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ACTION, DESIGN & RESEARCH – A PROCESS META-MODEL

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Abstract

Conducting Action and Design Research within organizations – with the objective of solving multidimensional problems, promoting effective change, developing useful artifacts, and generating actionable knowledge – involves the iterative application of a rigorous set of integrated processes.

In a previous publication – based on empirical work, on a comprehensive literature review, and the practice of applying it to teach graduate students on qualitative research methods – a high-level conceptual model for Action & Design Research has been developed and published. It has identified – through the presentation of a tri-dimensional perspective, under the form of a cube – the essential processes and data components, emerging from the Organization Development, Engineering, and Science perspectives.

Based on that high-level conceptual view, the objective of the current article is to detail a pragmatic approach to the main activities which are involved in the Action and Design Science Research approaches – under the form of high-level Process Meta-Models.

Keywords: Organizational Research; Action Design Research; Action Research; Design Science Research; Process model

1. INTRODUCTION

Action Research (AR) has already proven to be an effective instrument to promote learning and development – solving problems, embodying people’s aspirations, and meeting their dreams and deep expectations – within organizational and social communities. Literature is plenty of narratives of successful applications within distinct contexts and using a multiplicity of approaches, and some relevant publications have reflected a diversity of successful Action Research approaches.

Several important seminal and structural articles, books, handbooks, and encyclopaedias (Shani & Pasmore, 1982; Herr & Anderson, 2005; Coghlan & Brannick, 2010; Coghlan & Brydon-Miller, 2014) have been publish on the subject – being considered as key knowledge landmarks, providing strong orientations, and acting as main sources of inspiration for several generations of successful Action Researchers.

On the other hand – from a Design Science Research (DSR) perspective, and consubstantiating Simon’s (1996) view on the sciences of the artificial – several seminal and structural publications (Van Aken, 2004; Peffers et al, 2008; Hevner & Chatterjee, 2010; Gregor & Hevner, 2013;
Vaishnavi & Kuechler, 2015) have been developed and successfully applied along many years of research and practice activities.

Also, from a science perspective – starting from a knowledge gap-problem-opportunity, and developing the research agenda and activities within organizational contexts in order to solve it – several major publications (Creswell, 1994; Eriksson & Kovalainen, 2008; Saunders, Lewis & Thornhill, 2009; Yin, 2009; Bryman, 2012) address the main steps and data elements to be considered when proposing, designing, planning, developing, evaluating, and divulging applied research activities.

The current research has intended to develop an integrated process meta-model for Action Design Research, as well as specific process meta-models for Action Research and for Design Science Research, in order to be used, as a base orientation, by academics and organizational professionals.

It is rooted on previous research developed by the authors and has been produced using DSR as the underlying research method.

After the current introduction, the paper progressively presents the essential meaning, directions, targets and approach of the current research work (section 2) being followed by a summary presentation of its main requirements (section 3), research groundings (section 4), model development and research results (section 5), and culminating with its discussion, reflection (section 6) and main conclusions (section 7).

2. Research Meaning, Directions, Main Targets, and Approach

2.1. Context and previous research

The current publication is an integrated part of a wider initiative focused on the study, development, and application of Action-, Design-, and Research-based approaches within Organizations – aggregating knowledge emerging from empirical studies and systematic literature reviews, using it to teach graduate students, and, progressively, developing conceptual and logical meta-models to be applied and tested along graduate students’ thesis and dissertations, as well as in real organizational projects. The current line of research has been initially triggered, within a doctoral dissertation (Henriques, 2015) by a specific need to get a clear understanding of the main processes and data involved in an Action Research real application to a specific transformational change program (as detailed in Henriques & O’Neill, 2014).

Also, at a logical level, a process meta-model concerning holistic and participatory Action Research initiatives within organizational settings has been developed and presented (Henriques & O’Neill, 2018A). It has reflected the model which has been applied, being further tested and didactically
enriched by the feedback of qualitative methods lecturing activities to Master and DBA students within the domain of Information Systems and Management.

Further on, increasing its level of scope and abstraction – and grounded on that empirical research work and on a systematic literature review of the Action Research (AR) and Design Science Research (DSR) paradigmatic approaches – a conceptual model for action and design research has been previously developed and published (Henriques & O’Neill, 2018B).

