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Enriching the Existing Knowledge About Co-creation: Identifying Dimensions of Co-creation Using Explicit Theory in Various Research Fields

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Abstract Despite increasing popularity of co-creation approaches across various types of co-creation (e.g., value co-creation) and research fields, systematic and effective theory-building of co-creation research is generally lacking. We explored co-creation literature underpinned by explicit theory, taking a hybrid approach by combining a narrative literature review of studies in various research fields and a systematic literature review of studies in the field of public health. Subsequently, we identified common dimensions applied to the co-creation process across various types of co-creation and research fields, in performing an inductive thematic analysis. Across the total 27 articles included as part of the narrative and systematic review, we identified 5 dimensions related to the co-creation process applied across 9 research fields: (1) Multi-stakeholder collaborative action; (2) Process of co-learning towards innovation; (3) Contextual knowledge production; (4) Generating meaning; and, (5) Open, trustful and inclusive dialogue. The findings offer renewed insight into the common dimensions of the co-creation process, with underpinning explicit theories across various types of co-creation and research fields. A clear and consistent definition of co-creation was often lacking, especially in the field of public health. We strongly emphasise the need for research to adopt a multi-dimensional

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approach to the co-creation process—as well as to work towards developing a common language around co-creation, which involves operationalising these identified five dimensions.

Keywords Co-creation · Theory · Theoretical Frameworks · Multidimensional · Dimensions

Introduction

Co-creation is defined as the active collaboration and innovative problem-solving among various stakeholders across all initiative phases—from problem identification to evaluation of changes (Vargas et al. 2022a; Messiha et al. 2023). By engaging various stakeholders throughout the process, co-creation initiatives can be tailored to their needs and perspectives—resulting in more potential for successful and sustainable intervention implementation. Therewith, co-creation seems a promising approach to address the science-implementation gap (i.e., disconnect between the knowledge generated by researchers and the information used to inform policy and practice) (Grindell et al. 2022).

Co-creation can be traced to its origins in the research fields of business and marketing, with the aim to transform consumers from passive agents to "active co-creators of experiences" (Sarkar and Banerjee 2019: 588). The interdisciplinary nature of co-creation means that as an approach, co-creation can be implemented across various fields of research. Across research fields, co-creation approaches have engaged stakeholders in different types of co-creation, including: the creation of knowledge (Langley et al. 2018), experience design in terms of generating memorable and meaningful experiences (Sfandla and Björk 2013), public health intervention development and implementation (Leask et al. 2019), value creation (Prahalad et al. 2004) as well as product and service development (Verleye et al. 2015).

Despite the increasing popularity of co-creation approaches across research fields, there is a lack of understanding of the key features of how co-creation occurs, is experienced or communicated (Lee et al. 2018). In this article, such features are called 'dimensions' (Cohen 1999), as can be related to the process of co-creation initiatives. This lack of understanding is further affected by the evident lack of systematic inquiry related to theory applications in co-creation initiatives (Messiha et al. 2023; Brandsen and Honingh 2018). Identifying common dimensions of co-creation research based on similarities across various research fields promotes a shared understanding of co-creation approaches - and could improve the quality and consistency of co-creation initiatives. This is particularly important given the limited previous studies that investigate dimensions of co-creation. For example, lacking investigation of such dimensions limit our understanding of the nature of value co-creation, rendering "its precise composition unclear" (Yi and Gong 2013: 1279). Whilst Ranjan and Read's (2016: 306) work focuses on conceptual elements of value co-creation dimensions, their recommendation is that future research permits a means for researchers to "inventory the elements within a broad theoretical concept

and achieve theoretical cohesion". Yet, as there does not seem to be any research on the dimensions applied to co-creation beyond value co-creation as one type of co-creation, we will seek to take an even more extensive approach by including all types of co-creation. We will also contribute towards theory-building of co-creation (cf. Messiha et al. 2023), by exploring how co-creation is defined and applied as a process across various initiatives, underpinned by explicit theory.

Co-creation research fits with 'Mode 2' and 'Mode 3' knowledge production (Gibbons et al. 2000). Mode 2 knowledge production refers to the co-creation of knowledge comprising a diverse range of actors, such as academics, professionals and government officials (cf. Langley et al. 2018; Trencher et al. 2015). This mode in knowledge production marked a shift in scientific paradigms, from an evidence-based, top-down approach ('Mode 1') towards more open, evidence-informed science ('Mode 2') (Gibbons 2000; Greenhalgh et al. 2016). There is also 'Mode 3', a combination of both Mode 1 and Mode 2 (Carayannis et al. 2018a,b). Table 1 provides the distinctions between the three mode types.

Mode 1 characterises a traditional scientific model, possesses hierarchical traits and ranks certain methods and expertise over other types. By contrast, Mode 2 serves to reinforce knowledge production among diverse stakeholders (Greenhalgh et al. 2016; Hessels and Lente 2010). Furthermore, the research activities in Mode 2 are trans-disciplinary in nature, where research methods, skills, and expertise may be recognised on a more equal basis (Aram and Salipante 2003; Langley et al. 2018). Figure 1 demonstrates Nowotny et al.'s (2003) summarisation of the five main characteristics of Mode 2.

Notwithstanding the prominence of Mode 2 research in recent times (Van Aken 2005), Carpentier (2016) highlights the salient difficulties attributed to Mode 2 research in terms of developing theory and concepts of participation, how to support participatory research with the use of analytical models and how to evaluate related research outcomes. Moreover, the conceptualisation and empirical appraisal of Mode 2 is acknowledged to be noticeably lacking in progress (Hessels and Lente 2010).

Related to Mode 2, the Triple Helix model primarily centres on the collaboration between universities, industry and government - serving as a basic model for knowledge production and applications of innovation (Carayannis and Campbell 2014). Mode 3, a combination of Modes 1 and 2, introduces the concept of an 'entrepreneurial university', where democracy is essential for innovation (Carayannis et al. 2009; Carayannis and Campbell 2014). Further, Mode 3 emphasises collaboration approaches among universities, industry, government and the civic sector, including not-for-profit and voluntary organizations (Boehm 2015). These Quadruple and Quintuple Helix innovation systems are associated with Mode 3, and focus on "developing and proposing solutions and problem-solving approaches based on a broader conceptual and theoretical understanding" (Carayannis and Campbell 2014: 2). Therewith Mode 3 aligns with the increasing complexity of knowledge production, allowing various knowledge forms and innovation paradigms to co-exist and co-evolve (Carayannis et al. 2009, 2016).

