Journal of the Operational Research Society

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/tjor20

On building effective symbiotic relationships between micro-organisations. A community OR perspective

Eliseo Vilalta-Perdomo, Rosario Michel-Villarreal, Martin Hingley & Simone Guercini

To cite this article: Eliseo Vilalta-Perdomo, Rosario Michel-Villarreal, Martin Hingley & Simone Guercini (10 Mar 2025): On building effective symbiotic relationships between micro-organisations. A community OR perspective, Journal of the Operational Research Society, DOI: 10.1080/01605682.2025.2476058

To link to this article: https://doi.org/10.1080/01605682.2025.2476058

Published online: 10 Mar 2025.

JOURNAL OF THE OPERATIONAL RESEARCH SOCIETY
https://doi.org/10.1080/01605682.2025.2476058

RESEARCH ARTICLE

OPEN ACCESS Check for updates

On building effective symbiotic relationships between micro-organisations. A community OR perspective

Eliseo Vilalta-Perdomo[a], Rosario Michel-Villarreal[b], Martin Hingley[c] and Simone Guercini[d]

[a]Aston University, Birmingham, UK; [b]University of Leeds, Leeds, UK; [c]University of Lincoln, Lincoln, UK; [d]Universita degli Studi Firenze, Florence, Italy

ABSTRACT

Building symbiotic relationships within communities is crucial. Community OR plays a significant role in this process. This paper views communities as integrative processes that foster supportive environments, enabling individuals to enhance their performance while maintaining their identity and pursuing collective goals. This balance is achieved through mutualistic relationships among members. The proposed methodology, based on an in-depth study of previous examples and the authors' experience, integrates individual preferences and goals to systematically build knowledge. This leads to high-quality interactions that enhance both individual and collective performances. A key aspect is the concept of 'language', which analyzes and makes explicit interactions that facilitate community-building. The framework includes a 'vocabulary' of individual actions as shared resources and a 'syntax' of rules for their use. Three vignettes illustrate the framework, examining the languages of quid pro quo, customers' needs, and interactions. The first two languages show limitations in fostering mutualistic relationships, while the Language for Interactions emphasizes collaboration and collective resource-building, enabling open-ended contributions and shared enrichment. This approach is a novel contribution to Community OR, proposing a self-organized framework for building supportive communities, addressing systemic challenges, and developing resilient collectives without external dependency.

ARTICLE HISTORY
Received 1 March 2023
Accepted 3 March 2025

KEYWORDS
Community OR; individual preferences and aims; Language for Interactions; micro-organisations; mutualistic relationships; synergy

1. Introduction

Community OR (C + OR) is a sub-domain of OR, where citizens' concerns are addressed as complex systemic problems. This approach allows the study of different forms of 'meaningful engagement of communities' (Midgley et al., 2018, p. 772) that deal with challenges of a localised nature and individuals associated with specific characteristics (e.g. gender, race) (Johnson, 2012). This notion of 'community' is usually related to 'a body of people who live in the same place, usually sharing a common cultural or ethnic identity' (OED, 2022). The term has since been extended to free it from being limited to a specific place, as seen in the case of communities of practice (Wenger, 2009) or online communities (Kozinets et al., 2010). In this sense, a wide spectrum of what 'community' may mean has been used in social studies, from a group of people who share a certain identity (Somerville, 2011), to a social form that resists individual alienation created by the Western state (Nisbet, 2010).

Churchman (1970) provided a definition of OR as the 'securing of improvement in social systems by means of scientific method' (p. B-39); hence this paper is concerned with how 'chunks' of social fabric (i.e. communities) can be built in such a way that those communities help their members to improve their individual and collective performances concurrently. In this paper, the term 'performance' will be used in its conventional sense, with the specific aspects of performance that individuals' seek to enhance, varying according to their personal preferences, expectations, and goals. Accordingly, the paper considers the C + OR tradition to positively impact the functioning of purposeful human activities (Rosenhead, 1986).

Rather than looking at communities as *fait accompli* as an entity that requires support, we prefer to pose and answer a different challenging research question: *how to create supportive communities, in which future members can improve their performances, without the need to sacrifice their own identity in the name of a collective one?* Accordingly, we do not treat 'communities' as objects that deserve study, but as a *creative* process of integration (Follett, 1919). This integrative process should not be seen as an attempt to align community

CONTACT Eliseo Vilalta-Perdomo e.vilaltaperdomo@aston.ac.uk Department of Operations and Information Management, Aston University, Birmingham, UK

members under the banner of a unique purpose. Conversely, what we explore in this text is how to coalesce individuals into a collective that aspires to 'all wishes united in a working whole' (Follett, 1919, p. 576). Therefore, *this paper proposes a methodology for individual actors to achieve their purposes through the construction of communities that support their members in such endeavour*. This can be described as a 'symbiosis', 'the harmonious living together of dissimilar organisms in a mutually beneficial relationship' (Adler, 1966, p. 59), where emergent properties allow further innovation and adaptability (Sagarin, 2013).

The structure of this paper is as follows: after this introduction, a background section is provided to establish the research problem, introduce the concept of symbiotic interactions, and present the challenges to building supportive communities. This is followed by the method section where the language metaphor is proposed to answer the research question. It considers discovering beneficial activities (vocabulary) and implicit and explicit rules that regulate such activities (syntax). Subsequently, a section about a real-life case of a farmers' market during COVID-19 illustrates examples of vocabulary and syntax; this section also elaborates on the language metaphor to show three different instances of language: the Language of Quid Pro Quo, the Language of Customers' Needs, and the Language for Interactions. The discussion section weighs up the potential contributions of these languages to building and maintaining supportive communities, and their value in the context of C + OR research and practice. Finally, a conclusion includes a series of final reflections.

2. Background

2.1. Setting up the problem

The decision to study how to build supportive communities by following a systems perspective involves a non-trivial challenge. To draw systems' boundaries seems possible when talking about big organisations as systems (i.e. corporations), even though such boundaries are always observer-dependant, and the boundary judgements are not necessarily agreed upon by all observers (Ulrich & Reynolds, 2020). However, this exercise becomes more difficult when we study small communities. For instance, developing communities usually start as micro-organisations (e.g. micro-businesses), constituted by very few members, in many cases triggered by one dreamer's vision and actions. In this case, it is almost impossible to differentiate the aims and perspectives of the organiser(s)/owner(s) from the ones of the micro-organisations. This is probably because communications are faster between the top management and the slim operational base, making complex communication systems unnecessary. This is more evident in the case of a one-person business. This suggests that in small and starting communities, delineating boundaries that differentiate individual and collective aims and preferences might be impossible, making individuals' alignment in the name of potential collective benefits subject to personal sacrifices (Arrow, 1950).

Hence, this research focuses on how to support *individuals who strive to improve their performance by strengthening their mutualistic symbiotic interactions with others*. In this case, 'performance' is used in regular speech, and the performance individuals want to improve would depend on their preferences, expectations or aims. The focus is then on helping individuals build mutualistic symbiotic relationships by providing additional resources[1] and possibilities that increase their capability to deal with external variety (Ashby, 1956/1999; Beer, 1972).

2.2. Symbiotic relationships

To briefly illustrate what we mean by supporting collectives as a process that builds mutualistic symbiotic relationships to improve individuals' performance, we may look at a game of chess, where player A becomes a resource for player B in the quest for upgrading their playing expertise, and vice versa. Let's suppose that player A is a better player than player B (i.e. A wins more games against B); if they play together consistently, this may improve the performance of B. This also applies in the opposite case, with B being better than A. This example illustrates Adler's (1966) view of symbiosis. However, not all the cases of symbiosis produce the same effects in all the participants. If the chess interaction only benefits one player's knowledge, we witness a case of symbiosis known as 'commensalism' (Yoon et al., 2022) and, if the best player loses some of their chess abilities whilst the worst improves, the interaction can be seen as a case of 'symbiotic parasitism' (Yoon et al., 2022).

In any case, if the symbiotic interactions between A and B are stable for a long period, B may become a better opponent, pushing A to increase her playing quality, or A to B depending on who was the best at the start. Then, playing consists of intertwined sets of individuals' actions that become resources for other's improvement and vice versa. The regulated interactions of chess provide the opportunity for individuals to improve through a regulatory framework that combines the rules that control the game of chess and the rules of how both players will behave during the games (e.g. avoid cheating, be polite, share what has been learnt, etc.). Therefore, symbiotic relationships

may result in both participants obtaining benefits. This is known as 'mutualism' (Holland & Bronstein, 2008; Yoon et al., 2022).

Moreover, recording games using chess notation (e.g. algebraic, descriptive or other) allows for revisiting different plays, making their value explicit, and facilitating knowledge acquisition. As part of a knowledge acquisition process, this recording leverages the basic elements of a formal language: a vocabulary of movements and a syntax that helps evaluate whether a move was a quality play or a blunder. Later, we will explore in detail how language can explicitly convey the value of individual actions as collective resources.

Following the exploration of the chess example, another possible situation that deserves further reflection is when A and B achieve the same playing level, as this might stall any chance for improvement. If A and B cannot find other reasons why to continue playing together, the interaction might stop as no improvement is observed by A and B. This shows that this symbiotic interaction is a case of 'facultative mutualism', where participants' knowledge will persist even in the absence of a mutualistic interaction, conversely to 'obligate mutualism', where participants' knowledge would disappear (Holland & Bronstein, 2008).