2.2. Research Targets – main questions and objectives

Within this line of research scope – and using the Design Science Research approach itself – the current research work intends to solve a specific and relevant research problem, answering to the associated main research questions, and providing a solution, under the form of an artefact (process meta-model), to address it.

The main problem to be addressed involves the need for a rigorous and pragmatic integrated approach to ADR (in order to teach research students and organization professionals on their first usage of these research paradigms and its structured application to organizational settings) providing a general view of its process, data, and relationships to be used (adopted) and tailored (adapted) to specific circumstances. It intends to respond to their pertinent self-reflecting questions about their own research, when progressing in their first research steps using this kind of organizational change and design approaches, here taken as main research questions, namely:

RQ1. What are the essential steps of the research process which will allow me to introduce rigor on my knowledge-generation practice, and what are the pieces of information that must be used and produced at each step?

RQ2. What are the essential steps of the design process which allow me to introduce relevance on my engineering practice, progressing from problems to artifacts, and what are the pieces of information that must be used and produced at each step?

RQ3. What are the essential steps of the change process which allow me to effectively advance on my organization development practice, and what are the pieces of information that must be used and produced at each step?

In order to provide an adequate answer to these questions, the meta-model to be developed must achieve a main objective of producing a pragmatic view of the essential data and processes necessary to solve a multidimensional problem, integrating three dimensions: (1) promotion of organization development, change, and organizational learning, (2) design and production of useful artifacts, and (3) research and generation of, external and internal, knowledge.
2.3. **Research Approach – the Design Science Research paradigm**

Peffers et al. (2008) elaborating on the scope of DSR describe it as involving “a rigorous process to design artifacts to solve observed problems, to make research contributions, to evaluate the designs, and to communicate the results to appropriate audiences”. For them, such artifacts “may include constructs, models, methods, and instantiations, but might also include social innovations or new properties of technical, social, and/or informational resources”.

Van Aken (2004), regarding the characteristics of DSR, emphasizes that “research questions are driven by field problem, there is an emphasis on solution-oriented knowledge, linking interventions or systems to outcomes, as the key to solve field problems, and the justification of research products being largely based on pragmatic validity”.

Hevner & Chatterjee (2010) set a global and widely accepted, concept for DSR as “a research paradigm in which a designer answers questions relevant to human problems via the creation of innovative artifacts, thereby contributing with new knowledge to the body of scientific evidence”.

Altogether, these authors set the main foundations for DSR, as a rigorous research paradigm, evidencing its targets on a basis of relevance: to design artifacts to solve real problems.

Considering the current research problem, questions and objectives, this deeply justifies the choice for adopting this research paradigm as a basis for the current approach.

Hevner (2007), using an elaborated process, envisions Design Science Research as integrating a three-cycle approach and processes, including: “(1) a Relevance Cycle (requirements; field testing), (2) a Rigor Cycle (build design artifacts and processes; evaluate), and (3) a Design Cycle (grounding; additions to knowledge base).”

This model clearly evidences the main objects and actors within the application domain (people, organizational systems, and technical systems, and its problems and opportunities), the associated knowledge base, including scientific theories and methods, experience and expertise, and meta-artifacts (either design products as design processes), and the DSR process itself.

Considering Gregor & Hevner’s (2013) taxonomy for artifacts, the main target of this DSR re-search clearly fits the current process meta-models within the limits of their level-2 classification.

### 3. MAIN REQUIREMENTS

The need for a process meta-model has initially emerged from the needs expressed by Information Systems and Management graduate students – struggling with so many different AR and DSR traditions and approaches – in order to have a pragmatic and clear view of these research paradigms.
So, the main gap to be addressed corresponds to the lack of pragmatic Action Research and Design Science Research process meta-models which could be used to teach research students and organization professionals on their first usage of these research paradigms.

As a key requirement, these meta-models should provide a general and pragmatic view of the process, its data, and relationships, which can be adopted and adapted to specific circumstances, directly answering to self-reflecting main questions (RQ1, RQ2 and RQ3) as previously stated.

In order to provide an adequate answer to these essential questions, the meta-model to be developed must achieve a main objective of producing a simple, clear and pragmatic view of the main data and processes necessary to solve a multidimensional problem, involving three dimensions: (1) promotion of organization development, change, and organizational learning, (2) design and production of useful artifacts, and (3) research and generation of, external and internal, knowledge.