Gibbons (2000) highlight the importance placed on the engagement of both academic and non-academic stakeholders in an initiative, with Gibbons referring to

Table 1 The distinction between 'Mode 1', 'Mode 2' and 'Mode 3' knowledge production in science adapted from Gibbons et al. 1994 cited in Jiménez 2008 and Carayannis et al. 2018a. Source: Messiha (2021).

"Mode 1"	"Mode 2"	"Mode 3"
Problems proposed and resolved by a specific community, with respect to a discrete, scientific discipline	Researchers, practitioners, and other stakeholders work together to address real-world problems in a context-specific and problem-driven way	Different perspectives are dynamically integrated in a way that recognizes their complexity and diversity
Disciplinary	Trans-disciplinary	Open innovation ecosystem
Homogeneity	Heterogeneity	Higher-order-learning
Hierarchical organisation	Heterarchical organisation	Proactive and socio-technologically strategic
Permanent	Transitionary	Cross-cutting visions, missions, strategies and tactics
Peer-scientist quality control	Quality control by diverse stakeholders	Actors involved in the process are responsible for managing and co-ordinating their own activities
Less socially accountable	More socially accountable and reflexive	Complementary and reinforcing research

the new scientific paradigm (i.e., Mode 2). Against this backdrop, there is a need to investigate further how co-creation is understood and applied in various initiatives, given related claims for improving research and related outcomes (cf. Jones 2018). Yet, several challenges exist, from the fuzziness of how 'co-creation' is defined (Brandsen and Marlies 2018) to its entanglement with other co-approaches (e.g., co-design and co-production). As no consensus exists on how co-creation can be conceived (De Koning et al. 2016), there is risk of knowledge fragmentation about co-creation approaches across types of co-creation and research fields, as well as the issue of concept stretching (Messiha et al. 2023), which may have contributed to stagnation in systematic and effective theory-building of co-creation.

To enrich the existing knowledge about co-creation research, we explored the theoretical underpinnings for co-creation approaches across various types of co-creation and research fields, and identified common dimensions of co-creation. Our overarching research question is:

What dimensions of co-creation are applied in various research fields beyond one-dimensional participatory typologies?

Methods

Taking a hybrid approach, we combined a narrative and systematic literature review to explore published co-creation literature underpinned by explicit theory in various research fields. Starting with the articles retrieved from the narrative review, we identified dimensions applied to the co-creation process via an inductive thematic analysis across types of co-creation and different research fields. This article is part

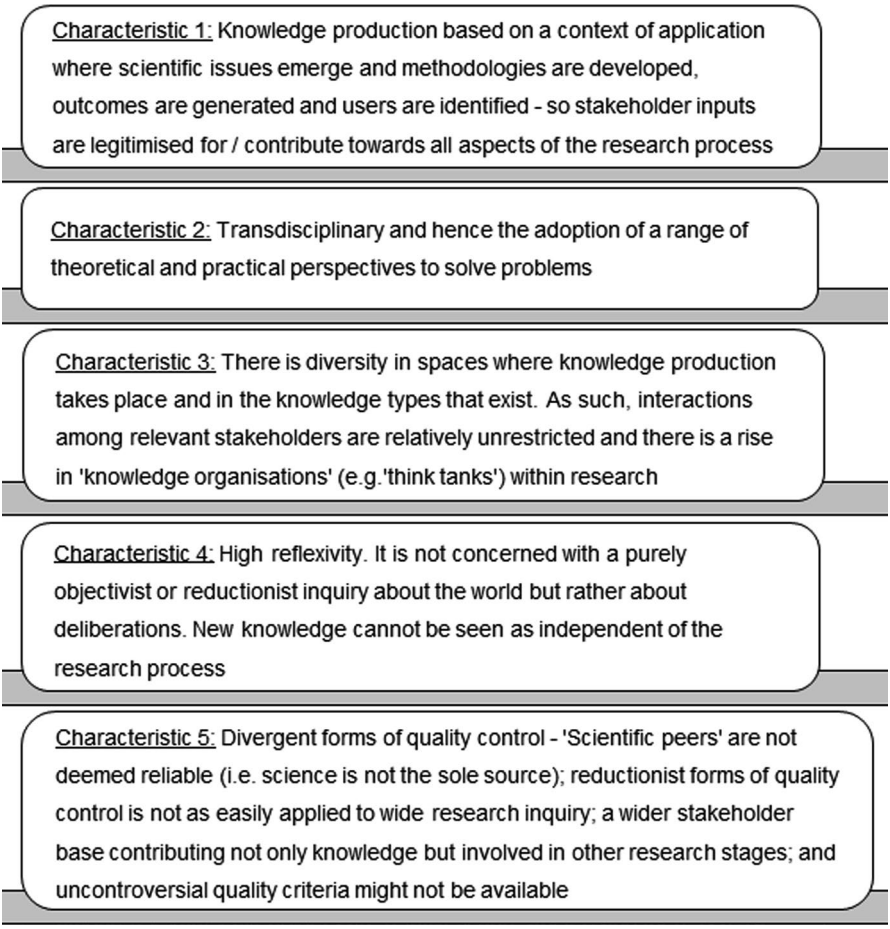

Fig. 1 Five main characteristics of 'Mode 2' posited by Nowotny et al. (2003). Source: Messiha (2021).

of a larger EU-funded project called Health CASCADE (https://healthcascade.eu/) for which we conducted a systematic review on co-creation articles studies in the field of public health underpinned by theory (Messiha et al. 2023). To retrieve articles from other fields, we applied a narrative review. Figure 2 presents the overarching information flow diagram of the methodology, including the number of retrieved articles.