One way to overcome such interactions (i.e. commensalism, parasitism, or obligate mutualism) consists of changing the original individual purposes that triggered such interactions, for instance, to continue playing and maintain their friendship. However, if there is no appetite for a change of the original purposes, the criteria used to evaluate performance is required to change; for example, to check A and B's competitive level against another player to test if their performance has improved. This means that the interest might be maintained by increasing the variety available. This can be done by adding new members to the interaction. In other words, by creating a community able to maintain the individuals' original purposes whilst enriching their future interactions. This chess vignette illustrates how a mutualistic symbiotic relationship might be maintained making their participants' performance stronger.

As diverse regulatory frameworks to build supportive communities can be discovered, a systematic approach needs to be developed to identify which are more successful in increasing performance among participants. Hence, one of the objectives of this paper is *to build a systematic approach to identify effective regulatory frameworks that support the creation of stable mutualistic symbiotic interactions*. As introduced in the chess vignette, such a regulatory framework will consider building communities that follow, at least, two principles: (a) to increase participants' performance, in terms of variety management (Beer, 1972), and (b) to reduce desertion by increasing the requisite variety available (Ashby, 1956/1999).

2.3. Challenges present when building supportive communities

Approaches are available to study the worthiness of people's interactions. These mainly focus on individual rational decision-making, where each potential action is evaluated according to its possible consequences (Rapoport, 1960). Rational decision-making has been extensively investigated and reported within decision-making literature (Edwards, 1954), such as Game Theory (Von Neumann & Morgenstern, 1944/2004), problem-solving (Newell & Simon, 1972) and meta-heuristics (Holland, 1992). Despite the undoubted benefits of these approaches, limitations have been recognised and adaptations have been made to depart from the assumption of rationality used to build models on individual decision-making (Gino & Pisano, 2008, Kahneman, 2012). Furthermore, when individuals are the object of study within an organisational context, the preferences and aims of individuals are usually forgotten or even avoided to try to reduce bias.

When looking at individuals' interactions and purposes within a business context, it can be observed that large organisations smooth individual expectations through lines of command and communication channels (Beer, 1972), but in the case of small and emerging supportive communities, such attenuators[2] are not usually formalised. Arrow (1950) proved that to achieve an alignment of preferences and aims among different stakeholders, at least one of the following conditions needs to be fulfilled: (a) to consider only some, not all, of all the possible preferences and aims; (b) to compel others to follow one's preferences and aims; (c) to support certain goals by deteriorating others, and (d) to introduce additional restrictions that make it difficult to implement others' objectives. Examples of such behaviour are observed in monopolies, oligopolies, and non-democratic societies. Other less extreme instances are found in mainstream supply chains, where big retailers impose practices among weaker suppliers and customers (Hingley, 2005).

Power-based interactions tend to produce two types of symbiotic relationships: (a) one where organisations obtain benefits without supporting or abusing others (commensalism), or (b) one where one benefits at the expense of others (parasitism). To escape from such unbalanced relationships, all the participants must benefit from their symbiotic interaction (mutualism).

This entails building opportunities to successfully accommodate all expectations, through processes that create and maintain supportive communities. This suggests considering communities as processes (Follett, 1919) that build collective resources (Lakshmi et al., 2015) rather than collections of individuals. Examples of such communities as processes can be found in many places around the globe; for instance, in England, there are *the Commons*, in Spain *the water access in the river Turia* (Valencia), and in Mexico the *ejidos*, a Mexican legal framework for collective ownership of land, through which members receive an individual plot of land for their own benefit, but also share and maintain communal holdings. However, the emergence of such communities required significant time and effort to self-develop; therefore, relevant questions to address are: how can we use communities as processes that support individual and collective improvements, concurrently? Furthermore, how can we accelerate the formation of such supportive communities?

At the micro-level, fostering cooperation (Axelrod, 1984), rather than taking advantage of others, requires recognising what we can offer and what to expect. Some individuals make decisions following a rational approach, while others use a more intuitive assessment (Kahneman, 2002, 2012); however, the quality of previous encounters seems essential to maintain a positive attitude towards collaboration (Axelrod, 1984). It is one thing to know that someone may facilitate and accelerate the decision to collaborate, but how might we build and maintain supportive communities without previous interactions? One possibility is to interact through intermediaries (e.g. brokers, other links in the supply chain, or common friends) who provide the closure required to stabilise interactions between different individuals and organisations (Hingley & Vilalta-Perdomo, 2017; Zhelyazkov, 2018). Another possibility is suggested by self-organising local actions, principles usually associated with C + OR (Herron & Mendiwelso-Bendek, 2018; Lakshmi et al., 2015; Vahl, 1994; Yearworth & White, 2018). Different constructs can be used to trigger such self-organising local actions; for instance, considering the quality of the relationship in terms of 'conviviality' (Guercini & Ranfagni, 2016), 'friendship' (Lakshmi et al., 2015), or even 'culture' as the basis of development in local contexts (Peredo & Chrisman, 2006). It is also possible to support network (and community) building by developing 'trust' (Guo et al., 2021; Putnam, 1994); for this purpose, Rapoport (1988) recommends conducting 'predisposition' exercises.

The previous chess vignette also indicates another challenge, that of avoiding abuse from the stronger over the weaker. In terms of the use and abuse of collective resources, Hardin (1968) illustrates the terrible end of such destructive behaviour using the 'Tragedy of the Commons' metaphor; a narrative that points out the need for a regulatory framework. Such rules may be built through external regulations; commercial law being an example in the context of micro-businesses. However, self-organisation seems to be a more effective and efficient way to produce balanced relationship rules; what Ostrom (2009) calls 'rules-in-use'. She recommends using democratic approaches to build such rules for coordinating actions, contrary to other writers who describe and discuss the appropriateness of more dictatorial positions, particularly in business literature (Christopher et al., 2006; Gereffi et al., 2005). However, the constraining powers of rules need to be well-tuned to respect the expectations and preferences of those governed by these rules (Hardy & Phillips, 1998; Rindt & Mouzas, 2015). The literature on heuristics in management and entrepreneurship provides insights into developing rule-based behaviours and cognition (Artinger et al., 2015; Guercini & Runfola, 2012; March, 1994), but there is the risk that such rules can be used by more powerful parties (for example, retailers) in asymmetric relationships, as a way of exercising their power (Hingley, 2005; Meehan & Wright, 2012); this risk needs special attention.

We identify three challenges that may emerge when building supportive communities. These challenges can be phrased as (a) how to foster collaboration? (Axelrod, 1984), (b) how do we achieve coordinated action? (Arrow, 1950), and (c) how to avoid abuse from the stronger over the weaker? (Hardin, 1968). We have also identified three approaches proposed in the literature to deal with these challenges: (i) to develop trust (Rapoport, 1988), (ii) to develop collective resources (Lakshmi et al., 2015) and (iii) to develop rules (Ostrom, 2009) (see Figure 1).

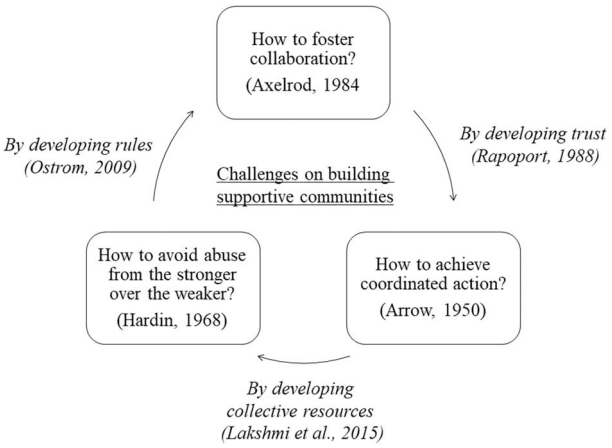

Figure 1. Approaches to deal with challenges when building supportive communities.
Source: Own production.

In summary, organisational literature documents practices describing how to deal with the challenges depicted in Figure 1, including the building of resources (Lakshmi et al., 2015), the (self-)regulation of business interactions (Bagozzi, 2006) and the engendering of trust (Solomon & Flores, 2001), even if the latter is not required as a foundation for cooperating (Axelrod, 1984). Such descriptions usually apply theories on big corporations to provide narratives, concerning issues of relative size, value, coordination, alignment, efficiencies and so forth. However, what seems forgotten is how to address such challenges whilst incorporating individuals' preferences and aims. This study extends these traditional frameworks by integrating individual preferences and goals, to foster high-quality interactions that concurrently enhance individual and collective performances. To achieve this, we propose a methodology that empowers individual actors to realise their objectives while contributing to collective goals, by constructing communities that support their members in such endeavours, creating a shared platform where individuals can thrive independently and collectively.

3. Method

To study how to build communities based on mutualistic symbiotic relationships whilst addressing the challenges explained in the previous section (see Section 2.3 and Figure 1), we will follow the C + OR tradition, with 'a desire to make a contribution to change in communities' (Midgley & Ochoa-Arias, 2004, p. 2), but with an additional twist. Rather than looking at individuals' views as constraints that need to be negotiated and aligned, perhaps through some accommodation (Checkland, 2000), we centre our research around building viable supportive communities. However, developing viable communities does not require them to be fully independent; the capability to self-sustain within their structural limits would be enough (Beer, 2002). Community self-sustenance refers then to the growth of internal resources and their accessibility to community members, as the availability of further resources results in more viable entities.