These were the current main targets, which have set the context for the current research and its focal requirements, using research students as main stakeholders for the design of the associated solution.

Considering Boonstra’s (2004) principle that “there is no one best way in organizing and changing” and Burnes’ (1996) argument that “the ability to manage change is now recognized as a core organizational competence, challenging the idea that there can be a one best way to do it”, the process meta-models to be produced should be necessarily simple, clear, and pragmatic (in order to be well understood and easily adopted), but also sufficiently general and flexible (allowing them to be easily adapted to distinct problem areas, disciplines, application contexts, and circumstances).

These essential formal modelling requirements determine that the emerging artifacts must not be prescriptive but mainly supportive. They should answer to “what to do” questions, rather than providing “how to do it” directives.

Also, considering its basic purpose, the process meta-model ought to deliver an useful basis to teach Master, DBA, and PhD students on applied Organizational Research Methods, by providing an overview of its main dimensions and helping them to discover their own way and main references for its contextualized application.

Furthermore, considering its field application, these meta-models should have the ability to support professionals while researching inside their own organizations, combining applied research with design and organization development, as a professional challenge.

Finally, they should incorporate what is already known about these approaches – thus integrating major orientations and recommendations which emerge from a systematic literature review on the methodological domains of AR and DSR.
4. RESEARCH GROUNDINGS

4.1. Previous empirical work

Using a DSR approach – based on the results of empirical work grounded on a major organizational change program (Henriques, 2015; Henriques & O’Neill, 2014), being successfully used to teach research methods essentials to Master and DBA students and enriched with an in-depth literature review, Henriques & O’Neill (2018B) have developed and published a Conceptual Model for Action and Design Research, under the form a tri-dimensional perspective (figure 1).

![Figure 1 – ADR foundations: the Science, OD, and Engineering perspectives (source: Henruques & O’Neill, 2018B)](image)

This conceptual model – combining the traditional scientific, engineering, and organization development approaches – depicts how an organization can, simultaneously, solve multidimensional problems, producing actionable knowledge, effective change, and useful artifacts. It has served as a main foundation to progress with the current research work.
4.2. **Systematic literature review**

In order to clearly identify and to define the current design requirements it was crucial to review the most relevant literature aspects for both research paradigms, with a special focus on their main process and data components.

These elements represent the Organization Development and the Engineering dimensions integrated onto the model. Furthermore – encompassing the need to obtain a whole perspective of the main requirements involved in research activities – a complete literature review has been also conducted in order to make explicit their major process and data components, and representing the Science dimension.

This literature review intended to provide the main foundations for the current meta-models, focusing particularly on (1) the main processes involved and its relationship, (2) the main pieces of data to be used / produced along the process, and (3) the essential data flows denoting the integration between the data and process components.

### 4.2.1 Science Dimension – Research Data and Process

Independently of the specific epistemological, ontological, and methodological characteristics associated with any inquiry paradigm, research activities exhibit a set of common patterns and requirements, allowing us to devise its main processes and data components.

As a first reference in this field – regarding the business research processes – Saunders, Lewis & Thornhill (2009) specifically recommend a set of main activities: “(1) formulate and clarify your research topic, (2) critically review the literature, (3) understand your philosophy and approach, (4) formulate your research design, (5) negotiate access and address ethical issues, (6) plan your data collection and collect data, (7) analyse your data using qualitative and/or quantitative methods, (8) write your project report and prepare your presentation, and (9) submit your project report and give your presentation.”

Yin (2009), focusing on the Case Study Research approach, includes in his approach six major interrelated steps: “(1) plan, (2) design, (3) prepare to collect evidence, (4) collect evidence, (5) analyse evidence, and (6) share”.

Concerning the area of Social Research, Bryman (2012) summarizes the process in seven essential components: “(1) literature review, (2) concepts and theories, (3) research questions, (4) sampling cases, (5) data collection, (6) data analysis, and (7) writing up”.

