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Enhancing systemic thinking by sharing experiences of reading literary fiction using causal mapping

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ABSTRACT

Great works of literary fiction seem to mirror life and its complexity. This paper claims that engaging in reading fiction can be beneficial for OR practitioners as it enhances systems thinking and understanding of complex human affairs. Using the experience of reading a fiction book, we applied Causal Mapping (CM) to Reading Labs, where participants read and share their views of fiction literature to appreciate the complexity of multiple and differing reading perspectives. The approach we adopt hinges on the relationship between literature and OR, two disciplines which belong to different fields of knowledge (humanities and science, respectively), but when examined in more detail, connect in meaningful ways. We explore this connection to identify potential gains of increasing systemic thinking awareness in the reading groups' context. The findings of this interdisciplinary study show that use of CM (i) enhances systemic thinking by producing a synthesis and shared views on what was meaningful and useful; and (ii) translates the subjectivity produced by the shared reading experience into new actions strengthened by systemic thinking awareness. These results should be of interest to Soft/OR practitioners using CM and systems practitioners working on encouraging the use of systems thinking in systemic interventions.

1. Introduction

I read fiction to be freed from my own suffocating narrow perspective on life
-Philip Roth, Reading myself and others (1975).

1.1. Bringing literature and Operational Research together

Literature, specifically fiction, can be seen as part of the humanities field of knowledge. In contrast, Operational Research/Management Science (OR/MS) is a discipline generally viewed as science, which uses a variety of methods to analyse complex situations. In this article we attempt to explore the linkages between these two fields of knowledge to expand our understanding of complex human affairs that both fields model in their unique ways. By doing so we aim to enhance our systemic thinking.

In this article we refer to literary fiction as a form of art created by the author's imagination that is not pretended to be appreciated as fact even though it can be based on a real-world situation or real events (Britannica, 2019). The fiction literature

entails mainly narrative pieces in the form of a novel, a short story, a fable, a tale, a chronicle, and a novella, to mention just a few variations. According to MacCulloch (2018), literature is part of "humanities" together with fields such as: law, philosophy, the history of art and music, religion, language and its meanings, and human history, amongst others.

Unlike literary fiction, defining "science" seems more straightforward because we are familiar with science and surrounded by its "achievements" in our daily life (MacCulloch, 2018). There is no doubt that science and its methods have been at the success of many human achievements, including landing on the Moon and Mars, developing vaccines able to cure fatal diseases, and many other technological conquests.

The purpose of this interdisciplinary study is to combine science in form of OR with fiction reading to increase the awareness of systems thinking. Specifically, "causal mapping" is applied to the exercise of reading fiction and sharing views and experiences amongst the participants of a Reading Lab to

demonstrate the benefits that such alliance brings towards the enhancement of the OR's systemic perspective for practitioners. Importantly, whilst this approach is targeted at all OR practitioners, irrespective of their experience, it is also open to anybody seeking to improve their understanding of complex human nature through participation in the reading clubs. The causal (or cause) map utilised in this research is related to the *group of participants* of the Reading Lab. In other applications, this network of arrow-linked nodes can be referred to as a *cognitive map*. Despite the same formalism as in the case of *causal maps, the cognitive maps* focus on the *individual cognition* (Eden, 2004).

The *aim* of this research is to sensitize OR practitioners to new ways of enhancing systemic thinking by encouraging them to appreciate new perspectives using causal mapping (CM). Specifically, the present paper shows how CM can increase the awareness of the learning process using the case of Reading Labs. As a methodology belonging to the soft end of OR, CM helps translate the subjectivity invoked in the shared reading and the experience of guided discussion into clear gains. Going beyond the context of a reading group, the present analysis of the CM demonstrates the systemic thinking capabilities that practitioners could incorporate when dealing with the complexity of human affairs. In the end, the problems we solve in our daily activities are the problems pertaining to being human. It is this human focus which should be considered as critical in professional training.

To address our aim, we pose the following research questions (RQ):

RQ1: What is the relationship between humanities and science?

RQ2: Can the reading and discussing of literature enhance systemic capabilities?

RQ3: Can soft OR practice benefit from using CM to share reading experiences and enhance systemic capabilities?

All three RQs intent to identify the link, commonly neglected, between humanities, in particular literature, and science. In addition, RQ2 explores whether active participation in reading groups can enhance systemic capabilities. Finally, RQ3 aims to identify the benefits of applying CM in the reading group context, to verify whether this application enhances systemic capabilities and the soft OR practice. To address these questions, we will set into practice the CM methodology with a group of participants in a reading exercise and assess the benefits towards enhancing systemic thinking. Providing answers to these research questions outlines our contribution to the OR literature.

Following this introduction, the rest of the paper is organised as follows: in Section 2 we introduce the conceptual framework and the research strategy underpinning this study. In Section 3, we briefly review the literature related to the topic of humanities and science, with the focus on reading fiction groups. There we also outline the main features of the "Reading Lab" programme, and the practice of causal mapping. Next, in Section 4, we detail the methodological framework. In Section 5, we present the application and discuss our results. Finally, in Section 6, we conclude our study recognising some limitations and providing avenues for future research.

2. Conceptual framework and research strategy

To underpin the study, we outline the elements of systemic thinking which enable us to bring the link between the two disciplines, literature, and operational research (OR). We borrow tools such as Rich Picture (Checkland, 2000) to depict the elements involved and their respective relationships and influences, in order to highlight that by using systemic tools and methods to frame our research we aim to take the idea that the whole is more than the sum of its parts seriously. More importantly, we expect to gain an understanding of a complex social system and the human participating in the system, which we analyse here (Jackson, 2019, p. 25).

The conceptual framework and the research strategy followed is shown in Figure 1. The two main areas, humanities, and science are depicted together with the sub-areas of knowledge. On the left-hand side, we regard OR as a field that lies at the intersection of social sciences, technology, and systems thinking (ST). Within OR we distinguish "Hard" and "Soft" OR. Causal mapping is a methodology aligned with *Soft* OR, also called Problem Structuring Methods (PSM) (Eden, 1992) and that is where the expertise of the project team resides.