As exemplified in the chess vignette, improving individuals' performance through resources and possibilities available within a supportive community – i.e. 'variety' according to Ashby (1956/1999) – is a way to increase individual and collective adaptability to external disturbances, and improve their viability (Beer, 1972). Hence, viability also implies designing and building long-term structures that maintain, if not increase, the resources available. However, making visible the resources available within a community without 'killing the goose that lays the golden eggs' is not a simple task; for instance, how can we identify which individual actions become desirable and then a resource for the rest of the community members? The chess vignette above suggests using vocabulary and syntax to recognise the value of different moves and gain knowledge from such analysis – i.e. use a language to create and maintain knowledge. However, building regulations and respecting individual aims and preferences also demands avoiding top-down approaches that usually translate into resistance to change (Ostrom, 2009).

The chess vignette provides insights to explore how to make desirable individual actions explicit and then a resource for the rest of the community members. It consists of using 'languages' that make explicit desirable individual actions in the context of a community. The use of such languages helps to present how different regulatory frameworks are built, as formal communicative systems that support the development of supportive communities; formal in the sense that these consist of a vocabulary plus a syntax. The 'vocabulary' encompasses a series of individual actions within a community that may impact their members' performance. The 'syntax' refers to the set of implicit and explicit rules that regulate such vocabulary (actions) and separate those desirable actions that may become a resource for any community member, from other unacceptable individual actions that should be avoided. This set of activities (vocabulary) organised through a set of rules (syntax) allows embedding meaning to the interactions (see Table 1). Furthermore, the use of language as a construct to trace individuals' actions is that, by looking at continuous interactions between community members, it is possible to describe individuals' interactions through natural language and to discover which kinds of interactions are more conducive to increasing the predisposition of individuals to collaborate (McAdam et al., 2014). In summary, languaging individuals' interactions may be an effective way to develop a supportive network of meaningful interactions that may become a supportive community, and as such contribute positively to growth and strength of C + OR research and practice through an innovative approach. In the following subsections, we will

Table 1. Constitutive elements of a 'Language'.

Concept	Definition
Vocabulary	A series of individual actions within a community that may impact members' performance.
Syntax	The set of implicit and explicit rules that regulate the vocabulary (actions), distinguishing desirable actions that can become resources for community members from undesirable actions that should be avoided.

explore some possible languages, emphasising their contribution to developing mutualistic symbiotic interactions as well as their limitations and risks.

4. Community as a process. Examples of vocabulary and syntax

To build mutualistic symbiotic interactions and, therefore, supportive communities, we have suggested considering communities as processes (Follett, 1919) that build collective resources (Lakshmi et al., 2015) rather than collections of individuals. To illustrate what 'a community as a process' may mean in the context of individuals acting together to improve their performances, and to show some examples of vocabulary and syntax in a real situation, we present the case of a set of micro-businesses (MBs), where their owners act collaboratively in a Mexican short food supply chain, specifically a farmers' market. The system-in-focus is the Mercado de las Cosas Verdes Tianquiskilit (hereafter MT). This research was conducted by some of the authors of this paper (Michel-Villarreal et al., 2021), and it concerns a set of micro-businesses (MBs) producers and processors, organisers, and consumers participating in a farmers' market that operates beyond being a place where products are exchanged for money. Since its origin, members within this community have been developing and sharing resources; a skill that allowed them to successfully navigate between the Covid-19 reefs (Michel-Villarreal et al., 2021).

This farmers' market was born in 2015 as a direct marketing project for Chinampa's producers around Xochimilco, Mexico City. The term 'Chinampa' (from the Nahuatl word chinamitl) refers to an ancient agricultural system integrated into shallow lake areas. Chinampas are usually rectangular plots measuring 5–10 m wide by 50–100 m long that comprise fertile arable land areas surrounded by trees and water channels. The different actors involved in MT are producers, processors, organisers, and consumers. The logistical and managerial work is handled by a set of organisers and a coordinator. All the organisers are producers or processors too.

Currently, MT has sixteen members, including producers and processors. Producers are micro-businesses (MBs), typically small farmers, and agricultural collectives, associations, cooperatives, or other small businesses, directly involved in agroecological production in Chinampas. Processors are people, collectives, associations, cooperatives, or small enterprises that use artisan processes to add value to local, and often agroecological products sourced directly from farmers, wholesale stores or retail stores (Mercado de las Cosas Verdes Tianquiskilit, 2020). Other important actors within MT are the customers. Interestingly, these are referred to as 'allies' by the MT's producers and organisers. In this sense, producers do not see these allies just as customers who are buying from them, but as an integral part of their productive projects. The circularity present in the relationship between producers and allies, mediated through the MT's organisers, shows that MT has become a process where collective resources are developed and shared, rather than just a place to exchange products for money.

Even though having agroecological or organic certifications is not required to join MT, producers interested in being members must demonstrate that they follow agroecological practices (e.g. syntax). For this purpose, MT periodically organise internal visits to production units of members and potential members, to verify that agroecological practices are followed, and to suggest better practices conducted by other members (e.g. vocabulary). Therefore, MT is a knowledge hub for people interested in engaging in agroecological practices. In summary, MT operates sustainably by providing opportunities designed to appeal to different members, such as allies, producers, and even other organisers/volunteers. Activities such as traditional cooking and agroecological training have become an important source for maintaining their current membership and co-opting new members (e.g. vocabulary).

Before the COVID-19 pandemic, MT took place every Sunday from 10:30 am to 4:00 pm (e.g. syntax). However, in March 2020, governmental instructions associated with the COVID-19 pandemic forced MT to close down its physical venue. The ongoing pandemic affected MT in two main ways. First, two weeks before the closure concerns about Covid-19 among customers were noticeable by a drastic reduction of attendance to the market; this led to economic losses and waste. Second, the local government decided to close markets that took place in public places to curtail the spread of the pandemic. Because MT takes place in a park that is considered a public place, they were forced to stop operating in that venue.

As a response to this unexpected event, and to limit its effects, MT started operating as a newly formed online network named Red de Consumo Solidario Tianquiskilit (Solidarity Consumption Network Tianquiskilit) (e.g. syntax). Even though normal operations were interrupted, the farmers' market never stopped selling; MT was able to adopt a web-based configuration within a week to offer home deliveries or collections from two different venues (e.g. vocabulary). It was key for MT to count on the support of a diverse pool of producers (i.e. suppliers). Even when some producers were reluctant to participate in the new network at the

beginning, MT was able to sustain operations by quickly recruiting external producers (e.g. vocabulary). This was accomplished primarily by relying on the networks and connections of existing producers and connections with other actors. Here, collaboration and information exchange with other farmers' markets was key for recruiting new producers. This was desirable because those potential producers were already familiar with the way farmers' markets work, and many already had inspections to demonstrate that they followed good agroecological practices. In this case, links between producers and potential ones became a resource for the collective effort to maintain MT operation. The COVID-19 pandemic triggered the opportunity for MT's members to recognise themselves as resources for each other, and in this context, to conceive and execute collective actions. In this case, a clear collective action was the development of a new online distribution channel (e.g. vocabulary). Participation in this new fulfilment model led some consumers, producers, and organisers to develop new digital skills (e.g. knowledge acquisition). Here, the adaptability of the consumer base was key for successfully changing the mode of delivering products. Some consumers struggled to understand the use of the order form, and some needed to acquire new digital skills to use Excel and WhatsApp.

Changes were also required on the production side. Producers had to change the days they harvested their crops (e.g. syntax). Whereas before the pandemic producers needed to get to the farmers' market at 9.00 am to set up the stalls, they now must get to the distribution point before 7.30 am so that boxes can be assembled (e.g. syntax). This means that producers have limited time to harvest the products during the morning before attending the market, and some must harvest their products a day before, on Saturdays, to ensure freshness and the prompt delivery of products on Sundays.

Finally, this new online network was a collective action that impacted the delivery. MT uses two different transportation systems. For shorter distances – less than 15 km – the delivery is carried out by a company that uses bicycles (e.g. vocabulary). For longer distances, the boxes are distributed in a vehicle that belongs to a member of the farmers' market (e.g. vocabulary). These new actors had to be co-opted by MT to implement this new online distribution channel. In summary, to maintain the collective resources, supportive communities may develop a series of individual and collective activities, conceived, and implemented for the benefit of all the members.

In terms of individual and collective benefits, the creation of the new Red de Consumo Solidario Tianquiskilit has allowed the organisation to expand their reach through deliveries to neighbouring municipalities. This resulted in increased sales for producers and increased food security for consumers. Furthermore, producers have seen a reduction in food waste. This is thanks to the orders that producers receive in advance. It gives them the information required to harvest exactly the amount of produce that will be sold. Nowadays, Red de Consumo Solidario Tianquiskilit has become a permanent and separate initiative that works in partnership with MT to promote online sales. After several months of work, they have been able to establish an order fulfilment process that allows them to efficiently receive, handle and deliver orders. They have gone from taking orders by hand on a piece of paper to developing an order form that includes a list of existing products, units, estimated prices, customer names and number of customers (e.g. vocabulary).

In both examples, the chess players' expansion and the farmers' market members, we can recognise that both regulatory frameworks for building supportive communities made use of the two principles previously indicated: (a) to increase participants' performance, in terms of variety management (Beer, 1972), and (b) to reduce desertion by increasing the requisite variety available (Ashby, 1956/1999).