Similar patterns are recognizable in several reference publications within the domain of Research Methods and Research Design (e.g. Eriksson & Kovalainen, 2008; Creswell, 1994).
These major references in the field allow us to identify and highlight, as information requirements, a set of common data elements, which integrate: (1) a literature review, covering the aspects of the research disciplines and method, (2) a definition of the research approach, (3) the explicit and clear identification of the research targets, (4) the production of a research design, (5) the reporting on the effective development of the research activities, including data evidence, (6) the identification of the research results, (7) the evaluation of the research, and (8) the production and publication of emergent knowledge.

In strict accordance with the production of these main data results, the associated research processes should include some essential steps: (1) a systematic review of relevant knowledge, (2) the definition of a research approach, (3) the formulation of research targets (questions, objectives and hypothesis), (4) the design of the research, in terms of process, data and tools to be used, (5) the effective development of the research activities, (6) the execution of the field processes associated with the research, (7) a formal evaluation of the research, and (8) the generation of relevant knowledge.

These are the main data and process elements which have been considered, as strictly necessary, to integrate the Science cornerstone of the targeted meta-models.

### 4.2.2 Organization Development – Change Data and Process

Being Action Research a process – with the double burden of testing hypotheses and effecting some (putatively) desired change in the situation, where there are two action research cycles operating in parallel, a core action research cycle and a thesis action research cycle, involving two goals: (1) to solve a problem and (2) to contribute to science – it is important to understand how the action and the research dimensions intimately develop and interleave along this process.

In this context, a widely accepted reference model for Action Research has been provided by Shani & Pasmore (1982). Setting the context for action and for the associated research activity, this perspective can be considered has having two major implications: (1) from a process point of view, it evidences the importance of promoting organizational change using a systemic approach to solve real organizational problems, and (2) from a data perspective, it enhances the relevance of internal and external knowledge as a basis to promote organizational learning and generate relevant knowledge.

Also, one of the former publications on the domain (Susman & Evered, 1978) considers AR as a cyclical process including several stages: (1) diagnosing, (2) action planning, (3) action taking, (4) evaluating, and (5) specific learning.

Kemmis & McTaggart (1988) – in their systematic and reflective model – consider AR as integrating a set of four main phases: planning, acting, observing, and reflecting.
This perspective, essentially adds to the previous ones the main role of observation and reflection, as a meaningful link between action results and research evaluation.

More recently, Coghlan & Brannick (2010) have identified a set of initial typical questions to be addressed as part of a research proposal – with a clear subset for the Action (“what is the action?; what is the rationale?; why is it worth doing?; what is the desired future?; what is the present situation?; what is the plan to move from here to there?; what is the time schedule?; with whom will you collaborate?; where do you, as the researcher, fit into the action?; what are the ethical challenges?”), and for the Research (“What is the rationale for researching? What is the contribution to knowledge? How do you intend to inquire into the action? How do you ensure quality and rigour?”) dimensions – corresponding to distinct, but deeply interrelated, concerns. Subjacent to these questions is a specific need to ensure a set of processes in the Action dimension, to diagnose the current situation and to get consensus on the desired situation, as well as, to plan the intervention, before action, and its evaluation.

On the other hand – concerning the Research perspective of these questions – relevance is given to the need to provide a research approach rationale, to set research targets (questions, objectives, and hypothesis), and to establish a research evaluation criteria.

Altogether, these essential perspectives on AR offer us a wide view to identify its main process and data requirements.

On an action perspective, AR interventions must consider, as relevant, the traditional planned change processes (identify organizational objectives and the change approach, develop a diagnosis, design the intervention, do the intervention, evaluate the results) and the associated data usually reported along a change intervention (change objectives and approach, organizational diagnosis, intervention design and plan, change results, change evaluation).

On a science perspective, being Action Research a rigorous paradigmatic approach to knowledge generation, it must also serve essential research purposes – aligning with the data and process requirements which have already been identified and made explicit for the Science dimension.

### 4.2.3 Engineering Dimension – Design Data and Process

A third dimension which integrates this meta-model is related to the traditional Engineering approach to the Design of useful Artifacts which solve relevant organizational Problems.

As previously referred, several seminal publications have been developed and successfully applied along many years of research and practice activities concerning Design Science Research, as “creating and evaluating IT artifacts intended to solve identified organizational problems” and involving “a rigorous process to design artifacts to solve observed problems, to make research
contributions, to evaluate the designs, and to communicate the results to appropriate audiences” (Peffers et al., 2008).

