



Problem Situation Thought from the Perspective of Coordination Theory

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In the philosophy of science, discussions of the relationship between problems and situations began with Dewey [1]. Building on Dewey's theories, the study of this relationship in the philosophy of science has developed along two paths: classical philosophy of science and systems philosophy of science. Theories related to this theme can be collectively referred to as problem-situation thought, and they have shown significant variations, primarily differing in two aspects: the definition of a problem situation and the methods for addressing it.

Leading problem-situation theories proposed by Steve [2] and Checkland [3], have two major issues: "unclear objective criteria for evaluating situations" and a tendency to "discard the pursuit of truth." To address these shortcomings, coordination theory [4,5] can be a possible solution. Coordination theory, proposed by Lei Ma, is a new model for scientific rationality based on Laudan's problem-solving model. It offers a series of new evaluation criteria for theory assessment and represents a novel attempt to combine the perspectives of logicism and historicism in the philosophy of science. Coordination theory introduces a new conception of truth that integrates the strengths of correspondence, coherence, and pragmatic theories of truth while avoiding their weaknesses. It can be used to explain scientists' pursuit of truth in their practical investigations. I believe that coordination theory can not only be used to evaluate problem-situation theories but also enhance them.

Steve [2] attributes the improvement of a problem situation to the realization and protection of value. Checkland's problem-situation theories [6] adopt an overly subjective interpretive stance. Both of their theories lack objectivity. The evaluating criterion of coordination force can address this issue. As the core concept of coordination theory, coordination force refers to the effectiveness

of a theory in solving problems, in other words, the manner or strength of a theory in solving problems. Coordination force only appears during the comparison of theories; it is reflected in a set of quantifiable evaluation systems that unify the evaluation standards of theories and the objectives of theoretical progress [4]. The evaluation systems of coordination force can be used to evaluate problem situation thought and be included in it-as a relatively objective standard for evaluating a problem situation-which helps the evaluation of a problem situation extend beyond the subjective standard of realizing and protecting values.

To understand the evaluation systems of coordination force, we need first to understand the concepts of "problemor" and "solutionor" [5]. Any theory consists of two parts: the part of problems or questions and the part of solutions to those problems or questions. The problem part is further divided into "problemor" and the way questions are posed. A "problemor" is something that makes us curious, eager to understand, and prompts us to ask questions, such as "why" and "what." The solution part consists of "solutionor" or the combination of "solutionors." A "solutionor" is a general term for all single internal and external strategies. Internal strategies provide the internal reasons for judging the relationship between theories and are presented in static forms like definitions, hypotheses, laws, principles, etc. External strategies provide the external reasons for judging the relationship between theories and are presented in dynamic, non-ideological forms like the processes of observation, experimentation, the function of technological objects, confirmation from the scientific community, policy support, etc. There are three types of problemors and solutionors: empirical problemors/solutionors, conceptual problemors/solutionors, and background problemors/solutionors. The attributes of problemors and solutionors are not fixed; when we become curious about

or question a solutionor and start to raise a problem for it, the solutionor becomes a problemor. Past solutionors can also become the background for new problemors.

By calculating the numerical relationship between problemors and solutionors of theories, we can derive two relative states: rise in coordination and decline in coordination. "Rise in coordination" means that a theory under comparison forms advantages that support the theory due to some internal or external reasons; this state is referred to as "coordination." On the other hand, "decline in coordination" means that a theory under comparison forms disadvantages that threaten the theory due to some internal or external reasons; this state is referred to as "conflict." Scientific rationality lies in the coordination of theories, while scientific progress lies in the enhancement of coordination [5].

From the model of "problemor-solutionor," we can see that problems and theories have a mutual influence on each other. Conceptual theories that act as the background of problems cannot be separated from the problems, and theories only gain meaning in comparison with the problems they solve. From our life experience, we know that observing the empirical environment also has an important influence on problems, but theories are also manifested in observation. That's why we can say that problems contain theories. The problemor in coordination theory can be viewed as the demonstration of a difficult situation, while the solutionor is the solution to the situation. Theories can be viewed as a demonstration of the situation; therefore, emphasizing the importance of background knowledge for problems is emphasizing the importance of situations for problems. Every newly proposed theory immediately becomes part of a problem situation-the historical background-and has a profound impact on people's observations. From this perspective, although coordination theory has mainly been used for theory evaluation since its introduction, it can also be used to evaluate the status change of a problem situation between its initial status and the status after addressing it.