Concerning the increase in individuals' performance, the chess vignette presents the benefits of organising a stable interaction space to increase players' competitiveness. Similarly, MT improves individuals' performance on several fronts, for instance, by increasing sales and reducing waste. Furthermore, to increase the requisite variety and reduce desertion, both illustrations provide a similar solution to accepting new members. The chess game suggests that it is possible to enrich the learning experience by adding requisite variety, through looking for more members and making it a supportive community. Similarly, the MT's active search for new producers and processors resulted in a stronger resilience from the collective resources. In terms of symbiosis, it may be claimed that both vignettes exemplify mutualism – i.e. symbiotic interactions that benefit all the participants. However, the reasons behind the decision to participate seem different; the chess vignette illustrates a case of facultative mutualism, as players' participation is voluntary; meanwhile, the farmers' market (MT) seems to be a case of obligate mutualism, as a form of increasing their resilience and sustainability (Holland & Bronstein, 2008).

In summary, examples of vocabulary and syntax can be identified in communities. These may make explicit individual actions that are desirable for the

community and others that are unacceptable. However, the logic behind the constructive process of such vocabularies and syntaxes (i.e. languages) seems to depend on the expectations that trigger community members to participate. Below we will explore three languages associated with different spirits of collaboration: (a) acting with no clear economic rationality in mind, (b) building models of action, and (c) building models for interaction.

4.1. The language of quid pro quo.[3] Acting with no clear economic rationality in mind

Within small communities, especially among micro-businesses (MBs), the prevailing ethos is *laissez-faire*. Individuals often resist what they perceive as excessive regulatory control from the community, and businesses expect minimal governmental interference in economic affairs. Examples of this can be seen inside lightly or non-regulated fora, such as bazaars, car boot sales, *tianguis*, and flea markets. The previous example of the *Mercado de las Cosas Verdes Tianquiskilit* shows how in Mexico it is common to see hundreds of individuals who run family-owned micro-businesses (MBs) joining Mexican *tianguis* – a Nahuatl-origin (pre-Hispanic) word, *Tiankistli*, that means 'marketplace'. These markets usually take place once per week in streets, closed to traffic for this purpose. *Tianguis* sell a large variety of products and operate following traditional rules, even though local government has become more and more involved in controlling illegal and/or risky activities, for example, regulating hygiene in practices involving food and dealing with other black-market issues, such as tax avoidance. Similar markets operate in many other countries.

In this *laissez-faire* environment, individuals (MB owners) closely interact with final consumers, and in some cases establish long-term commercial and personal relationships. Interactions with other MB owners are also created, mainly due to the physical proximity between the stalls located in a market. A common practice in *tianguis*, also seen in Farmers' Markets, concerns how MB owners coordinate their activities and support each other; for instance, when one needs to go for food or more prosaic activities like visiting the toilet. In these cases, MB owners trust other members to cover their absence and even deal with customers as if it were their own business. They may also recommend other MBs in the *tianguis* to their customers, in case they do not have what the customer is looking for. Mutualistic interactions can also be found, such as women who prepare the *elote* (Nahuatl-origin word for corn on the cob) in *tianguis*. These women collaborate in the cleaning of the cob, in exchange for using the leaves, which they sell to make *tamales*, a Mesoamerican dish usually made of corn dough, which is steamed in a corn husk (Licona Valencia, 2014). The above exemplify a vocabulary of mutualistic symbiotic interactions, that consists of a series of supportive activities within the *tianguis*. In summary, concerning the challenges of building supportive communities, this vocabulary may support the coordination of action (e.g. selling together), building collective resources (e.g. a collective reputation), fostering collaboration (e.g. receiving corn husks for cleaning cobs), and developing trust (e.g. covering each other's stalls). Examples of vocabulary and syntax of the language of *quid pro quo* can be found in Table 2.

Concerning the syntax, we may identify different rules and expectations. The first one, covering another's absence, illustrates an example of *quid pro quo* behaviour; the second, preparing *elotes*, is closer to a mutualistic symbiosis. However, the lack of strict regulations is expected, as *tianguis* concern communities where the regulatory frameworks are relaxed in the extreme, with a minimal set of rules that regulate the cost, the location, the instructions to set and pack the stall, and the start and end of the *tianguis* operation. We name this vocabulary of actions and the syntax that regulates these interactions as the language of *quid pro quo*.

In summary, incipient vestiges of supportive communities can be made explicit by using the language of *quid pro quo*. Advantages result from the effective and efficient use of the language of *quid pro quo*. For example, additional support results from making explicit continuous successful interactions that are (more or less freely) available for the community members, as shown in the case of the *tianguis*. However, the absence of a process for developing more exhaustive rules gives space for misbehaviours.

4.2. The language of customers' needs. 'Models of' action

To mitigate the undesirable effects described in the previous section, such as mafias and the black market, alternative approaches have been developed.

Table 2. Language of *quid pro quo*.

Quid pro quo	When running a business in a farmers' market Vocabulary: Activities that support others' actions (e.g. promoting and selling others' products, building a collective reputation, and sharing marketing ideas). Syntax: Rules of the farmers' market (e.g. opening time, layout, fees, and hygiene).

Examples – vocabulary and syntax.

These involve an external intervention to identify changes, their associated benefits, and any potential risks (Checkland, 2000; Huxham & Vangen, 2003). This second possibility, to discuss the building of sustainable regulatory frameworks that help create and maintain supportive communities, is usually based on descriptive models (i.e. 'models of'). The modelling exercise focuses on the development of a set of interfaces that aim to build mutualistic symbiotic interactions. In general terms, such procedures involve three steps. First, the better-positioned and more influential individuals provide their interpretation concerning others' (customers') needs, usually through building a 'model of' the typical beneficiary/customer or 'models of' clusters resulting from a market segmentation exercise. Second, stronger individuals develop a protocol that rules the community interactions (i.e. a syntaxis); this in the business environment usually equates to rules about packing, prices, and other characteristics associated with a cost/benefit relationship. Third, every community member is expected to act (i.e. to contribute to the collective vocabulary) in alignment with the instructions dictated to provide the expected product or service. In the business context, supply chains are a typical case of this power-unbalanced procedure (Hingley, 2005) (see Figure 2). Here, mainstream supply channels could be more accurately described as being 'captured' by big businesses (Gereffi et al., 2005), who are the only ones that interpret and own the descriptions concerning customers' preferences and aims. We call this second way of conducting interactions the 'Language of Customers' Needs'.

Despite the value of achieving others' expectations, this approach may also find resistance from weaker individuals. For instance, in a business context, MB owners who are usually limited in terms of resources available and have an independent-minded spirit, may oppose external impositions to their decisions about products and processes. However, it is the case that long-term exchanges may build bridges to achieve certain trust and promote further collaboration (Axelrod, 1984); like additional investments and joint ventures in commercial developments, facilities expansions, or industrial clusters. Examples of vocabulary and syntax of the 'Language of Customers' Needs' can be found in Table 3.

4.3. The language for interactions. 'Models for' action

It is important to note that in the vignettes provided previously – i.e. chess and the farmers' market – chess players and MT's members were cooperating, but also following their purposes, sometimes in conflict with that of others; for instance, to win a chess match or to benefit from others' customers. This situation has been identified in previous organisational literature as 'coopetition' (Bengtsson & Kock, 2000), where collaboration exists between competitors in the hope of mutually beneficial rewards. To explore this type of interaction, let's visit the world of hobbies, where people usually look for others who share their interests. This usually converges in the emergence of supportive communities where people may coordinate collective activities even when such activities can be seen as adversarial, like in wargaming.

Wargaming is one of many 'serious games' developed with the intention that 'gamers gain new knowledge about the phenomena the game

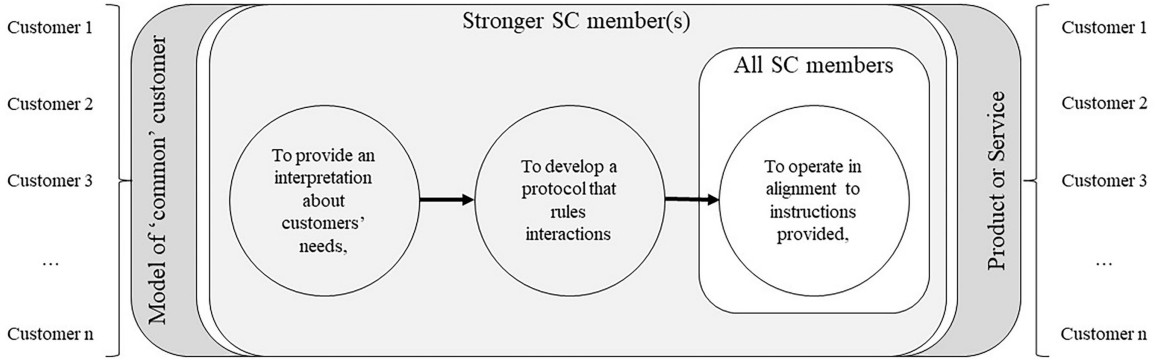

Figure 2. The language of customers' needs in a supply chain context.
Source: Adapted from Vilalta-Perdomo and Hingley (2018).

Table 3. Language of customers' needs.