Reeves (2006) – elaborating on the DSR path from problems to solutions – evidences a chain of main processes which include: (1) analysis of problems, (2) development of solutions, (3) test and refinement, reflection, and (4) enhanced implementation.

Also, Hevner’s (2007) view on DSR – integrating a three-cycle approach of relevance, rigor, and design – includes a set of six essential processes, as being focal to this paradigmatic approach, including: (1) requirements, (2) grounding, (3) building and design of artifacts and processes, (4) field testing, (5) evaluation, and (6) additions to the knowledge base.

Discussing the main DSR activities, Peffers el al. (2008) describe their Process Model as including six main stages: (1) identify problem and motivate, (2) define objectives of a solution, (3) design and development, (4) demonstration, (5) evaluation and (6) communication.

Offerman et al. (2009), based on a comparison of DSR activities, also proposes an outline for the process, which includes three major stages: problem identification, solution design, and evaluation.

Also, Vaishnavi & Kuechler (2015) propose a process for DSR, including the following main aspects: (1) awareness of problem, (2) suggestion, (3) development, (4) evaluation, and (5) conclusion.

These major contributions denote some kind of confluence and complementarity on their approach and, as a systematization based on their approaches to DSR, it can be can recognized some main processes, including: (1) definition of the problem, (2) definition of the associated requirements, (3) design of an appropriate solution, usually under the form of an artefact, (4) development of the artefact, and (5) its test and evaluation.

Also, along the whole process, some essential data components – which must be, progressively and congruently, produced – can be recognized, including: (1) problem definition, (2) requirements definition, (3) solution definition, (4) artefact development and testing, and (5) design evaluation.

Being DSR a research process, it must, understandably, aggregate the data and process requirements previously described as applicable to the Research perspective.

5. MODEL DEVELOPMENT AND RESEARCH RESULTS

In line with the research requirements which have been previously identified, and considering the previous empirical work and the results of a systematic literature review, an initial process meta-model has been designed to support the solution for those requirements.
This integrated process meta-model, providing an explicit representation of Action, Design, and Research activities, intended to provide a global overview of the inherit sub-processes, as well as of its main data stores and flows.

Further analysis of the essential input and output data associated with each of these sub-processes, and of the related data flows, has led us to the design of two, more detailed, meta-models – for Action Research and for Design Science Research – which are also presented.

5.1. Model representation: Dataflow Diagrams

Essentially, Dataflow Diagrams (DFDs) are visual representations which can be used to depict information systems’ processes and its interaction with data, through data flows. As a visual form of representation, they embody four main types of components: (1) External entities (elements outside the boundary of the system which interact with it via data flows), (2) Processes (sets of activities within the system, which transform data), (3) Data stores (groups of data that are kept, used and updated within the system), and (4) Data flows (representations of the flows of data within the system or crossing its boundaries).

Data flows are usually represented by lines with directional arrows, denoting the direction of the flow of information; processes can be represented by rectangles, with a significant (active action) name inside it; and Data stores can be represented by right open-ended rectangles with a double-line in the left side. As a graphical instrument, DFDs can be used to represent distinct levels of detail for systems’ representation. Being very comprehensive in terms of levels of abstraction, they can be used to represent higher degrees of abstraction (conceptual level), to illustrate systems’ functioning (logical level), or to detail real implementation instantiations (physical level).

They will be used here – at a logical, functional level – to illustrate the essential processes, data stores and information flows which are relevant for Action and Design Research.

5.2. ADR integrated meta-model – main sub-processes and its description

Using a Design Science Research approach – detailing the previously developed conceptual model (previously presented and depicted at figure 1) – an integrated process meta-model, at a logical level, for Action, Design, and Research has been designed (figure 2).

It evidences the essential aspects associated with a tri-dimensional perspective integrating the Organization Development, Science, and Engineering combined approaches to solve multidimensional (change, research, and design) contextualized problems.

The model depicts – for its main stages (proposal, planning and design, implementation, and evaluation) and dimensions (action, research, and design) – the essential steps, data elements and flows which, progressively, contribute to the production and documentation of its main outcomes.
5.3. **Action Research and Design Science Research process meta-models**

Based on the global design which has been produced – and detailing the main data elements associated with its essential data groups and process interactions – two specific meta-models have been produced depicting the Action Research and the Design Science Research approaches.

