical argument in the co-creation of new products and services, especially in the use made of the Internet (web and social networks), where the participation of different users is strategic. Under this logic, areas like Design that work for projection and creation based on a visual communication in response to the needs and expectations of the environment are prone to value co-creation due to its aspects of social innovation that encourage communities to participate in projects and activities related to digital components from a reflective and critical perspective, thus

contributing to the improvement of the interactions and relationships of people in certain contexts.

In the field of higher education, Voropai, Pichyk & Chala (2019) propose that the main function of institutions is to connect their economic actors, so that they provide organizational structures for cooperation and interaction of resources under a win-win strategy that results in value co-creation through the DART Model, where all participants benefit from the process. In this sense, these authors affirm that university directors should use marketing tools to encourage the participation of other users and increase the value generated for stakeholders. In terms of future research, they call for reflection on the role of higher education institutions in the process of value co-creation to reach a transformation from a passive role to an active one, so that there may be some correspondence with local currents and global trends, turning them into a source of competitive advantage and added value.

Discussion

According to the analyses presented here, four main subtopics are grouped in clusters that shape the trends toward which the DART Model converges. Therefore, the argument of Hurtado-Cardona (2018), according to which the term “co-trends” is defined as indicative of a correspondence with value co-creation is valid, given that, if the latter refers to generating value jointly, a co-trend indicates the collaborative way in which new and related situations will set trends or be projected. Using word clouds for each cluster, figure 6 details the trends that have been established with the DART Model as the cornerstone for understanding and measuring value co-creation. This classification becomes important to the extent that it offers broad benefits to researchers interested in different areas, since they can capture the perspectives through which the Model transits and, therefore, know first-hand the possible combinations that could

result, considering its versatility and ability to be adapted to any organization or context where value co-creation and its measurement are trend.

Cluster 1: Theoretical foundations



This first group of publications contain those documents that tend to theoretically strengthen the topic and that, in this case, are directly associated with value co-creation, given that the DART Model was created by Prahalad & Ramaswamy (2004a) as the pillar that allowed its measurement through four fundamental principles (dialogue, access, risk assessment, and transparency). Therefore, the words shown in the cloud are related to customer support (experiences), co-creation, marketing and businesses. Authors such as Vargo & Lusch (2008), Grönroos (2012) and Jaakkola & Alexander (2014) emphasize the importance of co-creation in the business environment, as it blurs the boundaries between organizations and their stakeholders, who increasingly adopt more active strategies, perform innovative functions and, therefore, are attracted to make strategic changes in business models.

Cluster 2: Education



The second set of records contains publications associated with the educational context, where value co-creation has played a participatory role in recent years, whose objective has been co-creating experiences in the academic field, due to the challenges that educational institutions should face from different angles. For example, Dziewanowska, K. (2018) adopts value co-creation as a multidimensional process related to the DART Model, specifically based on aspects associated with co-production, experience and relationships; and Voropai, Pichyk & Chala (2019) highlight how value co-creation improves situations of dissatisfaction and low perceived value by stakeholders in academia, so that there is an exchange of resources with win-win strategies, in addition to showing that this environment should fit into the DART Model framework.

Conclusions, limitations and future research

This work was structured to contribute to the knowledge of the DART Model, whose results are useful and interesting for academics, scientists and businessmen, since they show the bases on which the Model for value co-creation was built, developing a scientific mapping using scientometric techniques and resorting to the Tree of Science (ToS) metaphor to identify in the literature those trends or application perspectives that remain on the topic.

This study was carried out with a total of 283 documentary records nested and overlapping in the WoS and Scopus databases, which show an increase in scientific production since 2015, especially in English, and a notable contribution of authors belonging to the United States, the United Kingdom and Australia, where collaboration between countries such as Brazil and Finland also stand out. Specifically, Prahalad & Ramaswamy—creators of the DART Model in 2004—are the starting point for those researchers who have conducted applications in various organizational contexts, who have been based on the theoretical foundations of these authors, and whose results have been published in high-quality academic journals, ranking mainly in Q1 and Q2 positions.

Regarding the areas that set trends in the DART Model, according to the clusters shown in Figures 5 and 6, it was found that those areas related to education, social/entrepreneurship and innovation/strategy stand out, taking into account that among its advantages is the fact that it allows multiple combinations according to the particular characteristics of the organizational context in which it is applied. In this regard, the general items—presented in Table 3—associated with the four variables of the Model and that have been used in previous information-gathering instruments demonstrate it. Along these lines, it is necessary to highlight the role that Design can play as a field

of knowledge in value co-creation, since different disciplines related to the interaction between people and space-time are involved in it. This facilitates the active and proactive involvement of the different participants, given the creative and innovative experiences that can be designed in the process of understanding the needs and expectations of the environment derived from social or organizational aspects, either from the development of new projects or the application of strategies that improve existing ones.

Among the limitations for carrying out this study, it is worth mentioning that, due to flexibility in the application of the DART Model, a wide range of topics appears both in the combination of its variables and in the adaptation to the particular context of the organization or context in which it will be applied. Therefore, the clusters were chosen according to the inflection point shown in Figure 5, which exceeds 400 articles altogether. In this sense, future research would include those studies interested in specifically delving into any of the three areas that offer recent perspectives or trends related to the Model (education, social/entrepreneurship, innovation/strategy), or even review and analyze the clusters in detail that, although they are under the inflection point presented, tend and are useful to continue exploring knowledge of this growing research topic.

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For example, given the crosscutting nature of the Design field, research reflections can be produced around the three perspectives linked to the DART Model, since from the educational field, one could imagine the measurement of experiences of value co-creation between students and teachers, their interaction with the curriculum and the impact generated socially with their academic practices and activities. These, in turn, have a close relationship with the social/entrepreneurship and innovation/strategy fields, since starting from design the tendency is to develop meaningful projects that are adequately and naturally established in the inhabited context. All this said in the validation

of the processes that are set in motion and carried out for the benefit of those whose active participation makes value co-creation possible.

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