Narrative Review

A narrative review permits a broad approach in sourcing published articles for exploring the relevant literature from any field for the purpose of scrutiny and synthesis (Grant and Booth 2009). Therefore, Google Scholar was used from

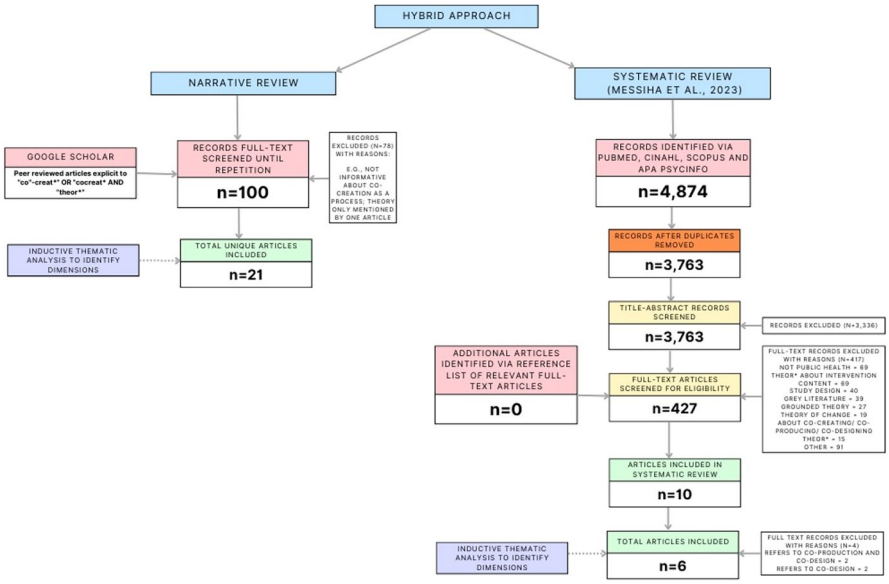

Fig. 2 Flow chart demonstrating this review's hybrid approach.

March-May 2022, for searching publications relating to "co-creat* OR "cocreat*" and "theor*". To ensure more insightful findings, we only included articles that explicitly refer to co-creation as a process, with underpinning theory. Here, explicit theory denotes theory as unambiguously a theory by virtue of it containing the word 'theory', for instance, 'empowerment theory'. To be included in the inductive thematic analysis, at least two articles needed reference to the same explicit theory; and explicit theories were combined if close enough in remit. For instance, Consumer Culture Theory was sorted by similar explicit theory, so in this case, with Culture Theory. The stop rule for the article search on Google Scholar occurred when we started encountering the same articles repeatedly in the search (Xiao and Watson 2019).

The lead author (K.M.) checked eligibility and then extracted the following items from all included articles: author(s) and publication year, field of study, research design, country context, type of co-creation, name of theory used as well as purpose of the used theory for co-creation. Two co-authors (M.G. and S.C.) each checked 50% of the data extraction of the included articles and all co-authors (T.A., M.G., S.C. and M.C.) ensured consistency and clarity in terms of the data presentation.

Systematic Review

For the field of public health we selected articles from a previously published systematic literature review (Messiha et al. 2023). Four electronic databases (PubMed, Ebsco/ CINAHL, Ebsco/ APA PsycINFO and Elsevier/ Scopus) and the reference

lists of included articles were searched from 2012 (with content-specific rationale) to March-April 2022. The inclusion criteria for the systematic review (Messiha et al. 2023) were: original studies (including protocols) with an explicit reference to theory/ theoretical frameworks used for co-creation, co-design and/ or co-production in the field of public health. Furthermore, the systematic review excluded certain theories and theoretical frameworks related to intervention content, such as behaviour change theories (e.g., Behavioural Change Wheel) as well as meta-theories (e.g., critical realism). These exclusions were made because these types of theories do not directly elucidate how the co-creation approach is applied. Additionally, Grounded Theory, was excluded as this is a methodology.

Starting with 4,874 records across these four electronic databases, we examined the title and abstract of 3,763 records and the full-text of 427 articles, with 417 being excluded for various reasons, with not being about the public health context being the most common reason for exclusion. In the previously published systematic review, we included 10 articles. For the current review, we only included papers that explicitly relate to co-creation (and not co-design or co-production), resulting in 6 included articles.

For further details on the search strategy, selection criteria, data extraction, etc., refer to the corresponding published systematic review (Messiha et al. 2023). As the items to be extracted from the 21 included articles (Online Supplementary File 1) have overlap with the items extracted as part of the theory content approach in the systematic review (Messiha et al. 2023: 726-728) - it was not deemed necessary to additionally extract data from the systematic findings for this article. Such extracted items already include study reference and country of (study) origin, name of explicit theory/ theoretical framework, and delineation of the purpose for the theory use as well as the study design used (Messiha et al. 2023: 726-728).

Analyses

To identify dimensions of co-creation, an inductive thematic analysis was initially conducted on the narrative review findings. The aim of this analysis was to generate a highly organised and salient overview of dimensions. This was a recursive process, where lead author (K.M.) firstly read and re-read all included articles from the narrative approach to gain an appreciation of the whole, as well as highlighted the relevant quotes on the co-creation process. Then, K.M. selected a sample of four articles, based on each article using a different explicit theory and was in consideration of the widest variation in quotes relating to different overarching themes/ dimensions. Codes from the sample articles were determined from salient quotes in the articles and in turn, overarching themes ('dimensions') were identified to form a preliminary coding scheme.

As a quality check of this coding scheme, two co-authors (T.A. and M.C.) read and highlighted quotes from two articles out of the four articles (i.e. random selection), and subsequently identified codes and overarching themes. Through discussions, the final preliminary coding scheme was established. Then, K.M. continued with all the other included articles, connecting the codes substantiated by the quotes

to the agreed preliminary coding scheme. The final coding scheme, reflecting the coherent set of dimensions, was established once T.A. and M.C. checked the relevance of the connection between the selected codes and their supporting quotes from the articles. See *Online Supplementary File 1* for the full coding scheme and Table 2 for the sample coding analysis.

Next, the lead author (K.M.) extracted the relevant quotes on the co-creation process, from the included articles of the systematic review. K.M. applied the coding scheme (i.e. from the narrative review) to quotes contained in the systematic

Table 2 Tabulated output showing a sample of the inductive thematic analysis resulting from the narratively-derived articles (n=21).