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**Figure 2** – Action, Design, and Research – an integrated Process Meta-Model
Figures 3 and 4 depict those main sub-process and data components, and how they do integrate onto each of these research paradigms.
Figure 4 – Design Science Research – a Process Meta-Model
6. DISCUSSION AND REFLECTION

Organizational Research – as an inquiry practice focused on solving organizational problems, while getting new knowledge, promoting deep change, and delivering useful artifacts – is a powerful instrument on the hands of researchers and professionals to promote their own development through applied research inside their organizations.

Particularly, a pragmatic application of Organization Development approaches combined with traditional Engineering practices – integrating AR and DSR into organization development and learning initiatives – can promote double-loop generative organizational learning, while developing individual’s capabilities, as well as, positive attitudes, behaviours, and real contributes to organizational effectiveness.

However – for early-career academics and professionals interested in their sustained development, and on an effective and pragmatic first-time use of such powerful research approaches – it is important to have some kind of “route maps” to provide some initial directions concerning the most relevant processes and data components which are relevant to accomplish their task within acceptable levels of rigor and relevance.

The main objective of this research was to introduce a pragmatic set of process and data elements integrating the essentials of that research pathway – under the form of global and specific Process Meta-models – combining the traditional Scientific, Engineering, and Organization Development approaches to problem-solving.

In its root orientations, they ought to be sufficiently clear and pragmatic to be well understood and adopted, but also quite general and flexible to allow for its easy adaptation to specific application contexts, disciplines, and real situations. In general terms, they aim to be supportive (answering to “what to do” questions) and targeting the identification and integration of the main steps and associated data which must be considered along the process.

Also, they intend to be used as a basis to teach Organizational Research Methods, providing a simple, clear, and pragmatic view of its main dimensions, stages, processes, data, and relationships. So, a simple set of “route maps” to guide their initial steps along the journey has been a major design driver. This set of meta-models have been developed using the DSR paradigm, itself, and had incorporated a two-stage refinement approach.

On the first stage – based on a systematic literature review focused on the Process and Data scopes of Action Research and Design Science Research – it has been produced a tri-dimensional top-level view (a cube) of the essential elements emerging from the main references in this methodological field (Henriques & O’Neill, 2018A).
The second stage has gone deeper, evidencing – under the form of Dataflow Diagrams, for the AR and DSR approaches, and its integration – three process meta-models (detailing processes, data, and relationships) as well as the associated summary descriptions.

The models have been developed and have been subject of field testing, with success, along a strategic transformational change intervention within an IS/IT Unit of a major Bank (Henriques & O’Neill, 2014).

The associated research has been the main focus of a successful Doctoral Dissertation in Information Science and Technology (Henriques, 2015) and a partial view of the model, summarizing the Action Research components, has been presented at EURAM 2018 Conference (Henriques & O’Neill, 2018A).

Also, a top-level overview – under the form of a cube and integrating the Action, Design, and Research dimensions – have been previously developed and presented (Henriques & O’Neill, 2018B).

7. CONCLUSIONS

These models have been, since 2014, progressively used and tested, as an educational instrument, to teach DBA candidates and Information Systems Management master students on Qualitative Research Methods. They have proven to be straightforward useful instruments to facilitate a clear understanding of the essential elements involved in the conduction of AR and DSR initiatives within organizations. As didactical references, the use of these meta-models do not exempted, either the necessary readings concerning the relevant literature in the specific field of application, or the use of complementary case studies to support students’ learning.

However, they have revealed as very useful instruments to facilitate the students’ initial approach to applied research – providing a global overview, stimulating further individual study, and facilitating research proposal’s elaboration. As any model, it is a simplified and limited representation of the reality – providing a main emphasis on process structure, rather than on data structure or events.

These main limitations represent also an opportunity for further research and development – particularly in terms of the design of the underlying data structures, and on the representation of the main events occurring along the process which may trigger the associated action, design and research activities. Grounded on this systemic applied perspective, there still exists a further opportunity to develop specific software tools to support Organizational Action Design Researchers on the progression and documentation of their core activities associated with their initiatives – covering the Proposal, Planning and Design, Implementation and Evaluation, and Publication stages.
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