The top of the right-hand side shows the humanities comprising of literature, art, law, and other disciplines. Fiction is part of the literature. As it happens, one of the members of the team wearing her hat of an avid fiction reader joins the reading club where, after reading a classic book, she uses causal mapping to organise the final discussion about the experiences of reading the book. Dotted lines in Figure 1 indicate the flow of information, views, feelings, experiences, and perceptions of the human activity systems. Figure 1 serves as a guide to and remainder to the research team and the reading group participants of the process followed in this research. This picture was used as the base for building the strands of literature review and research objectives shown in Figure 2.
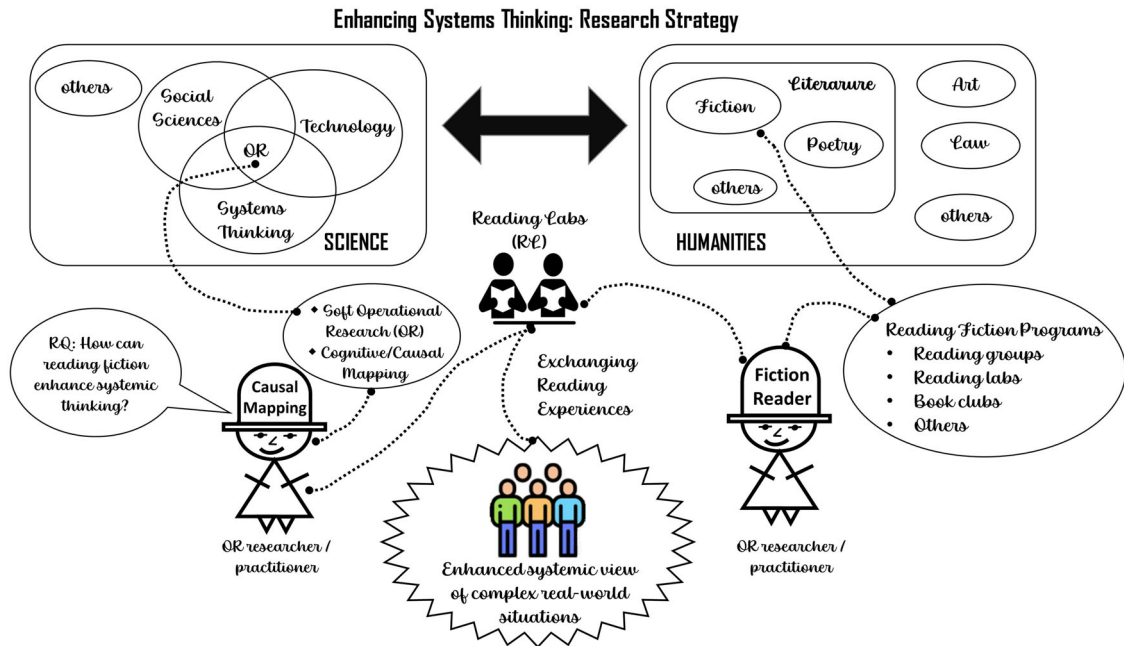
Figure 1. Conceptual framework and research strategy.
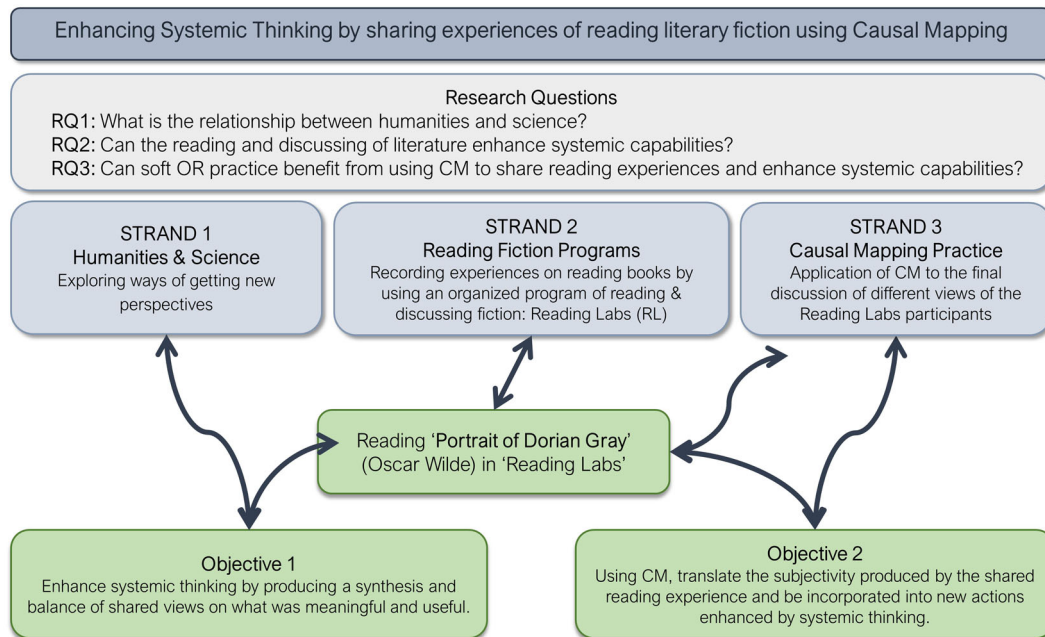
Figure 2. Strands of literature review and research objectives.

3. Literature review

Using the conceptual framework and the corresponding RQs, it became clear that three strands of relevant literature emerged. These are depicted in Figure 2.

Strand 1, which explores the relationship between humanities and science, led us to set out the background of the study. There, we outline how over time these two fields of knowledge have been seen in academia as separate but in fact that there is a meaningful relationship between science and humanities, in particular literature. In Strand 2, we broadly discuss the benefits of reading fiction books in an organised and open way as part of reading

groups/book clubs; we then outline a specific way of experiencing the reading in a formal setting reading programme called "Reading Labs." In Strand 3 of the literature, we discuss how the causal mapping pertaining to a *Soft* OR method can help shape the discussion when reading fiction.

3.1. The relationship between humanities and science

When asked about the relationship between humanities, where the literary art belongs to, and science, which encompasses OR, the debate points to a widening gap between the two fields (Snow, 1961). Yet,

if we reflect upon this matter from historical perspective, it is evident that until the beginning of the 17th century, the division of knowledge between these two fields simply did not exist. Knowledge was not confined within "silos." On the contrary, in all the activities of humanity, the two fields have always fed and fertilized each other. This became most visible in the Renaissance which gave us clear examples of the importance of the union between science and humanities. This includes Galileo, who in 1609 pointing for the first time to the sky of Padua with a telescope, saw the Moon twenty times bigger. Not only did this increase the scientific knowledge, but it also delighted the soul by perpetuating his experience in beautiful watercolours. Stemming from a single source, these events were registered as both astronomical accuracy and beauty (Rojo, 2013).