Customers' needs	When running procurement in a big retailer. Vocabulary: Activities related to procurement (e.g. providers' selection, contracts, product reception, and payments). Syntax: Rules associated with the different procurement activities (e.g. packaging instructions, delivery times, and quality specifications).

Examples – vocabulary and syntax.

represents' (Rubel, 2006, p. 2). Wargaming is usually defined as a model of military activities, without the use of actual military forces, where a set of rules, data, and procedures affected by random events, make players decide the course of actions of different actors, factions, factors, and frictions usually seen in military activities (Perla, 1990). The origins of wargaming can be traced to the *Kriegspiel*, a game developed during the XIX century to train Prussian officers in the art of war, but its extension in the form of a hobby can be linked to H.G. Wells and his book 'Little Wars' published in 1913.

It was 1991 when two wargaming players from different locations within Lincolnshire, UK, decided to organise a wargames club in the City of Lincoln. The first concern for developing such a club was to bring in other wargamers and to find a space for such a 'gathering' (i.e. vocabulary). As wargamers do not share the same economic or cultural background, flexibility in the membership was required; 'we, as wargamers, have to recognize [sic] that our hobby is not a world apart – not a rigid, inviolate enclave for fans of one or two specific things' (Wargamer, 2022).

The two organisers followed a series of steps to identify potential members for the wargames club. The first step consisted of continuously collecting observations about potential members and vice versa (i.e. vocabulary); the organisers had to decide if there was an appetite for a wargames club, and the potential members had to consider if it was worth becoming a member. This means that the people involved would have to construct their own sets of reported observations about others' preferences, aims and needs. As there were different datasets and evaluation criteria, depending on each person involved, the data collected from such interactions was never fully closed. In terms of research methods, this suggests that when individuals' aims, preferences and needs are considered, the traditional scientific method[4] is of limited use. When this is the case, some 'tricks' could be done, for instance, to simulate behaviours under study or conduct experiments (Hsu et al., 2017), but the collective dataset would need to remain open for further enrichment.

A second issue considered by the organisers of the wargames club was to make the participation palatable. As in the case of chess, individuals decided to become members because it was an effective and cheap opportunity to find other players (i.e. vocabulary); in other words, each member considered other members as free wargames resources. To make friendly use of the resources available (i.e., vocabulary), members of the wargamers club jointly developed a simple regulatory framework to coordinate actions (i.e. syntax), and three positions were established: Chairman, to deal with internal disputes; Secretary, to coordinate activities, and Treasurer, to manage the funds. As several games were played concurrently (i.e. vocabulary), usually two games per night, there was a need to regulate how to select what games to play (i.e. syntax), when to play them (i.e. syntax), who would be involved in each game (i.e. syntax), who would volunteer to become the game master: for explaining the rules and providing clarifications (i.e. vocabulary), and how physical collective resources would be shared and distributed (i.e. syntax). The Secretary administered these decisions (i.e. syntax). This issue involves another implication to research methods for building supportive communities, it demands the development of a regulatory framework.

Finally, a third aspect to consider relates to individuals identifying activities that may contribute to collective endeavour and reciprocate others' support. For instance, individuals established areas for collective development (i.e. vocabulary), exploring and playing specific games and associated projects, such as collective games in wargames conventions and exhibitions (i.e. vocabulary). Games, rules, scenarios, dioramas, and figures were designed, built, and painted to develop exhibition games (i.e. vocabulary). A promotional flag, dice and embroidered t-shirts featuring the club logo were purchased with club funds (i.e. vocabulary). These investments were overseen by the Treasurer (i.e. syntax). Consequently, club members successfully built a collective brand by participating in regional wargames exhibitions. This also illustrates a final implication to research methods, the need to support the construction of spaces to build and test innovative collaborative practices among the club members. The construction of such spaces, physical or virtual, depends on the direct intervention of members.

This three-fold procedure is consistent with the concept of 'supply community' (Hingley & Vilalta-Perdomo, 2017). It combines and enriches the previous two languages of *quid pro quo* and customers' needs. It consists of introducing elements from the first way of conducting interactions (Language of *quid pro quo*), that are forgotten in the second (Language of Customers' Needs), such as considering individual preferences and aims. It also enriches the first approach by including elements from the second, such as the possibility of developing collective actions coordinated by *ad hoc* rules. Accordingly, it might be argued that the Language for Interactions proposes an approach that strives to increase the members' predisposition to collaborate by making available members' actions that fulfil other members' expectations (Lakshmi et al., 2015). Examples of vocabulary and syntax of the 'Language for Interactions' can be found in Table 4.

Table 4. Language for interactions.

Interactions	When running a (wargames) club. Vocabulary: Activities prepared for participants to interact, (e.g. games to play, collective branding, exhibition games). Syntax: Regulations of the club (e.g. rules of games, club structure, monitoring and control of investments).

Examples of vocabulary and syntax.

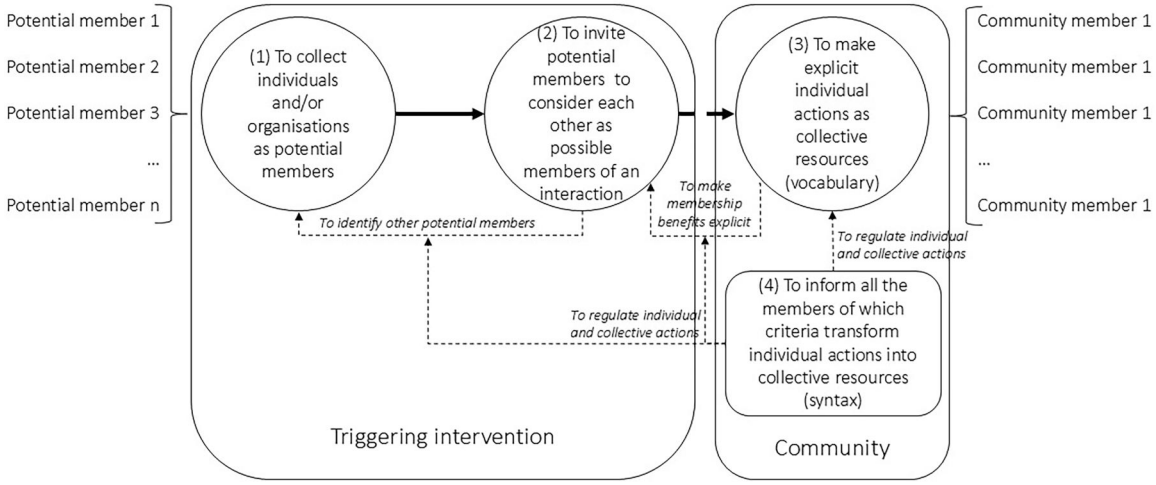

Figure 3. The Language for Interactions.
Source: Adapted from Vilalta-Perdomo and Hingley (2018).

However, this type of intervention must also consider risks associated with potentially undesirable side effects, like organised crime. A well-known example of a club accused of conducting illegal activities is the motorcycle club 'Hells Angels'. This group is complex and geographically widespread; it contains group social interaction around motorbikes and biker culture with charitable activities (Kuldova, 2016), but a darker side of organised crime has also been investigated (Morselli, 2009). Conversely, the wargames club vignette is closer to the original idea of looking at supportive communities as processes. It also illustrates a third way to look at regulatory frameworks that promote sustainable and resilient mutualistic symbiotic interactions.

Therefore, to avoid undesirable side effects and build and maintain long-term mutualistic interactions, where these preserve their value to participants through time, despite external disturbances, any language should also be able to describe how interactions may adapt and cope with other sources of tension, internal or external. This suggests the need for feedback and feedforward informative cycles, to close the loop and create collective resources that make interactive communities viable (Vilalta-Perdomo & Herron, 2018). Such viability usually operates through monitoring and control schemes, and adaptation procedures (Beer, 1972). Feedback and feedforward informative cycles can be used to increase the quality of the mapping, by making explicit how to create collective resources available to all the participants.

In summary, the building process of a wargames community suggests the following four steps: (1) to collect individuals, (2) to invite such individuals to consider each other as resources, (3) to make explicit individual actions as collective resources (i.e. vocabulary), and (4) to inform all the members which are the criteria that transform individual actions into collective resources (i.e. syntax). We call this approach 'the Language for Interactions'. By following this set of instructions, interventions can be designed to trigger the building of supportive communities based on mutualistic symbiotic interactions. It consists of developing and implementing 'models for' interactions (see Figure 3).

5. Discussion. Languages contributions to building and maintaining mutualistic symbiotic interactions

Previously, we presented three kinds of language that make individuals' interactions explicit to build and maintain supportive communities. However, how these languages contribute to developing mutualistic symbiotic interactions deserves further discussion. A way to do such evaluation is by looking at how each language (i.e. *quid pro quo*, of customers' needs, and for interactions) deals with the challenges when building supportive communities, as presented in Section 4.3 (see Figure 1).

The farmers' market vignette presented in Section 4.1 (i.e. the language of *quid pro quo*) illustrated that trust between different individuals (in this case MB owners) may be built when tokens of support are successfully exchanged, and participants in such exchanges could coordinate certain actions; for instance, attending the others' stalls when required or

even selling others' products in markets that only some of them attend. These activities allow individuals to provide and receive support from other community members. However, negative outcomes may also arise from its use, as non-regulated activities may emerge from ungoverned spaces where mafias can operate and black-market activities flourish. Hence, the language of *quid pro quo* does not fully cover the challenges identified when building a supportive community, like avoiding abuse or achieving coordinated action (see Figure 1).