Explicit Theory Name	*D1: Multi-stakeholder collaborative action*	*D2: Process of co-learning towards innovation*	*D3: Contextual knowledge production*	*D4: Generating meaning*	*D5: Open, trustful and inclusive dialogue*
Complexity Theory	• Inter-organizational collaboration within or across sectors (Bryson et al. 2017) • Implementing cross-sector collaborations (Bryson et al. 2017)	• Building ongoing capacity for learning (Bryson et al. 2017) • Increases innovativeness of new service (Melton and Hartline 2015)	• Multiple logics (i.e. epistemological paradigms) of reasoning (Bryson et al. 2017) • Integration of knowledge by an organisation (Melton and Hartline 2015)	• Democratic space can give some sense of belonging, meaning, purpose and continuity (Bryson et al. 2017) • Meaningful integration of knowledge (Melton and Hartline 2015)	• Democratic space for enabling trust in government/ public institutions (Bryson et al. 2017) • Dialogue and deliberation as addressing public value(s) concerns (Bryson et al. 2017)
Consumer Culture Theory	• Resource-integrating actors to co-exist and co-create value (Kolyperas and Sparks 2018) • Customer participation in the form of shared decision making (McColl-Kennedy et al. 2012)	• Creating additional/ superior value: e.g., shared inventiveness (McColl-Kennedy et al. 2012) • Complex high level activities include co-learning, actively searching for information and providing feedback (McColl-Kennedy et al. 2012)	• Customers as bringing their cognitive or knowledge resources (Aggarwal and Basu 2014) • Explore experience-derived knowledge (Kolyperas and Sparks 2018)	• Customer engagement as a key strategic priority with the potential to generate meaningful insights (Aggarwal and Basu 2014) • Stakeholder- and context-led value results in self-constructed meanings and symbols (Kolyperas and Sparks 2018)	• Regular dialogue meetings to target barriers of lacking teamwork, trust and communication (Erichsen Andersson et al. 2018) • Taking an open view to understanding stakeholder experiences (Kolyperas and Sparks 2018)
Institutional Theory	• Interactions between multiple actors within the system (Cassidy and Resnick 2022) • Requirement of collaborative approaches to tackle complex societal problems (Kumari et al. 2019)	• Learn from experience of others' (Cassidy and Resnick 2022) • Improve capacity and capabilities of co-creation for social innovation (Kumari et al. 2019)	• Involve a range of actors in an extensive process of consultation to shape futures (Cassidy and Resnick 2022) • Building on each other's knowledge through collective innovation of services (Lintula et al. 2020)	• Jointly develop meaning and outcomes (value co-creation) (Cassidy and Resnick 2022) • Eliciting stakeholders' views about future developments to enable a meaningful strategy (Cassidy and Resnick 2022)	• Mutual respect and valuing relations as a core element of networking and collaboration (Kumari et al. 2019) • Social inclusion as a value construct (Lintula et al. 2020)
Service Science Theory	• Multi-actor, collaborative resource integration may better meet complex challenges and needs (Hardyman et al. 2022) • Value is collaboratively created as a result of interaction between consumers and providers (Botti and Monda 2020)	• 'Innovative imagination' focused on learning and knowledge exchange (Hardyman et al. 2022) • Continuous listening about how practices are experienced by multiple stakeholders (Hewett and Shantz 2021)	• Integration of complementary resources/ knowledge/ perspectives (e.g., input from multiple sources) (Majeed et al. 2020) • Each participant inputs their knowledge into the transaction (Ratten et al. 2021)	• Failing to satisfy stakeholder interests can threaten their meaningful involvement (Best et al. 2019) • Meaning created about efforts, money, time and skills (Tommasetti et al. 2017)	• Stakeholder salience: includes trust and commitment (Best et al. 2019) • Building trustworthiness in meeting stakeholder needs (Navarro et al. 2014)
Value Co-creation Theory	• Firms use their business network to achieve value co-creation by co-developing collaborative solutions (Leone et al. 2021) • Collaboration amongst a range of firms and their stakeholders in developing successful innovations (Ratten et al. 2021)	• Stakeholders within an ecosystem are inclined to gather information from different sources and activate learning dynamics (Leone et al. 2021) • Creativity for adaption in contextual conditions and to become agents of change (Ratten et al. 2021)	• Active stakeholders within the knowledge exchange process (Leone et al. 2021) • Each participant in the value co-creation process inputs their knowledge into the business transaction (Ratten et al. 2021)	• Complementarity between values and stakeholder culture (Leone et al. 2021) • Encouraging a process of sense-making about individual experiences (Ratten et al. 2021)	• When dealing with a specific problem, stakeholders tend to establish reciprocal co-operation (Leone et al. 2021) • A sense of belonging among stakeholders can result in peer learning/ mentoring (Ratten et al. 2021)

review articles. Two co-authors (T.A. and M.C.) checked the connection between the selected codes and the supported quotes from the included articles.

Finally, K.M. extracted any working definitions of co-creation from all included articles part of the narrative and systematic review (see *Online Supplementary File 2*).

Results

Narrative Review Findings from Various Research Fields

The narrative review included 21 unique articles pertaining to co-creation with explicit theory from multiple fields of research, for which five articles referred to more than one explicit theory. Online Supplementary File 1 displays the narrative review findings in terms of author(s) and publication year, research design, country context, type of co-creation, research fields, used theory name and theory purpose in relation to co-creation.

The 21 articles reported various research designs: a literature review (n=2), empirical studies (n=8), exploratory study (n=1), qualitative studies (n=5), case studies (n=2), quantitative study (n=1) and conceptual study (n=2). Nine research fields were covered, namely: Public Management (n=3), Marketing (Services/ Strategic/ Unspecified) (n=7), (Health) Services Research (n=2), Information Systems (n=1), Sustainability (n=1), Business Research (n=3), Tourism (n=1), Human Resources (n=1) and Key Account Management (n=1). Among the identified articles showcasing co-creation, marketing was the most prevalent research field (n=7), encompassing service-oriented, strategic and unspecified types of co-creation.

Also, in our findings value co-creation (n=17) was the most common type of co-creation. This might be explained by the dominant field of marketing focusing on understanding and meetings customer needs and preferences. Consequently, customers and consumers emerge as primary stakeholders in this process. Within value co-creation, co-creators were primarily involved in phases related to product or service development, implementation and delivery.

Table 3 presents the results of the inductive thematic analysis of the narratively-derived articles, with the sample codes reflecting the dimensions. Many included articles incorporated a working definition of co-creation, and the dominant themes of such a definition were linked to value co-creation among stakeholders for developing innovations and new business opportunities (see *Online Supplementary File 2*).

The inductive thematic analysis of the 21 articles resulted in five explicit dimensions across co-creation research of various fields (excluding public health) based on five explicit theories, namely: Complexity Theory, Consumer Culture Theory, Institutional Theory, Service Science Theory and Value Co-creation Theory. The five dimensions identified in all articles, include: (1) Multi-stakeholder collaborative action; (2) Process of co-learning towards innovation; (3) Contextual knowledge production; (4) Generating meaning; and, (5) Open, trustful and inclusive dialogue.

Table 3 Tabulated output showing a sample of the inductive thematic analysis resulting from the systematically-derived articles (n=6).