Links between science and other forms of humanities have also been studied. The relationship between science and music has been explored since ancient Greece, where Pythagoras and his followers speculated that properties of celestial bodies such as Earth and other planets are related to music (James, 1995). Another beautiful link between scientific endeavours and music is the case of the German-born British astronomer William Herschel, who in 1781 discovered Uranus, the first planet to be discovered since antiquity. Hershel, the astronomer who lived and worked in Bath, England, was an accomplished musician that played the oboe, violin, harpsichord and was a composer of concertos and symphonies.[1]

There are many cases of prominent individuals whose practice entailed some forms of both, science, and humanities. Newton (1643–1727)'s groundbreaking work ranged from metaphysics to mathematics, philosophy, and alchemy (Newman, 2018). More recently, famous cases of exploring the intersection between the fields of art and science involved the writings of Borges (1899–1986), whose prose is interpolated with abundant mathematical readings. Moreover, he also wrote beautiful stories that feature mathematical calculus, quantum physics and the concept of infinity as central themes. In fact, according to the physicist Alberto Rojo, Borges is the most cited poet amongst scientists.[2]

Another case is that of the Argentinean, Ernesto Sábato (1911–2011), who was a nuclear physicist before becoming a writer, and the Chilean, Nicanor Parra (1914–2018), a notable physicist and poet. Laying aside historical distance and famous cases, one of authors of this paper is a management scientist and a published poet. This shows that there is no rational dichotomy between the practice of literary writing and science. Moreover, these examples prove that scientific and humanistic practice can intertwine to produce a bridge on the pathway of creativity. Indeed, Schwartz and Berti (2018) state, science and literature (or any other form of humanities) can be seen as ways of exploring reality, devising strategies for understanding the world. They might differ in their methods, but they are similar in their intentions. Both literature and science are manifestations of human creativity, and they have been nourished as such by a common collective imaginary.

In 1959 the novelist C. P. Snow delivered the annual Rede Lecture in the Senate House of the University of Cambridge. In his lecture, "The Two Cultures and the Scientific Revolution" he described the chasm of mutual incomprehension, disregard, and lack of sympathy between *literary intellectuals* and *natural scientists*; he called these "the two cultures" (Snow, 1961). A few years later, in a breaking ground book: *Literature and Science*, Aldous Huxley analysed this apparent division or conflict between the humanistic and scientific worlds to conclude in favour of a reconciliation between both (Huxley, 1963). He tried to harmonise the scientific and humanistic fields arguing that language is what makes communication between them difficult, encouraging both camps to seek mutual understanding and appreciation.

This has been a cursory review of the nexus between science and humanities, with the latter one focusing on literature. From a systemic perspective in which interrelationships between the elements are key to understand the complexity, we certainly agree with Schwartz and Berti (2018, p. 3) in that *beyond the thick walls of separation between the disciplines, there are connections subterranean and unconscious that allow a permanent transfer of ideas and concepts between the plural fields of knowledge.*

In this paper we want to explore the link between science, in particular operational research (OR) and literature. This connection has not been explored lately in either science or literature outlets. An exception is the special issue of Science and Education (Vlahakis et al., 2014). In it, Vlahakis, Skordoulis, & Tampakis stated:

> The most extraordinary fact about the need for a discussion of the relationship of Science and Literature, is that it needs discussing (p. 521)

Further, these authors ask the following question:

> What is the reason that two such broad and archetypical fields of study are only cautiously approached together? (p. 521)

We claim to be provocative in our approach as we strongly believe that engaging in reading fiction is beneficial for OR/MS practitioners and everybody

else since it enhances their systems thinking and understanding of complex human affairs. Our believe echoes the words of Carlo Rovelli (2020), the Italian theoretical physicist and writer, who studying what he calls *the continuing dialogue between literature and science*, stated:

> *The greatness of literature lies in its capacity to communicate the experiences and feelings of human beings in all variety, affording us glimpses of the boundless vastness of humanity. Literature has told us about war, adventure, love, the monotony of everyday life, political intrigues, the life of different social classes, murderers, banal individuals, artists, ecstasy, the mysterious allure of the world […]* (Rovelli, 2020, p. 28)

3.2. The role of reading programmes

Reading groups (also known as *book clubs*) are groups of people who read the same books and dedicate time to discuss them jointly and informally (Collins, 2022). Some books traditionally end with suggestions of potential questions to be debated. However, there is a list of common broad questions that can assist a meaningful discussion of any book. This list includes questions, such as *How did the book make you feel? What did you think about the main characters? What did you think about the ending? Which parts of the book stood out to you?* and so on. Additionally, major publishers offer reading guides and tips to lead reading group discussions (Penguin, 2019). In the lines that follow, we report on a few cases of reading groups that have been explored and redesigned to reach different goals in different environments. They can certainly demonstrate the function and the power of a good read and a well mentored group conversation.

- In the professional *milieu,* Parsons and Reid (2011) reported *reading groups* to be used among *behaviour analysts* as an affordable means of on-the-job professional development that can be practiced on a regular basis. Other forms frequently involve staff attending conferences and workshops; however, these require significant time and cost resources. Parsons and Reid (2011) use scholarly literature and pre-defined study questions which are considered as a way of staying abreast of scientific developments and updates regarding the relevant information and practices in the area.
- In the education *milieu*, Raphael et al. (2001), described a literature-based reading program framework called *Book Club Plus*, which was designed by a team of teachers aiming to support literacy teachers to offer students the opportunity to learn literacy skills and strategies with texts that are appropriate to their instructional level.
- In the therapeutic *milieu*, book clubs have become a creative intervention to eliminate some of the psychosocial barriers, thus promoting psychological safety that positively impacts therapeutic engagement of trauma victims. In such cases, reading themes are carefully and intentionally selected. For instance, in Holman et al. (2018), a traditional book club was used to increase trust and to reduce vulnerability among women who experienced complex trauma and various forms of addiction. The related activities were conceptually "normalised" diminishing social stigma barriers to help-seeking, thus reducing the chance of being culturally sanctioned. In this context, book clubs provide a safe environment that lays foundations for a trusting relationship from which therapeutic work can take place.
- In the academic *milieu*, a guided reading group named *LabHum* (abbreviation for *"Laboratory of Humanities"*) or *Reading Labs,* when used in case of in-company training (Bittar et al., 2013), originated from educational activities in the School of Health Sciences at the Federal University of São Paulo in São Paulo, Brazil. The Lab intended to introduce and encourage debate of humanistic themes amongst students of the medical field that is understood as a very technical-scientific formation. In this configuration, world-famous classical literature was used since it presents problems of humanity as enduring, universal issues which transcend historical and cultural limitations (Calvino, 2000) and are highly relevant for medical practitioners. This configuration also promotes the re-reading process which usually uncovers ideas not perceived in the first reading of the text. The main purpose was to make health care professionals more sensitive to abstract and concrete human pains when taking care of their patients. In the present study, the programme of reading fiction is an example of a standard Reading Lab (RL).