The mainstream supply chain vignette in Section 4.2 showed that the language of customers' needs considers actions (centrally) coordinated through (centrally) developed rules; however, it does not support the building of collective resources or trust, and it does not avoid potential abuses committed by stronger actors. Therefore, it fails to cover all the challenges of building supportive communities (see Figure 1).

The wargames club vignette in Section 4.3 suggested that the 'Language for Interactions' provides the opportunity to identify how to coordinate actions (e.g. weekly games) and build collective resources (e.g. materials for collective branding like the banner). It also considers devices to avoid, or at least limit, abuse (e.g. the Chairman's position) and to build rules (e.g. the club's constitution). Furthermore, it supports the collaboration of club members on different projects (e.g. organising games for shows) and developing trust (e.g. managing the club's funds). Therefore, it provides a comprehensive approach to dealing with the challenges identified in building supportive communities (see Figure 1).

In summary, Table 5 characterises the different languages investigated in terms of their contributions to dealing with challenges when building supportive communities, through developing mutualistic symbiotic interactions.

5.1. The Language for Interactions contributions to community OR research and practice

In the previous section, we confirmed that of the three languages explored the 'Language for Interactions' is the most comprehensive approach to dealing with the challenges identified in building supportive communities (see Figure 3 and Table 5). The wargames club vignette also helped illustrate the strength of the Language for Interactions to make the value of individuals' actions explicit and add visibility to transform them into collective resources. This suggests that the Language for Interactions can be used to improve the performance of communities and their members. However, one question concerning the use of such language would be to confirm its contribution to building supportive communities in the context of Community OR (C + OR). One actionable way to consider if the Language for Interactions is part of the OR family is to establish if it fulfils the expected role of OR in 'securing of improvement in social systems by means of scientific method' (Churchman, 1970, B-39). The traditional steps concerning the scientific method usually consider steps like the following: (1) to collect data, (2) to adjust such data in the light of current theory, (3) to suggest classes that contain plausible hypotheses and (4) to suggest further limitations on hypotheses (Churchman, 1971). Therefore, to confirm that the Language for Interactions is a tool useful for Community OR, we need to show that the procedure is aligned with the scientific method.

5.1.1. To collect data

To scientifically study mutualistic interactions that respect individuals' aims and preferences, researchers or organisers (i.e. somebody interested in starting or enriching a community) should trigger the construction of collective spaces, where current and potential community members may collect reported observations about other individuals' preferences and aims. However, individuals' preferences and aims are not stable; these change through time due to further experiences and interactions. This means that collecting data as closed sets is ineffective for studying mutualistic interactions that respect individuals' aims and preferences. The design of the data collection process must consider that current and potential community members will continue interacting and observing each other's actions and behaviours; this suggests the construction of open data sets that must be maintained and updated through continuous interactions, rather than relying on fixed-point, quickly outdated observations. Therefore, the data collection in the Language of Interactions and the

Table 5. Characterisation of the different languages of *quid pro quo*, of customers' needs, and for interactions.

Language for …	Coordinate action	Build collective resources	Avoid abuse	Develop rules	Foster collaboration	Develop trust	Side- effects
Quid pro quo	It may be supported	It may be supported	Not considered	Not considered	It may be supported	It may be supported	It may cover up illegal activities
Customers' needs	It may be supported	Not considered	No	Yes	It may be supported	It may be supported	Resistance from MBs
Interactions	It may be supported	It may be supported	It may be supported	It may be supported	It may be supported	It may be supported	It may cover organised crime

scientific method are similar, even though the Language for Interactions considers more dynamism. The Language for Interactions focuses on collecting vessels (i.e. current and potential community members) rather than fixed out-of-date data.

5.1.2. To adjust collected data in the light of current theory

Current and potential community members use their open datasets to identify clusters of individuals with similar preferences and aims. These clusters also provide insights concerning others' actions that might be of interest. This can be done, for instance, by inviting current and potential members to adjust how they interact with others and consider each other as beneficial resources. Accordingly, the Language for Interactions explicitly proposes inviting current and potential community members to explore what others do and how that might match with what they do, and to decide whether others' activities make it attractive to join the community. Similar adjustments are made in step 2 of the scientific method. Traditional organisational approaches adjust the data collected (not the vessels) to form hypothetical collaborative structures through a top-down intervention (e.g. alignment of goals and objectives) or by providing external resources (e.g. funding, permits, and training). However, this may result in resistance. For instance, in the case of micro-businesses, these are owned by independent-minded individuals who usually resist leading authorities, and fragmentation often results in the lack of singular, coordinated direction (Hingley & Vilalta-Perdomo, 2017). To reduce side effects, such as defections or resistance, every participant should find something of interest and relevance in the relationship. The Language for Interactions makes this explicit.

5.1.3. To suggest classes that contain plausible hypotheses

The Language for Interactions explicitly encourages community members to view each other as valuable resources and identify others' activities that might benefit them. Accordingly, the Language for Interactions proposes to initiate formal interactions where individuals identify activities which may contribute to collective endeavour; this is to make individual actions that become collective resources explicit (i.e. building the vocabulary). These collective resources are usually built through conversations concerning the creation and sharing of resources that they may be unable to acquire and maintain as individuals, like transport vehicles or buildings. Specific examples are found in the previous vignettes provided, such as organising an internal competition (chess gamers), sharing the costs associated with marketing (farmers' market), or attending a wargames exhibition (wargames club). Therefore, this step of the Language for Interactions considers hypotheses concerning how to collaborate. Such hypotheses and their level of acceptance can be collected to map individuals' reactions to different sustainable and resilient interactions that can be considered a mutualistic symbiosis. Similarly, in its third step, the scientific method recommends building hypotheses, suggested by the data collected and the current state of the art.

5.1.4. To suggest further limitations on hypotheses

To strengthen the links and commitments between community members, some of the collaborative structures proposed could require additional quality (e.g. to become more attractive or to be worth maintaining in the long term). This can be done by developing criteria (e.g. regulations) that make more explicit the most desirable and feasible individual and collective actions. For this purpose, the Language for Interaction offers to inform all the community members of the criteria that transform individual actions into collective resources (i.e. syntax) (see Figure 3). The explicit criteria allow mapping the quality of interactions and how these can improve by developing purposeful collective actions, conducive towards strengthening the current interactions. Instances of this process of continuous improvement can be activities that take place in the social dimension (e.g. business events and celebrations), or more practical (e.g. the development of a set of regulations) to foster certain actions and inhibit others, which are collectively discussed and agreed upon.

A summary of the comparison between the Language of Interactions and the scientific method is shown in Table 6. It provides evidence of direct links between the scientific method and the

Table 6. Traditional scientific method and the Language for Interactions.

Traditional scientific method (Churchman, 1971)	Language for Interactions (mutualistic symbiosis)
Axiom 1: To collect data	Instruction 1: To bring people together
Axiom 2: To adjust such data in the light of current theory	Instruction 2: To invite individuals to consider each other as potential resources
Axiom 3: To suggest classes that contain plausible hypotheses	Instruction 3: To initiate interactions, where individuals identify activities by which they may contribute to the collective endeavour
Axiom 4: To suggest further limitations on the selected hypothesis	Instruction 4: To strengthen and improve desirable and feasible interactions and inhibit the rest.
Note: Knowledge developers and users are not usually the same individuals	Note: Knowledge developers and users are the same individuals

Language for Interactions and confirms that the Language for Interactions can be considered part of the OR discipline. Furthermore, since the Language for Interactions aims to build supportive communities, Table 6 suggests its integration into the C + OR tradition and in its toolbox.

6. Conclusions

The paper aims to address the research question: *how to create supportive communities, in which future members can improve their performances, without the need to sacrifice their own identity in the name of a collective one?* We propose viewing communities as integrative processes, where individuals' preferences and aims are considered when building symbiotic relationships.

The concept of 'language' was proposed to make explicit and analyse the worthiness of the contribution of individual actions in developing high-quality (mutualistic symbiotic) interactions. The 'vocabulary' consists of individuals' actions that may become collective resources, and the 'syntax' regulates what actions are acceptable and even desirable within the community, and how these could be accessed and used. Three languages were explored: (a) of *quid pro quo*, (b) of customers' needs, and (c) for interactions, and three Community OR vignettes (i.e. chess players, farmers' market members, and wargames club members) were presented to contextualise the research problem and illustrate the languages. The paper also delineated the advantages and limitations of the first two languages and proposed the Language of Interactions to address challenges associated with building supportive communities. The Language for Interactions was contrasted with the scientific method to confirm if the latter can be considered part of the OR discipline, particularly the C + OR tradition.

An important contribution of this research comes from how the Language for Interactions was developed and proposed. It involves several implications on how the scientific method may be interpreted and used. First, the traditional scientific method is usually concerned with dealing with sources of bias; accordingly, to alleviate bias requires closed datasets. Conversely, the Language for Interactions allows using open datasets, where new aims and preferences may be included for further analysis and enrichment; this makes bias explicit and a fundamental part of enriching the process of collective knowledge creation. Second, the Language for Interactions asks individuals to look upon each other as resources, where possibilities for individual and collective development may be defined and explored, mainly through joint projects and investments. Accordingly, operational mechanisms, such as building a collective brand, can be explored through this language. Finally, concerning research methods, the Language for Interactions can be used to build and maintain spaces to design and test innovative collaborative practices among individuals. An implication of this is the expansion of traditional frameworks for supporting new entrepreneurial activities, such as technology parks and business accelerators and incubators.