Explicit Theory Name	*D1: Multi-stakeholder collaborative action*	*D2: Process of co-learning towards innovation*	*D3: Contextual knowledge production*	*D4: Generating meaning*	*D5: Open, trustful and inclusive dialogue*
Empowerment Theory (Anselma et al. 2020)	• Participatory process leading to a multicomponent action • Training community partners to actively engage children in decision making	• Stakeholders learn from participation, for example, about healthy behaviour and how to discuss within the group • Learning skills that could benefit multiple environments (e.g., inside and outside school)	• Providing valuable insights into community, lives and behaviour • Increase knowledge (e.g., about research topic)	• Co-created actions to suit stakeholders' needs and interest	• Stakeholders being given freedom, feeling listened to, valued for their ideas and seeing results from their involvement • As part of adoption, stakeholders are well-informed, and thus goals and project processes are transparent to them
Empowerment Theory (Cueva et al. 2017)	• Engage professionals (stakeholders) as collaborators as opposed to authoritative experts • Interactively co-creating an intervention (i.e. online cancer education course)	• Stakeholders can refine outreach efforts including share how they learned about the intervention and their motivations to engage with the intervention • Stakeholders have interest in providing feedback during the intervention development	• Empowerment-focused interventions can allow opportunities for stakeholders to develop their knowledge and skills	• Prospect of stakeholder empowerment to enhance their wellness and improve their problems • Intervention to lead to meaningful behaviour change (i.e. better health) and shift social norms	• In intervention development, it is key to have mutual respect and regard for various cultures • In intervention development, it is key to be sensitive to beliefs, values and ways of coping
Social Learning and Narrative Learning Theory (Koops van't Jagt et al. 2016)	• Participatory developmental process • Innovative qualitative methodology for active involvement	• Participants invited to give feedback and propose other possible solutions and strategies • Formative evaluation for better understanding (e.g., of desired outcomes), including older adults' own topics, barriers and solutions	• Stepwise bottom up development procedure incorporating different perspectives	• Relevant, valuable and authentic to the target group	• Communication aspects (e.g., increase awareness of intervention barriers, patients' self-efficacy etc.)
Symbolic Interactionism Theoretical Framework (Handberg et al. 2019)	• Social interactions among various stakeholders • Consistent and continuous involvement of various stakeholders to generate possibilities for co-creation	• Learn from different approaches within the field (i.e. rehabilitation) • In co-creation, not to be afraid of the unknown and unpredictable, as they are what can be learned from in the process	• Knowledge production/ gaining access to knowledge • Stakeholder perspectives needed	• Human act towards things on the basis of the meanings the things have for them • Meaning to arise from social interaction with others	• Perceived solidarity (everyone's opinion counts) • Profound acknowledgement (stakeholders' feeling valued and heard)

Table 3 (continued)

Social Effectiveness of Interventions Theory (Hoeeg et al. 2019)	• Involving several key stakeholders • Participatory workshops used to engage stakeholders	• Innovative methodology/ Facilitating innovative approaches • Creativity and innovation are key for optimising interventions	• New perspectives on lived experience • Contribute specific knowledge and perspectives	• Meaning as pinned to feelings/ emotions/ affective experiences (e.g., frustration when agreements on what to do were not honoured by stakeholders)	• Understanding power relations is needed to analyse the context for which the co-creation is applied • Human-centred approach to create ownership and commitment of the stakeholders involved
Realist Evaluation Theoretical Framework (Garton et al. 2022)	• Participatory methods to involve stakeholders on evaluation and improve their data literacy • Research and practice stakeholders to contribute to study design, research questions, results validation and recommendations via interactive workshops, consistent dialogue and reflection	• The co-created outcome to ensure continuous improvement (e.g., future evaluations) • Reflection and learning from research process/ findings	• Going beyond scientific results • Observations of research to be guided by knowledge exchange	• Meaningful challenges related to who defines the goals/ priorities of the intervention/ evaluation	• Providing flexibility as the intervention and assessment develop (to remain open to adjustments over time)

Dimension 1: Multi-stakeholder Collaborative Action

In all included co-creation research, emphasis was on including varied stakeholders (e.g., referred to 'participants'), and even considered necessary in a service innovation project (Melton and Hartline 2015). Specifically, inter-organisational collaborations within and across sectors have been accounted for, with recognition of the interdependencies involved between these organisations (Bryson et al. 2017). Bryson et al. (2017: 642) asserted such collaborations involve a type of action, where "different kinds of actors may join up in the centre […] in a shared effort to strategically lead and manage public value creation, and in doing so they referred to different authorising environments, activate different organizational capacities, and typically differentially prioritise the values pursued by different audiences and publics". Relatedly, engagement and 'value co-creation' were specified as the active and explicit collaboration of stakeholders, which was connected to the integration of resources and competence (Aggarwal and Basu 2014). For example, collaborative action includes fostering shared decision making (Leone et al. 2021).

Dimension 2: Process of Co-learning towards Innovation

Characterised as a dynamic, iterative and adaptive process (Aggarwal and Basu 2014; Leone et al. 2021; Melton and Hartline 2015), ensuring an ongoing capacity for learning in co-creation research has been found (Bryson et al. 2017), which has

been linked to problem-solving (Erichsen Andersson et al. 2018; Tommasetti et al. 2017). Creating learning opportunities in co-creation can enable stakeholder goal clarity and personal relevance – and relatedly, facilitation can guide stakeholders via collaborative feedback and mentoring, such that stakeholders can become 'resource integrators' (Aggarwal and Basu 2014; Bryson et al. 2017). Furthermore, creativity suited this process in increasing the innovativeness of outcomes - for example, service development (Melton and Hartline 2015).

Dimension 3: Contextual knowledge production

Context-specific knowledge in co-creation research was acknowledged widely, and encompassed knowledge production (Melton and Hartline 2015), such as those derived from lived/ shared experience in the form of insights offered by stakeholders (Best et al. 2019), specialist knowledge (Bidar et al. 2022), knowledge rooted in best practices (Ratten et al. 2021) and theory-informed knowledge (Erichsen Andersson et al. 2018). Moreover, knowledge translation as a part of co-creation research was characterised as complex and emergent; one of the barriers of knowledge translation in co-creation research was due to balancing conflicting goals, where "front-line managers expressed concerns that participation in the project would potentially lead to disruption of daily work activities" (Erichsen Andersson et al. 2018: 6).