Independently of which of these forms of reading programmes is considered, it seems that its primary aim is to provoke self-reflection and critical thinking (Raphael et al., 2001). The benefits of reading programmes have been prospected with positive feedback in several fields of knowledge, particularly in those professional groups who directly deal with people (patients, children, and so on). Those include reading groups in the political science field (Cooper, 2018) and in a virtual mode with emergency medical interns (Jordan et al., 2020), amongst others. In

common, they follow a guideline that reading group meetings are conducted in a structured manner which includes specific evaluation topics and systematic prompting that enhance individual participation. Additionally, such groups include a leader or facilitator who assists the exchange of experiences by conducting the discussions. Lastly, the participants of such reading groups are likely to appreciate the activity in a way that allows for their active participation and enjoyment. After all, people *are more likely to do things they enjoy, and to learn from things they enjoy* (Cooper, 2018, p. 3)

3.3. Causal mapping practice as a tool for increasing awareness

Reading programmes undoubtedly play a key role in the continuous learning process of professionals in any field. Raising awareness of such learning among the participants of such reading groups is equally relevant and there are different ways to achieve this. Some reported forms of evaluation of an increased awareness include the comparison of *pre-* and *post-* reading groups' *quiz responses* showing a consistent improvement in correct answers. This method has been utilized in the reading group meetings in Parsons and Reid (2011)'s case. An anonymous web-based survey was conducted by Cooper (2018) focusing on assessing three main goals of book clubs in Political Science classroom: (i) classroom social capital (including social network development); (ii) perceived learning (learning from others' perspectives), and (iii) enjoyment (in reading the book, discussing the book in groups, presenting the book to a class, listening to colleagues' narrative about the books they had read).

Besides aforementioned quizzes and surveys, the literature does not report of any other reading groups that applied *causal (or cognitive, in the context of individuals rather than groups) mapping* (CM) to evaluate the learning process. Hence, we borrow this valuable tool from the *Soft* OR area to promote learning assessment and its awareness particularly in cases where the participants provide their appraisals through a discourse (spoken) or text (written account). The reason is that CM "translates" the subjectivity of the participants' statements in relation to the process (Eden, 2004), thus bringing sense to the experiences (Pidd, 2003) and making learning objective transparent for the participants themselves.

In the field of Operational Research, cognitive or cause (causal) mapping has been introduced by Colin Eden in the late 1970s and 1980s (Eden et al., 1979b, 1992, 1979a; Eden, 1980, 1992, 1988). Since then, CM and its associated methodology, Strategic

Options Development and Analysis (SODA), have played an important role in Soft OR. SODA's role in Soft OR has been studied extensively, see for example Rosenhead and Mingers (2004) and more recently, Abuabara and Paucar-Caceres (2021). Furthermore, SODA proposes an approach by using individual interviews and maps, known as SODA I. In the case of a group decision support, thus building a map directly from the team, we have then the so-called SODA II version (Pidd, 2003). Circumstances will drive the suitable mode selection. For the purpose of this paper, it is important to stress that CM is a fundamental part of the SODA approach (Rosenhead & Mingers, 2001; Ackermann & Eden, 2010), but SODA as such is not applied in our study. Rather, we focus on the potential use of CM that is to enhance systemic thinking and shared views amongst OR practitioners.

Overall, causal (cognitive) maps have been broadly used in problem-structuring interventions (Rosenhead & Mingers, 2004), in particular in SODA (Rosenhead & Mingers, 2001) and in Journey Making (Eden & Ackermann, 1998) methodologies. Such maps permit a rich representation of ideas through the modelling of complex chains of argument and are suitable for several types of analyses. The particular version of cognitive/causal mapping used in SODA methodology is proposed to be applied here in order to explore and to learn about *Reading Labs*. This specific map is based on two key ideas of George Kelly's theory of personal constructs (Kelly, 1955). The first one (theoretical), is the use of dichotomous constructs (instead of concepts) comprising two polarities for the purpose of contrast or alternativeness (Georgiou, 2010; Eden et al., 1992). The second idea is procedural and refers to attendees expressing themselves through verbal language (whether written/textual or natural/spoken). The use of language is central to thinking development, and what is learned by any individual begins at the stage of social interactions in which the individual engages (Gavelek & Raphael, 1996; Vygotsky, 1978; Wells, 1999). In these interactions learners use language to achieve collective and personal goals (Raphael et al., 2001).

4. Case study - Reading Labs and causal mapping

This section outlines the methodological framework which considers two main stages. First stage includes the participation in an entire cycle of a *Reading Lab (RL)* which entails four sequential weekly meetings, in addition to the lonely preceding exercise of reading the book. Second stage entails the application of causal mapping to the conclusive

phase of the RL. Subsequently, the outcomes are presented to participants for appreciation. Figure 3 shows the methodological stages which we will detail in the sub-sections that follow.

4.1. Stage 1: joining a Reading Lab

As mentioned previously, the reading programme herein followed is known as *Reading Lab* (Gallian, 2017) focusing on the discussion of views and experiences of fiction literature. We start by characterising the three main elements of a *Reading Lab*, which are: (i) a guide-coordinator; (ii) participating readers and (iii) a fictional story in a book which shall be read prior to a discussion. We continue by delineating the *Reading Lab* dynamics, where this process is also divided in three phases. These are: (a) initial, entitled *Reading Stories*; (b) intermediate, called *Discussion Itineraries*; and (c) conclusive, known as *Stories for Living*.

The selection of the book to be read is the responsibility of the coordinator and can be attributed to their personal choice informed by their preferences, previous experience and knowledge or suggested by individual participants. Classical literature portrays many themes that are common to the human experience. For example, if betrayal or jealousy is a focus or concern, Shakespeare's [First published in 1603] Otello or Dom Casmurro by Machado de Assis [First published in 1899] are recommended choices. If there are couples in the group, it might be interesting to look at Tolstoy's (First published in 1859) Family Happiness. In the case of a pandemic, Albert Camus's [First published in 1947] The Plague is the suggested reading. When an existing crisis is being hotly debated, The dream of a ridiculous man by Dostoyevsky (First published in 1877) can be insightful. There are many literary pieces which deserve analysis in *Reading Labs,* and which have the power to incite deep reflections and sharing amongst participants.

A purposive (an invited) sample of the Reading Lab participants from the coordinator's social network comprised only those individuals who enjoy reading and indicated an interest in the meetings. The participants were invited by the entitled coordinator one month prior to the first meeting to give them enough time to acquire and read the book regardless the version, edition, translation, and paper/digital mode of the proposed reading.

4.1.2. Reading Lab dynamics

Three categories of sequential meetings, each one with a different purpose, were conducted. These are synthesised in Table 1 and explained below:

a. **Reading Stories**: During this first meeting, each participant tells their own reading stories. This entails sharing their personal, subjective, and aesthetic reading experiences, which activates affections and feelings. Questions that can facilitate this process are listed in Table 1.