It is worth noting that "the conflict and coordination of theories refer to comparative statuses in comparison" [5]. Coordination is more than a clearly defined objective; it is the pursuit of objective as relational realism. The coordination force includes three parts: empirical, conceptual, and background, corresponding to the effectiveness of theories in solving empirical, conceptual, and background problems. Empirical coordination includes aspects such as empirical novelty, empirical unity, empirical mightiness, and empirical succinctness. Conceptual coordination includes aspects such as conceptual novelty, conceptual mightiness, conceptual succinctness and conceptual unity. Background coordination includes aspects such as experimental coordination, technological coordination, and psychological coordination. These three dimensions-empirical, conceptual, and background-cover all aspects of a situation, unlike previous researchers who often focused on only one or two dimensions. Additionally, the coordination force not only involves the achievement of objectives but also the manner and extent of their realization, serving as a relational evaluation standard.

Based on the criteria provided by coordination theory, when engaging in interactions with a situation, such as recognizing and adjusting, if there is a decline in the coordination force of a known description, the situation turns into a problem situation. In such a case, we need to further explore the situation and make a new interpretation with a higher level of coordination. Only through testing the result of this interpretation can we complete the adjustment of real-life situations. By further exploring the improved situation, we can make new interpretations of the problem situation. The method to achieve this is to compare the comprehensive coordination force of the situation before and after the adjustment to evaluate the extent of improvement. The parts that need adjustment in a problem situation vary over time. Coordination force can provide a more reliable basis for comparing problem situations, rather than relying solely on whether the agent's values are realized and maintained.

Another shortcoming of problem situation thought is that it tends to view the description of situations as purely subjective. Its excessive pragmatism and interpretivism tendencies undermine the pursuit of truth. This perspective is inconsistent with the actual history of science and challenges the rationality of practices that aim to improve situations by exploring problem situations. If the description of problem situations is purely subjective, why can subjective statements address objective situations? To solve this issue, the concept of truth of coordination theory can be adopted.

Laudan's theory [7,8] also exhibits pragmatic tendencies; he rejects the classical, non-practical "definition of truth," believing that the problem-solving model is sufficient for evaluating theories. Therefore, Laudan argues that there is no need to set "truth" as a goal. However, to establish connections between scientific theories and the real world, i.e., to defend the rationality of theoretical discoveries, he has to introduce the concept of truth. By reconstructing the conception of truth, coordination theory criticizes the problem-solving model for neglecting the concept of truth. According to coordination theory, truth is the ultimate goal of predetermined scientific progress, but science never aims to fully achieve this goal. It only requires us to gradually approach the goal over time, within dynamic relationships of conflict and coordination. This conception of truth incorporates the strengths of the correspondence theory, coherence theory, and pragmatic theory while avoiding their shortcomings. Coordination theory unifies the three concepts of scientific progress, rationality, and truth as follows: the rationality of theories lies in their coordination; if a theory is coordinated, it is rational; the progress of science lies in the continuous enhancement of the coordination force of theories; the truthfulness of theories lies in the strengthening of their coordination force [5].

Based on coordination theory, the conception of truth in problem situations can be summarized as follows: A thoroughly coordinated situation is the ultimate goal of inquiring into and addressing problem situations, and it represents the ultimate truth pursued by agents, although it is not required to be fully achievable. In each inquiry and handling process, the aim is to achieve a higher degree of coordination in the results compared to the previous

problem situation statement. People's sense of identification within the situation continuously increases, their understanding of the problem situation becomes more comprehensive, and the relational state of the problem situation approaches the ideally coordinated situation, thereby grasping relative truth. The pursuit of a more coordinated problem situation is the pursuit of truth. The progress and rationality of science lie in depicting problem situations with higher coordination, thereby improving actual life.

Throughout the development of problem-situation thought, it can be observed that changes in the model of scientific rationality have played a significant role in driving its evolution. The model of scientific rationality has gone through four stages: logicism, historicism, problem-solving, and coordinationism. Coordination theory represents the coordinationist model of scientific rationality. It offers a more refined solution for integrating logicism, historicism, and problem-solving, enabling us to have a deeper and more comprehensive understanding of problem-situation thought.

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Conflict of Interest

No conflict of interest.

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