Dimension 4: Generating Meaning

Generating meaning in co-creation research concerned multiple interpretations of how co-creation can be meaningful – broadly about prioritising how co-creation is meaningful for the participating stakeholders over time. For instance, the end-product (e.g., brand meaning) being co-created was related to generating meaning as it shaped user experiences (Tommasetti et al. 2017). As reinforced by Aggarwal and Basu (2014: 326), stakeholders (e.g., consumers) "bring their own personal meanings and identity goals to consumption experiences" in co-creation activities and therefore co-creation had to be meaningful in terms of relevance and contributing to the end-goal of the stakeholders (i.e. as co-creators); which influences the inclination of such stakeholders to participate in co-creation. Hence, meaning could be attached to the involvement or engagement of stakeholders (Best et al. 2019; Hardyman et al. 2022). Sense-making in co-creation was also part of generating meaning, such as how stakeholders act as feelers, doers and thinkers as they engage in co-creation (Aggarwal and Basu 2014; Lintula et al. 2020; McColl-Kennedy et al. 2012; Ratten et al. 2021).

Dimension 5: Open, Trustful and Inclusive Dialogue

Open, trustful and inclusive dialogue can permit an environment conducive to co-creation, which contributed to several benefits: from transparency to valuing

relations among co-creators throughout the process (Best et al. 2019; Partouche-Sebban et al. 2022; Ratten et al. 2021; Navarro et al. 2014; Tommasetti et al. 2017; Kumari et al. 2019). Harnessing openness, for instance, by not having a pre-determined theoretically bound research agenda in co-creation is in line with more stakeholder-centric research about engaging with stakeholder experiences in the research (Kolyperas and Sparks 2018). By prioritising the formation of trusting relationships, facilitators in co-creation research can recognise assumptions about research topics "at deeper levels of the culture" which exposed stakeholders to new ways of thinking (Erichsen Andersson et al. 2018: 7). Inclusive dialogue - the free ability to articulate various opinions, effectively engaged stakeholders in the co-creation of solutions (Erichsen Andersson et al. 2018).

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Messiha et al. (2023) identified five different theories/ theoretical frameworks used across the six co-creation-specific articles included in this current article, namely: Empowerment Theory (Anselma et al. 2020; Cueva et al. 2017), Social Learning Theory (Koops van't Jagt et al. 2016), Symbolic Interactionism Theoretical Framework (Handberg et al. 2019), "Social Effectiveness of Interventions" Theory (Hoeeg et al. 2019) and Realist Evaluation Theoretical Framework (Garton et al. 2022).

Messiha et al. (2023: Table 1) contains the results related to public health co-creation such as national country contexts/ country of origin and methodological approaches/ study design. All included articles focus on co-creating public health interventions, primarily on intervention development using/ or evaluation of the co-creation process. The primary stakeholders involved in co-creation were related to the school and/ or community context.

The application of the inductive thematic analysis to the included co-creation articles in the field of public health did not reveal additional codes, and instead, we identified the same dimensions with supporting codes, as comparable to the findings from the narrative review. Table 3a, 3b presents the results of the inductive thematic analysis of the systematically-derived articles, with the sample codes reflecting the dimensions. None of the included articles in the field of public health incorporated a working definition of co-creation (see *Online Supplementary File 2*).

Dimension 1: Multi-stakeholder Collaborative Action

Multi-stakeholder collaborative action related to the participatory process with various stakeholders, showing instances of working in partnership (Anselma et al. 2020; Hoeeg et al. 2019). It involved stakeholders collaborating on the level of shared decision making and making democratic decisions; which was most valued by the stakeholders (Anselma et al. 2020; Koops van't Jagt et al. 2016). The co-creation research encompassed interactive and participatory workshops in order to enable various stakeholder actions, such as to the research design, validation and drawing recommendations (Garton et al. 2022; Hoeeg et al. 2019). Multi-stakeholder collaborative action generated local ownership and commitment (e.g., being more

engaged) and could lead to empowerment (Handberg et al. 2019; Hoeeg et al. 2019; Anselma et al. 2020).

Dimension 2: Process of Co-learning towards Innovation

The (ongoing) co-learning process towards innovation resulted in (continuous) improvements - for instance, related to project outcomes, skills and feelings of empowerment (Anselma et al. 2020). For example, empowerment played a role in this dimension as related to acquired skills of stakeholders via the instances of co-learning (Anselma et al. 2020; Cueva et al. 2017). Other aspects of this dimension as revealed in the co-creation process included the demonstration of giving feedback (Koops van't Jagt et al. 2016) and reflections (Hoeeg et al. 2019).

Dimension 3: Contextual Knowledge Production

Context-specific knowledge production from stakeholders in the co-creation process elicited valuable insights about community, lives and behaviour – and, youth-led participatory action research increased knowledge on the specific research topic (Anselma et al. 2020). Participatory methods were used to co-create knowledge through reflection among all stakeholders to ensure sustainable change in context (Garton et al. 2022). Taking a stepwise bottom-up development procedure was considered a strength in incorporating different stakeholder perspectives (Koops van't Jagt et al. 2016). As such, involving stakeholders "is essential to obtaining contextual knowledge", which has been found to be particularly informative for the development and implementation of interventions (Hoeeg et al. 2019: 1). For illustration, stakeholders used the knowledge from their research and practice roles to feed into research design, validation and recommendations (Garton et al. 2022).

Dimension 4: Generating Meaning

Generating meaning as part of co-creation involved understanding the salience and subjective interpretations of different aspects connected to the collaborative environment. In catering to the target group, the co-creation process and outcome can be more relevant, valuable and authentic as a way of embedding meaning (Koops van't Jagt et al. 2016; Cueva et al. 2017). Specifically, generating meaning was shown to be pertinent to the suitability to co-creator's needs and interests for more effective interventions in public health research (Anselma et al. 2020). Generating meaning was also concerned with how stakeholders carried themselves in the "significance and meaning that their specific perspectives and interests have for them" (Handberg et al. 2019: 3054).

Dimension 5: Open, Trustful and Inclusive Dialogue

This dimension manifested in stakeholders being given freedom, being listened to, receiving profound acknowledgement (i.e. feeling valued and heard) and feeling valued for ideas/ perceived solidarity (i.e. everyone's opinions count) in the co-creation research process (Anselma et al. 2020; Cueva et al. 2017; Handberg et al. 2019). In the development phase of a co-creation process, well-argued professional discussions in which diverse perspectives could be elaborated on, was recognised as important; where stakeholders were open-minded when reaching a topic consensus (Handberg et al. 2019). Ensuring a trustful relationship with stakeholders was key for close collaborations, whilst maintaining the interest and motivation of the stakeholders (Anselma et al. 2020). Inclusive dialogue in co-creation research related to communication, such as end-users' increased comprehensibility (Garton et al. 2022; Koops van't Jagt et al. 2016).