As per the statement of the philosopher and medical researcher John Locke, knowledge is achieved as a result of things operating through our senses (Androne, 2014). In other words, "… *our entire knowledge derives from experience through sensation and reflection*"(p. 75).
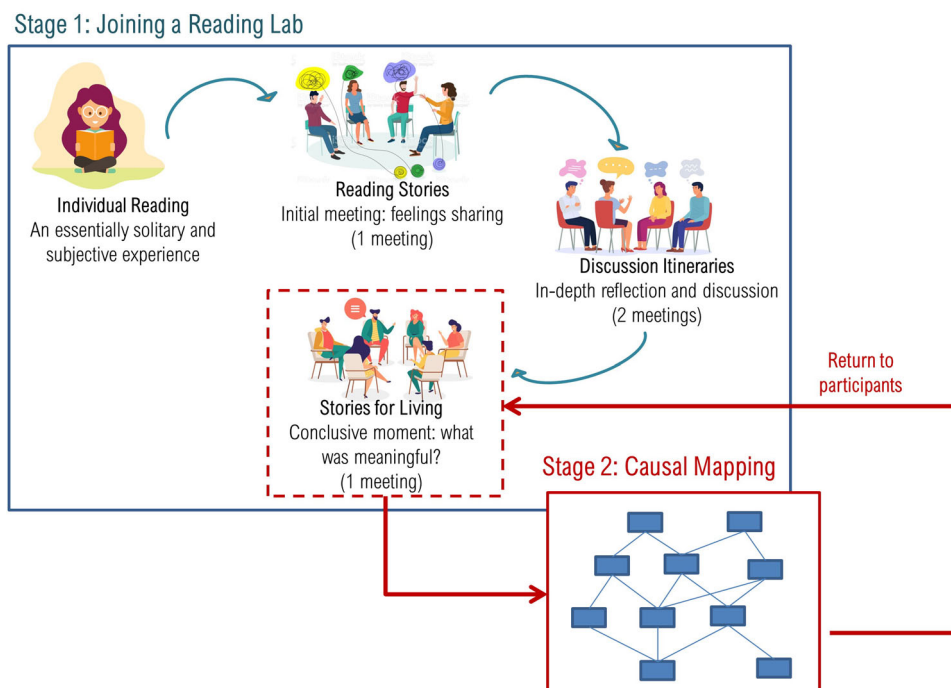

Figure 3. Methodological framework employed in two main stages.

Table 1. Reading Labs phases.

	Reading Labs Phases		
	Initial READING STORIES	Intermediate DISCUSSION ITINERARIES	Conclusive STORIES FOR LIVING
Purpose	Aesthetic experience/Awakening of affections	Reflexive dynamics developed collectively	Synthesis moment/the most significant things
Questions to be contemplated by each participant	• *How was the reading process?* • *Was it difficult?* • *Was it pleasant or unpleasant?* • *Was it an interesting, revealing, provoking experience?* • *What affects, feelings, questions or reflections arose during the reading?*	• *Were the words spoken by the characters duly understood?* • *What were the historic, social, political, economic, religious contexts that led the author to choose some words and sentences?* • *Is there any special reason for the names of the characters?* • *Is there any intertextuality feature that deserves our attention?* • *Was any other classical author mentioned, both clearly and implicitly?*	• *What did this experience mean to you?* • *What was most significant?* • *What moved you the most?* • *What were the main discoveries you made about the world, about human, about yourself?* • *What do you keep and carry with you from all this Reading Lab experience?*

The feelings and affections shared in the *Reading Stories* phase are the "kick-off" to the humanization process that each participant will experience and analyse during the *Reading Lab*. The analysis may be done as an internal exercise with themselves but also with other participants, depending on the level of dedication and focus given.

b. **Discussion Itineraries**: This refers to all intermediate meetings which are determined by the size of the book and the length of time it takes to accomplish the reading. In each meeting, an allocated part of the book is scrutinised and collectively discussed. This is done sequentially. It is recommended that each part of these sequences is also re-read.

After sharing thoughts and feelings, and familiarising themselves with others' perceptions of the book, the coordinator provokes the group's intellectual thinking by a range of appropriate questions, which are listed in Table 1. This is the time to clarify any doubts surrounding the text. *Discussion Itineraries* meetings are excellent tools to exercise empathy; they facilitate opportunity for participants to understand the author's reality and to identify themselves with different characters.

c. **Stories for Living**: This is the final and conclusive meeting, a synthesis regarding all the lived experiences that were generated through the literary and people's interactions. Each participant reports in writing and reads out to the group what was their most meaningful experience. This stage may be seen as difficult and laborious for participants since it requires time and effort to introspect one's own experiences. Questions that may be posed at this stage are listed in Table 1. The work developed in this phase has implications for the future attitudes

and actions of the participants (as such, it is directly linked to *the human will*).

Stories for Living is the most important part of the whole process since it represents the synthesis, the climax of all the intense aesthetic and reflexive processes. It is also the most significant moment of the *Reading Lab* experience for participants (Gallian, 2017, p. 136), since it is the time to "put themselves in other participants" shoes' and to exercise good listening. Naturally, this should encourage more empathy being shared with each other. It might not necessarily be an act, but a simple change of mind. This reflects a shift of will power and provides evidence that the participant's "human range" has really been enhanced.

4.2 Stage 2: causal mapping

Second stage consists of scrutinising the attendee's experience reported through *Stories for Living* and re-presenting it as a set of bipolar constructs (or *nodes* in a graph) that are causally (means-ends) connected (through *arrows*). This reflects the group descriptive logic.

Although Graph theory and network science are not widely adopted for systems thinking analysis (Georgiou, 2019), giving attention to the *structure* (beyond the *process*) of the map can wisely promote a holistic perspective (Jackson, 2006). Thus, map interpretation is conducted through a quantitative evaluation by means of hierarchical and structural analysis based on *digraph* (or *directed graph*) theory (Harary et al., 1965). Georgiou (2010) offers details of such analysis. Table 2 summarises the information about the constructs, which are structurally classified according to certain basic types (Georgiou, 2010, 2009a, 2009b, 2019). This information was

Table 2. Classification of constructs.

Construct types	Basic information
Tails	In-degree (or *arrow-in*) = 0, Out-degree (or *arrow-out*) > 0; known as *prime causes*.
Heads	In-degree (or *arrow-in*) > 0, Out-degree (or *arrow-out*) = 0; reflect *objectives*, *outcome* or *consequences* arising from the constructs that lead to them. Numerous heads may indicate multiple (and conflicting) objectives. Constructs highlighted with oval shape.
Strategic options	Constructs immediately connected to a head. Constructs highlighted with dotted outline.
Implosions	High in-degree; indicate a *major effect*.
Explosions	High out-degree; indicate a *major cause*.
Dominants (based on Degree Centrality)	High degree (sum of in-degree and out-degree); indicate cognitive centrality or the central influence a construct has in the map. Simple centrality index is based on local measure of direct neighbourhood of a construct (Schoch, 2015). Constructs are highlighted in yellow.

used to extract significance about the produced map.