Connected to previous approaches, the use of a set of instructions as part of the C + OR research and practice for building mutualistic interactions has implications in policymaking. Concerning the Language of *quid pro quo*, the role governments' are expected to play must be limited to building free, but not necessarily fair, societies. In this context, no support can be presumed for those in a disadvantaged position, and effects from unrestricted power will continue to be present in individual and collective relationships; therefore, for the Language of *quid pro quo*, mutualistic interactions would not be in the foreground of community creation processes. According to the Language of Customers' Needs, the role of governments and their agencies is to invest in legal means that can offset deficiencies; the challenge would be agreeing on the nature of those deficiencies and how these should be dealt with. For limitations of this approach, see Arrow (1950) for more detail on this exposition. Finally, the Language for Interactions operates at the level of individuals and their interactions; the aim is to build collaborative resources, where participants, their abilities and their activities become resources for others and become the vocabulary available to build mutualistic interactions. However, these resources need to become available to everyone, to be considered a form of knowledge; regulatory frameworks (i.e. syntax) should be developed and made explicit to ensure the increase of individuals' ability to excel in their performance. In this context, the role of authorities would be to support regulatory frameworks to ensure that the collective resources available may enrich individuals and organisations in unison. Examples of this may be found in the development and access to free online systems and content (e.g. e-government), and in the re-alignment of supply chains and networks around customer-to-customer (c2c) arrangements, away from power-loaded linear and 'captured' backwardly integrated supply chains.

Further research on similar types of languaging exercises to make explicit or analyse the worthiness of individual actions as collective resources is relevant; for instance, the *do ut des* ('I give that you might give') behaviour. This is similar to *quid pro quo*, even though in the former an expectation of reciprocity is the trigger for the individual action,

whilst in the latter not having a proper exchange is considered an unfair action.

Finally, this paper builds on Follett's ideas about communities as creative processes, where individuals' wishes are integrated into different modes of association, what Midgley et al. (2018) refer to as a 'meaningful engagement of communities' (p. 772). Follett focuses on the practice of community as a process, for those cases where communities perpetuate the activities by which they came into existence. This perspective has a direct relation with the Community OR expectations, indicated at the start of this paper: to address citizens' concerns by framing them as complex systemic problems, which allows studying different forms to deal with challenges of a localised nature with a diverse set of individuals associated with specific characteristics. However, this paper goes beyond this external vision of solving collective problems. It presents an original research approach to building supportive communities, by considering the Language for Interactions as a tool to analyse individual actions as potential collective resources and make them explicit through natural language sentences. Such language is constituted by a set of individuals' actions (the vocabulary) and rules that guide such actions (syntaxis). This approach allows building sentences that instruct individuals on how to identify which actions better support the collective and vice versa.

The main contribution is that such a building process does not require knowledge from external experts; building desirable individual actions and internal interactions, and adding new members are the main ways to enrich individuals' and collectives' performance. Communities built in such a self-organised way might become an alternative for developing more viable collectives, as increasing variety for autonomous decision-making results in more resilience to internal and external disturbances (Beer, 1972). We propose this by looking at OR for insights concerning the 'securing of improvement in social systems by means of scientific method' (Churchman, 1970, B-39), and their application within communities.

Notes

1. We understand by 'resources' tangible or intangible assets used by individuals to compete (Miller et al., 2007).
2. 'Attenuator' is a concept that comes from the cybernetics' tradition, Stafford Beer (1979/1994) and his Viable System Model in particular. An *attenuator* is not just a device to reduce the amount of signal received; it also consists of a selection of aspects of the signal that are relevant to the receiver. Examples in current business practice are internal procedures to claim expenses, to report failures or to appraise employees.
3. According to the Oxford English Dictionary quid pro quo entails giving one thing in return or exchange for another.
4. We refer here to the Descartes' method (1637): (1) Never to accept anything for true which I did not clearly know to be such; (2) to divide each of the difficulties under examination into as many parts as possible, and as might be necessary for its adequate solution; (3) to conduct my thoughts in such order that, by commencing with objects the simplest and easiest to know, I might ascend by little and little, and, as it were, step by step, to the knowledge of the more complex, and (4) in every case to make enumerations so complete, and reviews so general, that I might be assured that nothing was omitted. This can be extended to other forms of scientific research, see Churchman (1971) and de Zeeuw (2001).

Disclosure statement

No potential conflict of interest was reported by the author(s).

References

Adler, L. (1966). Symbiotic marketing. *Harvard Business Review, 6 Nov–Dec,* 59–71.

Arrow, K. J. (1950). A difficulty in the concept of social welfare. *Journal of Political Economy*, *58*(4), 328–346. https://doi.org/10.1086/256963

Artinger, F., Petersen, M., Gigerenzer, G., & Weibler, J. (2015). Heuristics as adaptive decision strategies in management. *Journal of Organizational Behavior*, *36*(S1), S33–S52. https://doi.org/10.1002/job.1950

Ashby, R. (1956/1999). *An introduction to cybernetics*. Principia Cybernetica Electronic Library. http://pespmc1.vub.ac.be/books/IntroCyb.pdf

Axelrod, R. (1984). *The evolution of cooperation*. Basic Books Inc.

Bagozzi, R. P. (2006). The role of social and self-conscious emotions in the regulation of business-to-business relationships in salesperson-customer interactions. *Journal of Business & Industrial Marketing*, *21*(7), 453–457. https://doi.org/10.1108/08858620610708948

Beer, S. (1972). *Brain of the firm* (2nd ed.). The Stafford Beer Classic Library. John Wiley & Sons.

Beer, S. (1979/1994). The heart of enterprise (2nd ed.). The Stafford Beer Classic Library. John Wiley & Sons.

Beer, S. (2002). What is cybernetics? *Kybernetes*, *31*(2), 209–219. https://doi.org/10.1108/03684920210417283

Bengtsson, M., & Kock, S. (2000). Coopetition' in business networks – To cooperate and compete simultaneously. *Industrial Marketing Management*, *29*(5), 411–426. https://doi.org/10.1016/S0019-8501(99)00067-X

Checkland, P. (2000). Soft systems methodology: A thirty years retrospective. *Systems Research and Behavioral Science*, *17*(S1), S11–S58. https://doi.org/10.1002/1099-1743(200011)17:1+%3C::AID-SRES374%3E3.0.CO;2-O

Christopher, M., Peck, H., & Towill, D. (2006). A taxonomy for selecting global supply chain strategies. *The International Journal of Logistics Management*, *17*(2), 277–287. https://doi.org/10.1108/09574090610689998

Churchman, C. W. (1970). Operations research as a profession. *Management Science*, *17*(2), B-37–B-53. https://doi.org/10.1287/mnsc.17.2.B37

Churchman, C. W. (1971). *The design of inquiring systems. Basic concepts of systems and organization*. Basic Books Inc.

de Zeeuw, G. (2001). The three phases of science. *Systemica*, *13*, 433–460.

Descartes, R. (1637). *Discourse on the method of rightly conducting reason, and seeking truth in the sciences*. https://www.gutenberg.org/files/59/59-h/59-h.htm

Edwards, W. (1954). The theory of decision making. *Psychological Bulletin*, *51*(4), 380–417. https://doi.org/10.1037/h0053870

Follett, M. P. (1919). Community is a process. *The Philosophical Review*, *28*(6), 576–588. https://www.jstor.org/stable/2178307 https://doi.org/10.2307/2178307

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy*, *12*(1), 78–104. https://doi.org/10.1080/09692290500049805

Guercini, S., & Ranfagni, S. (2016). Conviviality behavior in entrepreneurial communities and business networks. *Journal of Business Research*, *69*(2), 770–776. https://doi.org/10.1016/j.jbusres.2015.07.013

Guercini, S., & Runfola, A. (2012). Relational paths in business network dynamics: Evidence from the fashion industry. *Industrial Marketing Management*, *41*(5), 807–815. https://doi.org/10.1016/j.indmarman.2012.06.006

Gino, F., & Pisano, G. (2008). Toward a theory of behavioral operations. *Manufacturing & Service Operations Management*, *10*(4), 676–691. https://doi.org/10.1287/msom.1070.0205

Guo, B., Zhou, R., & Li, Y. (2021). Systemic research on owner participation in old residential community management from the perspective of identity – A case study of a Typical Old Residential Community in Xi'an, China. *Systemic Practice and Action Research*, *34*(6), 607–634. https://doi.org/10.1007/s11213-020-09549-2

Hardin, G. (1968). The tragedy of the commons. *Science*, *162*(3859), 1243–1248. https://doi.org/10.1126/science.162.3859.1243

Hardy, C., & Phillips, N. (1998). Strategies of engagement: Lessons from the critical examination of collaboration and conflict in an interorganizational domain. *Organization Science*, *9*(2), 217–230. https://doi.org/10.1287/orsc.9.2.217

Herron, R., & Mendiwelso-Bendek, Z. (2018). Supporting self-organised community research through informal learning. *European Journal of Operational Research*, *268*(3), 825–835. https://doi.org/10.1016/j.ejor.2017.08.009

Hingley, M. (2005). Power imbalanced relationships: Cases from UK fresh food supply. *International Journal of Retail & Distribution Management*, *33*(8), 551–569. https://doi.org/10.1108/09590550510608368

Hingley, M., & Vilalta-Perdomo, E. (2017). Roles of intermediaries in developing resilient systems: A community approach to food micro-producers. In L. Saglietto & C. Cézanne (Eds.), *Global intermediation and logistics service providers* (pp. 43-63). IGI-Global.