Discussion

The aim of this article is to explore the multi-dimensionality of the co-creation process across various types of co-creation, research fields and underpinning theories. In this capacity, we identified a coherent set of five dimensions attributed to co-creation research: (1) Multi-stakeholder collaborative action, (2) Process of co-learning towards innovation, (3) Contextual knowledge production, (4) Generating meaning and (5) Open, trustful and inclusive dialogue. Across the various co-creation initiatives, we confirmed the multi-dimensional nature of the co-creation process and therewith uncovered a coherent set of dimensions, some of which overlap. The co-creation process dimensions identified in the narrative search of articles from various research fields was confirmed in the systematic search of public health research articles. The overlapping nature of the dimensions allow for a more holistic appreciation of the synergies that emerge when different dimensions of the co-creation process intersect and complement each other. It is worth noting that none of the co-creation process dimensions identified in this study explicitly delineate the degree of participation of co-creators or stakeholders. For example, Arnstein's (1969) Ladder of Participation addresses power dynamics and control in participatory projects across eight rungs of a ladder ranging from manipulation to full citizen control. Arnstein's Ladder may not have been referenced across the included papers due to the dominant focus on value co-creation, which often centres on eliciting feedback or consulting; with decision-making typically remaining in the hands of a few in power, rather than being shared across all relevant stakeholders. Another reason the included studies may not have mentioned Arnstein's Ladder of Participation could be an oversight in reporting the extent and quality of engagement when employing co-creation approaches.

The identified dimensions are supported by the wider pertinent literature. For example, the importance of (1) Multi-stakeholder collaborative action is highlighted in the research by Reypens et al. (2016), as closely tied to engagement within

'collaborative networks'. In such networks, several diverse stakeholders interact to co-create innovative value. In this context, action is linked to co-ordination of their collective activities, such as planning. Furthermore, the (2) Process of co-learning towards innovation, was mentioned by Masseck (2014) as engaging in participatory co-learning activities plays a key role in generating new ideas within co-creation research. This process can lead to tangible outcomes, like service improvement and innovation (Barile et al. 2020). Similarly, (3) Contextual knowledge production aligns with co-creation research given the "experiential and contextual nature of the co-creation perspective", covering the knowledge from stakeholders' lived experiences (Fuentes 2019: 105). (4) Generating meaning, in the co-creation process resonates with the prospect of co-creating meaning (Ind and Coates 2013), and is evidently traced to value co-creation (Camargo-Borges and Rasera 2013). Finally, (5) Open, trustful and inclusive dialogue has been reinforced as "fundamental enablers of multi-stakeholder value co-creation" in the literature (Cannas et al. 2019: 141).

The identified co-creation process dimensions expose several parallels with the characteristics of "Mode 2" (Figure 1) and "Mode 3" knowledge production, which has implications for co-creation research. The emphasis on *multi-stakeholder collaborative action* aligns closely with Mode 2 knowledge production which centres on trans-disciplinarity and heterarchical organisation. Mode 2 values the inclusion of diverse stakeholders working collaboratively within context-specific, problem-driven environments. Mode 3 extends this concept further, advocating for a dynamic integration of perspectives within an open innovation ecosystem that recognises the complexity and diversity of contemporary challenges. This perspective implies that co-creation efforts could benefit from adopting a more fluid and systemic approach, as seen in Mode 3 - which prioritises shared decision-making while also embracing the interdependencies that exist between various stakeholders. The *process of co-learning towards innovation* in co-creation research also resonates with both Mode 2 and Mode 3. This is given that Mode 2 characterises knowledge production as an ongoing, adaptive process that involves continuous learning and problem-solving through the mobilisation of diverse methodological approaches and Mode 3 draws on the concept of higher-order learning; this suggests a more advanced stage of knowledge production that anticipates future challenges through strategic foresight. Therewith, higher-order learning could enhance the innovativeness of co-creation outcomes by encouraging stakeholders to integrate forward-looking strategies into their collaborative processes.

Further, *contextual knowledge production* finds a strong parallel in Mode 2, which places great emphasis on the production of knowledge within specific contexts and the reflexive nature of this process. In co-creation research, Mode 2 knowledge production is derived from lived experiences, best practices and theoretical frameworks, with a clear recognition of the importance of context in shaping research outcomes. Adding to this, Mode 3 implies that while co-creation research rightly prioritises context-specific knowledge, it could further benefit from considering how such knowledge might contribute to broader, more strategic objectives. The dimension of *generating meaning* within co-creation research is also related to the reflexive and dialogic nature of Mode 2 knowledge production, where meaning is continuously shaped by the interactions between stakeholders. Similarly, Mode 3 proposes that

generating meaning should incorporate the integration of diverse perspectives of participating stakeholders in a way that creates a more holistic understanding within the broader innovation ecosystem, for instance, of a research problem/ question and solution(s). Moreover, the importance of *open, trustful and inclusive dialogue* in co-creation research could be seen as related to the emphasis on heterarchical organisation and novel forms of quality control within Mode 2. This is to recognise that open and inclusive dialogue is essential for adopting transparency and building valued relationships among stakeholders. Mode 3 takes this a step further by advocating for an open innovation ecosystem where actors are responsible for managing and coordinating their own activities.