Additionally, each construct was categorised according to different issues that emerged from the speeches of participants. The categorisation of individual constructs (Georgiou, 2009b) (instead of a clustering process, for instance) was selected as several issues intertwined.

Importantly, we are not interested in the social process that causal maps usually support in decision-making processes (Eden & Ackermann, 1998) since *Reading Labs* are *per se* a social process. Rather, we aim to explore CM structurally as a powerful and analytical tool to support the conscious learning process that happens in the conclusive phase of the *Reading Lab*. Thus, after this analysis, we came back to the group to share with them our findings. Using causal mapping, together with the Reading Lab's participants we then rationalised the results of the learning process they have just undergone. This process is described next.

5. Reading *the Picture of Dorian Gray*: Discussion of experiences

The *Reading Lab* that served as the present case study took place in the second half of 2019. All sections were audio-recorded in case any participant had missed them and to meet the purpose of this study. This section reports on the book that was selected for the reading fiction program, its participants, the process, and outcomes of causal mapping, including the feedback shared with the participants.

5.1. The fiction literature

The Picture of Dorian Gray written by Oscar Wilde and first published in 1890, is a story of a handsome and rich young gentleman who undergoes moral and physical decay while he discovers the high-flying society living of the English aristocracy. As he continues to make important choices for his future, his sex appeal and beauty increase. On the other hand, his marvellous portrait (made by a special friend), suffers injuries and becomes uglier and uglier. Oscar Wilde's intention behind this unique novel was to criticize Victorian morality and attitudes. This novel was censored by publishers and book reviewers and the author was obliged to delete many words from the original version. The story is a classic; *The Picture of Dorian Gray* shows very poor and fragile society that judges and condemns those who do not agree or act in accordance with its (false) morality. It has been explored in the humanities and in various studies focusing on the personalities, customs, and behaviour in the Victorian Era and for its literary aesthetics, too (Gomel, 2004; Liebman, 1999; Carroll, 2005).

5.2. Reading lab participants

The *Reading Lab* group was comprised of 10 attendees (7 women and 3 men), including the coordinator, who was responsible for inviting the participants to the Reading Lab. For this study she invited people with passion for reading within her network. The first author of this article was amongst the attendees. The last author held the role of the coordinator. For the purpose of the study, the anonymity of the other attendees was maintained. In this particular instance, the *Reading Lab* included a lawyer, engineers, a technician, a doctor, and a chef; all participants were between 30 to 60 years of age. This multidisciplinary setting was enriching as it gave rise to multiple perspectives, involving diverse expertise and experiences. This is one way of securing a rich outcome. In the equivalent version of *Laboratory of Humanities* (see Section 3.2), the students of health sciences could choose to participate as an elective option. As the option is also available to the community members, the editions of the programme are constantly in high demand. Table 3 summarises this initial information.

Each participant had their turn to speak in all phases. Some attendees spoke more than others, but everyone was encouraged to speak by the coordinator. Ultimately, the extent to which a participant

Table 3. Reading Lab information of the case study.

	Case Study	Remark
Book Title	The Picture of Dorian Gray	A classical book and classical author of the British literature.
Author	Oscar Wilde	
Number of participants	10 attendees (including the coordinator)	The recommended number for full participation is around 12 attendees.
Number of meetings	4 (weekly): • Reading Stories (1st); • Discussion Itineraries (2nd and 3rd); and • Stories for Living (4th)	Generally, 4 meetings, but it depends on the size of the book. Always proceeding according to the book sequential story.

Table 4. Constructs categorisation.

Construct Categorisation	Categorisation Meaning	Code	Number of constructs	Percentage
Feelings	Constructs which contain reference to the feelings and sensations raised by the participants.	F	2	4%
Acquaintanceship	Constructs which contain reference to the relationship among the participants of the group.	A	4	7%
Self Knowledge	Constructs which contain reference to the process of looking inside.	S	5	9%
Reflection	Constructs which contain reference to the speculation about issues not considered until then.	R	14	**25%**
Behaviour	Constructs which contain reference to awakening to the way of acting, towards a change in behaviour.	B	20	**35%**
Reading	Constructs which contain reference to the reading and re-reading processes.	D	4	7%
Empathy	Constructs that contain reference to being sensitive to the emotions of fellow participants or even characters.	E	8	14%
Total			**57**	**100%**

took advantage of the experience is unique to each individual. Some people are shier and more reserved, while others are more open and talkative. Communication skills can also be developed by participating in different *Reading Labs*.

5.3. Causal mapping

The causal map (herein "map") of the group was built using the audio-recording of the last meeting, *Stories for Living*. Each participant could read aloud the *speech* they wrote beforehand or improvise. Due to the use of all statements together, the map included constructs attributed to all participants. In our case, even the coordinator has a construct attributed to her which was a linking thinking. Thus, we can state that the map belongs to the group. This was the selected phase for deeper study since it synthesises the entire *Reading Lab* experience. Lastly, we performed a structure analysis of the map and concluded by reviewing the lessons learned from the process. The speeches produced a total of 57 exclusive constructs. When necessary, and for the sheer need to simplify the map, similar (same meaning) constructs were merged.

We started by attributing a reference label to each construct (*numbered node*). The label included: (i) an aleatory reference number from 1 to 57 (the total of constructs); (ii) a reference "P#" (P plus a number from 0 to 9) designating the participant who made the statement first; and (iii) a code that described the statement of the construct, according to the classification listed in Table 4. Since in this phase participants expose their perceptions and conclusions not only in a practical way (*what they will take for life*), but also sentimentally and emotionally, we opted to classify each construct independently instead of analysing them in clusters. This approach is used in practice (Georgiou, 2009b). The map presented in Figure 4 reflects the group's understanding, as expressed at the final meeting. The elements detached from individual discourse gave rise to this map about mutual learning. The full map with all 57 constructs is available from the authors upon request.