Holland, J. H. (1992). Genetic algorithms. *Scientific American*, *267*(1), 66–72. https://www.jstor.org/stable/24939139. https://doi.org/10.1038/scientificamerican0792-66

Holland, J. N., & Bronstein, J. L. (2008). Mutualism. In Jørgensen, S. E. & Fath, B. D. (Eds.), *Encyclopedia of ecology, earth and environmental sciences* (pp. 2485–2491). Academic Press. https://www.sciencedirect.com/science/article/abs/pii/B978080454054006 73X

Hsu, D. K., Simmons, S. A., & Wieland, A. M. (2017). Designing entrepreneurship experiments: A review, typology, and research agenda. *Organizational Research Methods*, *20*(3), 379–412. https://doi.org/10.1177/1094428116685613

Huxham, C., & Vangen, S. (2003). Researching organizational practice through action research: Case studies and design choices. *Organizational Research Methods*, *6*(3), 383–403. https://doi.org/10.1177/1094428103254454

Johnson, M. P. (2012). Community-based operations research: Introduction, theory, and applications. In M. Johnson (Ed.), *Community-based operations research. International series in operations research & management science* (Vol. 167). Springer.

Kahneman, D. (2002). Maps of bounded rationality: A perspective on intuitive judgement and choice. *Prize Lecture, Nobel Prize and Laureates*. http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/2002/kahnemann-lecture.pdf

Kahneman, D. (2012). *Thinking fast and slow*. Penguin Books.

Kozinets, R. V., De Valck, K., Wojnicki, A. C., & Wilner, S. J. (2010). Networked narratives: Understanding word-of-mouth marketing in online communities. *Journal of Marketing*, *74*(2), 71–89. https://doi.org/10.1509/jm.74.2.71

Kuldova, T. (2016). Hells Angels™ Motorcycle Corporation in the fashion business: Interrogating the fetishism of the trademark law. *Journal of Design History*, *30*(4), epw041. https://academic.oup.com/jdh/article-abstract/30/4/389/2623688?redirectedFrom=fulltext

Lakshmi, G., De Zeeuw, G., Vahl, M., & Vilalta-Perdomo, E. (2015). Making friends with windmills: Building territorial capital. *ACRN Oxford Journal of Finance and Risk Perspectives*, *4*(4), 100–108. http://www.acrn-journals.eu/resources/jfrp0404f.pdf

March, J. G. (1994). *Primer on decision making: How decisions happen*. Simon and Schuster.

McAdam, M., McAdam, R., Dunn, A., & McCall, C. (2014). Development of small and medium-sized enterprise horizontal innovation networks: UK agri-food sector study. *International Small Business Journal: Researching Entrepreneurship*, *32*(7), 830–853. https://doi.org/10.1177/0266242613476079

Mercado de las Cosas Verdes Tianquiskilit. (2020). *Home* [Facebook page]. Facebook. Retrieved October 14, 2020, from https://www.facebook.com/Mercadodelascosasverdes/?locale2=es_LA&_rdr&checkpoint_src=any

Meehan, J., & Wright, G. H. (2012). The origins of power in buyer–seller relationships. *Industrial Marketing Management*, *41*(4), 669–679. https://doi.org/10.1016/j.indmarman.2011.09.015

Midgley, G., & Ochoa-Arias, A. E. (2004). An introduction to community operational research. In G. Midgley & A. Ochoa-Arias (Eds.), *Community operational research. Contemporary systems thinking* (pp. 1-36). https://doi.org/10.1007/978-1-4419-8911-6_1

Midgley, G., Johnson, M. P., & Chichirau, G. (2018). What is community operational research? *European Journal of Operational Research*, *268*(3), 771–783. https://doi.org/10.1016/j.ejor.2017.08.014

Michel-Villarreal, R., Vilalta-Perdomo, E. L., Canavari, M., & Hingley, M. (2021). Resilience and digitalization in short food supply chains: A case study approach. *Sustainability*, *13*(11), 5913. https://doi.org/10.3390/su13115913

Miller, N. J., Besser, T., & Malshe, A. (2007). Strategic networking among small businesses in small US communities. *International Small Business Journal: Researching Entrepreneurship*, *25*(6), 631–665. https://doi.org/10.1177/0266242607082525

Morselli, C. (2009). Hells Angels in springtime. *Trends in Organized Crime*, *12*(2), 145–158. https://doi.org/10.1007/s12117-009-9065-1

Newell, A., & Simon, H. A. (1972). *Human problem solving*. Prentice-Hall.

Nisbet, R. (2010). *The quest for community*. Intercollegiate Studies Institute.

Ostrom, E. (2009). Beyond markets and states: Polycentric governance of complex economic systems. *Prize Lecture, Nobel Prize and Laureates*. http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/2009/ostrom_lecture.pdf

Peredo, A. M., & Chrisman, J. J. (2006). Toward a theory of community-based enterprise. *Academy of Management Review*, *31*(2), 309–328. https://doi.org/10.18352/ijc.206

Perla, P. P. (1990). *The art of wargaming: A guide for professionals and hobbyists*. Twayne's Masterworks Studies. Publisher Naval Institute Press.

Putnam, R. D. (1994). Social capital and public affairs. *Bulletin of the American Academy of Arts and Sciences*, *47*(8), 5–19. https://doi.org/10.2307/3824796

Rapoport, A. (1988). Provision of step-level public goods: Effects of inequality in resources. *Journal of Personality and Social Psychology*, *54*(3), 432–440. https://doi.org/10.1037/0022-3514.54.3.432

Rapoport, R. N. (1960). *Community as doctor: New perspectives on a therapeutic community*. Tavistock Publications.

Rindt, J., & Mouzas, S. (2015). Exercising power in asymmetric relationships: The use of private rules. *Industrial Marketing Management*, *48*(July), 202–213. https://doi.org/10.1016/j.indmarman.2015.03.018

Rosenhead, J. (1986). Custom and practice. *Journal of the Operational Research Society*, *37*(4), 335–343. https://doi.org/10.1057/jors.1986.61

Rubel, R. C. (2006). The epistemology of war gaming. *Naval War College Review*, *59*(2), 8. https://digital-commons.usnwc.edu/nwc-review/vol59/iss2/8

Sagarin, R. (2013). To overcome your company's limits, look to symbiosis. *Harvard Business Review*. https://hbr.org/2013/06/to-overcome-your-companys-limits-look-to

Solomon, C., & Flores, F. (2001). *Building trust: In business, politics, relationships, and life*. Oxford University Press.

Somerville, P. (2011). *Understanding community: Politics, policy and practice*. Policy Press.

Ulrich, W., & Reynolds, M. (2020). Chapter 6. Critical systems heuristics: The idea and practice of boundary critique. In M. Reynolds & S. Holwell (Eds.), *Systems approaches to making change: A practical guide* (2nd ed., pp. 255–305). Open University and Springer. https://oro.open.ac.uk/70336/

Vahl, M. (1994). Research into community operations: An exploration of C + OR and CO+R. In R. Trappl (Ed.), Cybernetics and systems '94 (Vol. 1, pp. 645–651). World Scientific.

Valencia, E. L. (2014). Un sistema de intercambio híbrido: El mercado/tianguis la purísima, Tehuacán-Puebla, México. *Antípoda. Revista de Antropología y Arqueología*, *18*, 137–163. Retrieved October 20, 2020, from http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S1900-54072014000100007&lng=en&tlng=es. https://doi.org/10.7440/antipoda18.2014.07

Vilalta-Perdomo, E., & Herron, R. (2018). Individual actions as community informative resources. A collective informative systems approach. *Systemic Practice and Action Research*, *31*(6), 581–598. https://doi.org/10.1007/s11213-018-9441-3

Vilalta-Perdomo, E., & Hingley, M. (2018). Beyond links and chains in food supply: A Community OR perspective. *Journal of the Operational Research Society*, *69*(4), 580–588. https://doi.org/10.1057/s41274-017-0252-1

Von Neumann., & J., Morgenstern, O. (1944/2004). *The theory of games and economic behavior*. Princeton University Press.

Wargamer. (2022). *Welcome to your new Wargamer*. https://www.wargamer.com/welcome

Wenger, E. (2009). Communities of practice. *Communities*, *22*(5), 57–80. https://www.projecttimes.com/wp-content/uploads/attachments/communities-of-practice-1.pdf

Yearworth, M., & White, L. (2018). Spontaneous emergence of Community OR: Self-initiating, self-organising problem structuring mediated by social media. *European Journal of Operational Research*, *268*(3), 809–824. https://doi.org/10.1016/j.ejor.2018.01.024

Yoon, C., Moon, S., & Lee, H. (2022). Symbiotic relationships in business ecosystem: A systematic literature review. *Sustainability*, *14*(4), 2252. https://doi.org/10.3390/su14042252

Zhelyazkov, P. I. (2018). Interactions and interests: Collaboration outcomes, competitive concerns, and the limits to triadic closure. *Administrative Science Quarterly*, *63*(1), 210–247. https://doi.org/10.1177/0001839217703935