Expanding further on the comparable links to existing reviews, Galvagno et al.'s (2014) review identified six common themes to culminate from the co-creation literature in business and management journals, such as "co-creating value through customer experience and competence" and "[service] innovation", overlapping with our identified co-creation dimensions, such as (1) Multi-stakeholder collaborative action and (2) Process of co-learning towards innovation. Similarly, Terblanche's (2014:3) review argues there are three crucial components of co-creation, namely "the customer, the firm and the interaction between the customer and the firm" – which our review confirmed is predominantly linked to value co-creation and the dimension of 1) Multi-stakeholder collaborative action. Relatedly, our findings show that value co-creation seems the most prevalent form of co-creation across research fields. The findings of this study reveal an unexpected predominance of value co-creation, often associated with disciplines such as business and marketing, in contrast to knowledge co-creation which is common in public health, where relatively few theoretical frameworks have been applied. The theoretical orientation of value co-creation may be driven by an underlying inclination to explore and validate theories. This could be attributed to certain fields (e.g., public management, marketing) predominantly relying on particular theories (e.g., Service-Dominant Logic Theory), whereas other fields like public health may be less explicit in their theoretical foundations or employ a broader range of theories that could not be captured due to our study's criterion that requires at least two papers to explicitly adopt the same theory for co-creation research. Moreover, in public health, there is a closer alignment with practical knowledge co-creation, which prioritises collaborative engagement with stakeholders to address real-world health challenges. Our study examined various co-creation processes in research, from which we identified similar co-creation process dimensions. Although value co-creation emerged as the dominant co-creation type, the identified dimensions seem to match knowledge co-creation as well. Nevertheless, future research on knowledge co-creation could benefit from theory building.

Furthermore, it could be reasoned that our reviews' identified dimensions contribute to and facilitate the higher-level concept of collective intelligence, a concept that "enables an idea to have a greater impact than any individual's idea on its own as a result of a process whereby the individual idea is combined with and evolves with others, creating a synergy effect" and therewith evidently compatible with the essence of co-creation (Lee and Jin 2019). Our explorations of the co-creation dimensions advance research beyond previous articles. While

previous studies have highlighted the main objectives of co-creation, such as "gaining more effectiveness" as illustrated in Voorberg et al.'s (2015: 13) systematic review, it is not clear how such objectives may be enacted in the co-creation process. The identified dimensions can aid more specifically in this case by informing the co-creation process. For instance, achieving more effectiveness can be aligned with co-learning towards innovation via support mechanisms and inclusive dialogue to effectively engage stakeholders. Informing the co-creation process is even more important, as Vargas et al.'s (2022b) systematic review about co-creation in health-enabling initiatives in food retail outlets, determined that all included articles were more about outcomes rather than reporting on co-creation processes.

Likewise, Vargas et al. (2022a: 4) denoted four principles of co-creation which overlap with all our identified dimensions. Our work adds the essential role of inclusive dialogue to Vargas et al.'s principle of 'creation of platforms that promote continual dialogue among stakeholders', in order to ensure that there is a capacity for freely expressing diverse viewpoints among stakeholders. Vargas et al.'s (2022a: 4) principle of 'focus on all stakeholders' experiences' attunes with our dimension of (4) Generating meaning, showing the salience of co-creation research in eliciting meaningful experiences for stakeholders. By acknowledging stakeholders' personal meanings, identity goals and past experiences, such stakeholders can be motivated to more actively and directly participate in co-creation processes. Attaining successful co-creation necessitates a clear understanding of stakeholder roles (Agrawal and Rahman 2015), and our review recognises that as stakeholders actively participate in co-creation processes, such stakeholders could become more profoundly involved in influencing their roles and generating meaning.

The specific dimensions identified in this review offer valuable insights into the nature of the co-creation process within diverse research fields, even when working definitions of co-creation are lacking or inconsistent. This is especially notable because our investigation revealed a lack of clear and consistent definitions in most of the included articles, especially within the field of public health research (see *Online Supplementary File 2*). Applying the identified dimensions can foster a shared language in co-creation research, which is worthwhile for advancing the conceptualisation of co-creation as a process. This advancement can be seen with respect to addressing the aforementioned research challenges—namely by minimising the risk of knowledge fragmentation and concept stretching. Hence, this article contributes to rectifying the discrepancies and uncertainties in the understanding of "co-creation" both within and across research fields.

Further, we raised recognition of the explicit theories used to underpin co-creation research in various fields (Online Supplementary File 1). For instance, Complexity theory is used to inform value co-creation in the public management context, elucidating the links to systems thinking. Such a theory benefits co-creation practice for its explanatory value in addressing issues of how diverse stakeholders' interactions result in innovative outcomes. Most included articles from the narrative review referred to Service Science Theory and used value co-creation. By considering insights about the type of co-creation enacted and the explicit theories underpinning the co-creation process as applied across research fields—researchers can become

more acquainted with the broader manifestations of co-creation, which helps to navigate the complexities of collaborative processes.

Future research is needed to investigate best practices for how these dimensions can improve co-creation initiatives within real-world contexts. To reiterate, we advocate for research to adopt a multi-dimensional approach to the co-creation process—and to work towards developing a common language around co-creation, which involves operationalising these identified five dimensions.

Limitations and Strengths

As the first review of its kind to offer a multi-dimensional lens to co-creation research across all types of research fields, can be counted as a strength in addition to the thorough inductive thematic analysis. Another strength includes the proximity of explicit theory use in relation to the co-creation process. However, the extent to which the theory applied to the co-creation process was variable across the included articles, as some made the link in this regard more explicit than others. Similarly, the fundamental lack of coherent and consistent definitions given for co-creation rendered it difficult to necessarily assess the boundaries of the co-creation process (Neghina et al. 2015; Ind et al. 2013)—see *Online Supplementary File 2*.

Another limitation of our study is that while we identified common dimensions of co-creation, our study does not elucidate their interrelationships, which is arguably important for theory development—and as such, this could be an avenue for future research. Moreover, the subjectivity of the inductive thematic analysis given its interpretative process could be rendered a limitation. Distinguishing the dimensions was a challenge given the overlap between some dimensions. For example, co-learning intersects with contextual knowledge production, as it relates to exchanging ideas and points of view (i.e. knowledge) for co-learners to understand context, challenges and needs as well as how to implement ideas. Any overlap between dimensions related to the co-creation process could not be avoided—but to strengthen the analysis, we performed a comprehensive quality check. This quality check was achieved by establishing a preliminary coding scheme in line with an inductive thematic analysis approach and refining codes per dimension among three authors (K.M., T.A. and M.A.).

Conclusion

We identified five dimensions of co-creation across various initiatives with underpinning theory and with focus on all types of co-creation enacted (e.g., value co-creation) and research fields: (1) Multi-stakeholder collaborative action, (2) Process of co-learning towards innovation, (3) Contextual knowledge production, (4) Generating meaning and (5) Open, trustful and inclusive dialogue. A clear and consistent definition of co-creation was often lacking, especially in the field of public health. Overall, we encourage researchers applying co-creation approaches to further explore and operationalise these five dimensions in order to build an evidence-base for the application of trustworthy co-creation research.

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Declarations

Conflict of interest The authors have no competing interests to declare that are relevant to the content of this article.

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