With respect to the classification of the constructs, the majority of them referred to Reflection (25%) and Behaviour (35%). This means that *Reading Labs* provoked mostly reflection on points of view and, consequently, change of behaviour. The participation was a way of opening minds to new
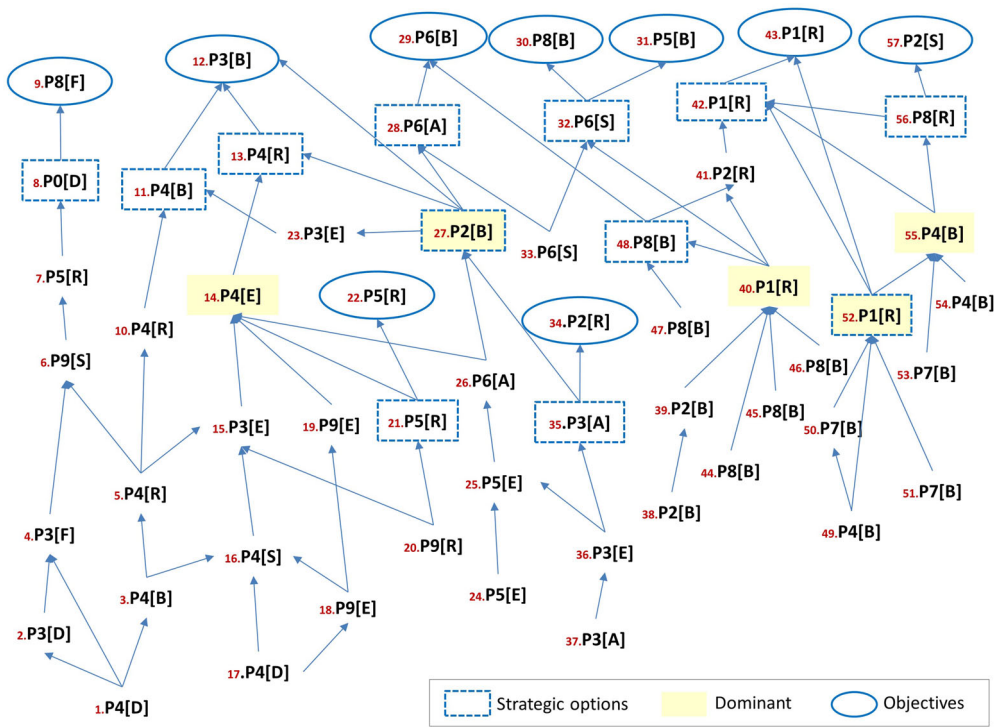
Figure 4. Codified causal map.

Table 5. Head constructs.

Code	Objective (first pole)	Explanation (opposite pole)
9.P8[F]	Awakening feelings and sensations through reading.	… What the book says is liable to human beings.
12.P3[B]	Respecting others is fundamental.	… We are all different.
22. P5[R]	Discover the message that the author wants to get across.	… It is not so much fiction.
29.P6[A]	Relating to others more easily.	… Avoid impasse.
30.P8[B]	Be a better person.	… Less star, less selfish.
31.P5[B]	Avoid labels that society puts on people.	… Do not avoid.
34.P2[R]	Broaden my vision.	… Search and discover things that I have never wondered.
43.P1[R]	Provoke reflection on how you want to get old.	… Do not provoke.
57.P2[S]	Looking in the mirror and being grateful for the marks of time and wisdom of the soul.	… Do not look.

Table 6. Degree centrality of constructs.

Degree centrality	Amount of constructs	Constructs
$D = 1$	16	9, 22, 24, 30, 31, 34, 37, 38, 44, 45, 46, 47, 51, 53, 54, 57.
$D = 2$	15	2, 7, 8, 10, 17, 19, 20, 23, 25, 29, 33, 39, 43, 49, 50.
$D = 3$	15	1, 3, 4, 6, 11, 12, 13, 18, 21, 26, 28, 35, 36, 41, 56.
$D = 4$	6	5, 15, 16, 32, 42, 48
$D = 5$	2	14, 55.
$D = 6$	2	27, 52.
$D = 7$	1	40
Total	57	

possibilities, including to better professional and personal attitudes and practices.

5.4. Heads constructs: goals

The map produced nine *head-constructs*. These correspond to nine (sometimes conflicting) objectives that were reached during this *Reading Lab*. Table 5 lists these goals including its opposite pole for a detailed explanation. The "three dots" denoted by "(…)" is a sign commonly used to separate first

pole from its opposite (or simply a small explanation) in the construct and so, exhibiting the dichotomy.

5.5. Dominant constructs: strategies

In the map under analysis, the sum of degrees in each construct (or node) varied from 1 to 7. This *measure of centrality* known as *degree centrality* is based on the construct's degree. This commonly used simple local measure indicates importance and influence of the

Dominance = 5

(a)   14.P4[E]: Experiencing situations from other perspectives
...
Living the character

(b)   55.P4[B]: Do not live by appearances
...
Be obsessed with youth, happiness etc.

Dominance = 6

(a)   27.P2[B]: Respect opinions different from mine
...
Do not respect

(b)   52.P1[R]: Reflect on maturing & aging
...
Try to disguise

Dominance = 7

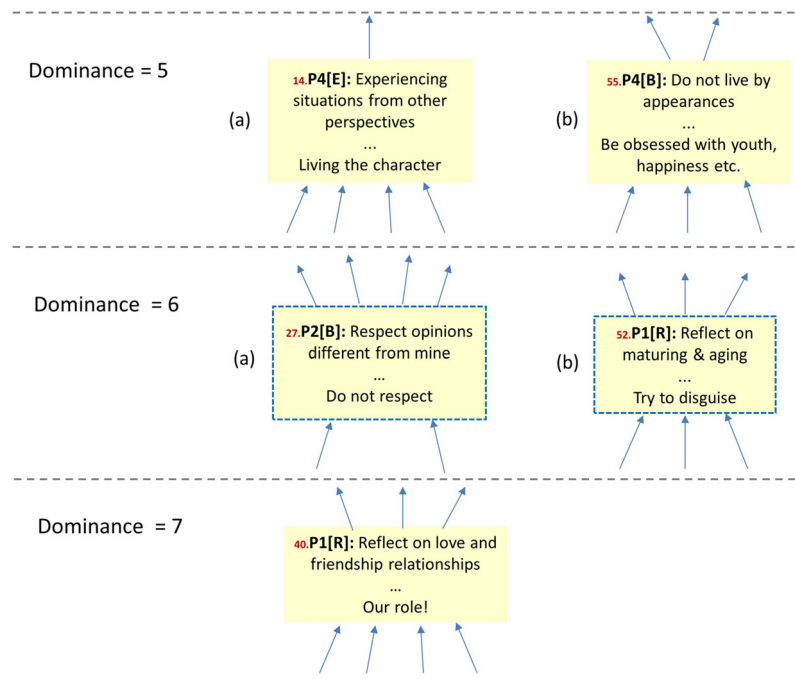40.P1[R]: Reflect on love and friendship relationships
...
Our role!

Figure 5. Dominant constructs.

construct (Georgiou, 2009b; Schoch, 2015). Degree Centrality $D = 1$ refers exclusively to head and tails constructs, but the opposite cannot be assumed, meaning that there exist head and tail constructs with degree centrality greater than 1 ($D > 1$). Table 6 summarises the constructs for each index of degree centrality. We evaluated the constructs with degree centrality between 5 to 7 since they are the dominant ones and less numerous in this case.

In Figure 5, we transcribe the constructs with the greatest dominance, that is $D = 5$, $D = 6$ and $D = 7$. *Dominant constructs* are rated with a *cognitive centrality*. Given that *centrality* means importance in relation to others within the context, we can conclude that these constructs provide *strategies* to achieve the *goals* (head constructs) that we have just discussed above. In practical terms, they are part of intra-personal and interpersonal skills development. The most dominant construct, $D = 7$, refers to love and friendship relationships, very relevant to any human being. The others refer to empathy, respect and the course of life.

Constructs **14.P4[E]** and **40.P1[R]** are *implosions* meaning they have a *major effect* on the map. On the other hand, construct **27.P2[B]** is an *explosion*, meaning it is a *major cause*.

The map inference and structure analysis were discussed and validated between the first author (also one of the participants of this *Reading Lab* and an operational researcher) and the *Reading Lab* coordinator (the last author of this article and a literary professional). The process continued with the feedback to the participants.

5.6. Feedback to the group

At the end of the *Reading Lab* cycle, we presented to the participants the map built from their speeches and the analysis from the map inference based on its structure. As the group is not familiar with the mapping process, we limited the presentation to our findings (and not to how the findings were generated). The group had great receptivity to the results presented from the map, which brought them sensitivity and perception (*rationality and awareness*) of the process they had just undergone, a truly conscious learning, in addition to the enjoyment of being part of this project.

6. Conclusion

In this paper we set to study the relationship between humanities and science as a way to explore the potential benefits that reading fiction brings to OR practitioners, such as enhancing their systemic capabilities and sensibilities.

Our aim was to link reading fiction with enhancing systemic and humanistic capabilities in OR practice. To achieve this, we set out three RQs. We are convinced that the present study addresses them all. Specifically, our literature review and the discussion of humanities and science have demonstrated that although these fields (and even more so OR/MS and literature) differ in their methods, they can work towards the same goal, thus addressing our first research question (RQ1). It is exactly the connection between these two disciplines that we explored and took advantage of in this article. By combining a reading fiction programme known as a *Reading Lab* with causal mapping (CM) in a practical case, we evidenced the potential benefits to systems

thinking. In order to understand such gains better, we followed an entire cycle of a *Reading Lab* and analysed its conclusion phase using CM. The fictional story used was the classic book *The Picture of Dorian Gray* by Oscar Wilde, an unsettling romance in which understanding must be discussed and negotiated (Durão, 2015) – a truly social process.

Completing real-life exercises (reading fiction and discussing the readers perceptions) also helped us to address our second research question, RQ2. Whilst we all are aware of the benefits of reading such as enriching vocabulary, improving speech and the ways of expression and communication, stimulating creativity, facilitating empathy and so on, a real-life case of sharing experiences when reading a fiction piece has demonstrated that, apart from those well-known benefits, reading fiction within a guided reading programme can enhance systemic thinking skills. Through the exercise of reading *The Picture of Dorian Gray*, the perception of the conscious learning (Simons, 2012) were made explicit through causal mapping, a tool from the *Soft* OR area. This was the main outcome of the present study which should interest *Soft* OR practitioners, academics and systems practitioners working on finding ways to encourage the use of systems thinking in systemic interventions.

Causal Mapping, which extracts information through language, played a key role as it provided detailed information and explanation of perceptions and meanings of the statements at the *Reading Lab's* final meeting, the so-called *Stories for Living*. The outcome of the analysis showcased here is just an example of how we can take advantage of this kind of training. *Stories for Living* phase is *per se* a living exercise, where a good understanding of the situation has been gained by sharing opinions. These thoughts are developed together and arise from active listening among participants, who dynamically interact even on issues related to power, politics, and personalities.

Finally, by mapping the participants' perceptions we have managed to translate the subjectivity produced by the shared reading experience with the purpose of encouraging new actions, in which the systemic thinking awareness of the participants will be strengthened. This addresses the third research question (RQ3). Furthermore, the article is also an invitation to the OR community, especially those researchers who desire to enhance their soft skills in systems thinking, to complement their training by participating in *reading groups,* regardless of being experienced or new career researchers. Many professionals including doctors and engineers have an eminently scientific-technical background. This often means that they are more likely oriented to a reductionist paradigm and to rational thinking, when dealing with other persons (human beings) and their concerns in a world with real problems. Thus, by

offering new knowledge through fiction, and awareness through *causal mapping*, this is an opportunity for them to enhance their emotional intelligence. It translates as understanding human behaviours and stimuli in a broader and deeper way. These elements go beyond an algorithmic view simply because they incorporate emotion, empathy, and vital intuition. In the end, the problems we try to solve in our daily activities are the problems of being human. It is this human focus which should be considered as critical in professional training.

Although the study suggests a lot of potential still unearthed about the relation between science and humanities in general and literature and OR/MS in particular, it is worth noticing some limitations. The first concerns literature-reading practice amongst science-oriented researchers to become a regular *reading habit* which is related to the time available in our busy daily life. Second, *individual preferred choice*, particularly regarding fictional work may not be favoured by the majority of OR practitioners. The conclusions of this case study should be taken certainly within the context of the particular book read and the peculiarities of the group of participants *per se*. Other stories offer other conflicts and characters; thus, new perspectives and new learning will be certainly available. Furthermore, it is worth noting that the same book will be read and interpreted differently by different participants. That feature allows the revelation of idiosyncrasies which are confronted and negotiated during the reading fiction programme. This is the endless enrichment that reading groups can offer us and that will never be the same, and this can be beneficial for OR practitioners trying to grasp the usefulness of systemic thinking in practice.

We end this paper with an extract from the American former president Barack Obama's speech when he attended the Booker prize ceremony in 2020. He mentions his habit of reading books every night while residing in the White House:

Reading beautiful works of fiction late at night […] offered me a brief respite from the daily challenges of the presidency, […]. And at their best, […] books remind me of fiction's power to help us put ourselves in someone else's shoes and understand their struggles and imagine new ways to tackle complex problems and effect change. (Vanderhoof, 2020)

Notes

1. Sir William Herschel, MUSIC DATABASE, https://www.radioswissclassic.ch/en/music-database/musician/157620f3db1699fcba0221df1ab15400e086c1/biography
2. BORGES CITADO POR CIENTÍFICOS, Author(s): Alberto Rojo. Source: Variaciones Borges, 2013, No. 36 (2013), pp. 185–193. Published by: Borges Center, University of Pittsburgh. Stable URL: https://www.jstor.org/stable/24881506

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