Skills of Scientific Investigation: Conceptual Foundations, Methods, and Theoretical Implications for Social Science Research

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A R T I C L E   I N F O

ABSTRACT

Original Research Article

Scientific investigation remains central to the production of reliable and cumulative knowledge in the social sciences. This article examines the meaning, methods, objectives, and skills of scientific investigation, with particular emphasis on their relevance to social science research. Drawing on classical and contemporary methodological literature, the paper conceptualizes scientific inquiry as a systematic process grounded in observation, logical reasoning, and empirical verification. It reviews the scientific method and its contemporary relevance, outlines major types of scientific methods employed in social research, and discusses the objectives and core activities that structure scientific inquiry. The article further explores the interdependent relationship between research and theory, highlighting how empirical research and theoretical frameworks jointly contribute to explanation, prediction, and knowledge advancement. Attention is given to the elements and types of social science theory, as well as the dynamic interaction between facts, theory, and empirical explanation. The paper also examines the role of hypotheses as testable propositions derived from theory and explains how hypothesis testing sustains the self-correcting nature of scientific knowledge. Finally, the purpose of theory in guiding research design, interpretation, evaluation, and evidence-based understanding is discussed. By synthesizing methodological principles and theoretical insights, this article demonstrates that scientific investigation is not a rigid procedure but a dynamic and evolving framework for understanding complex social realities. It concludes that strengthening scientific investigation skills is essential for advancing sociological knowledge, enhancing methodological rigour, and addressing contemporary social challenges through evidence-based inquiry.

Keywords: Scientific Investigation, Scientific Method, Social Science Research, Theory, Hypothesis, Empirical Inquiry, Methodology.

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1. Introduction

The quest to understand, explain, and predict events within the natural and social world is a defining feature of human existence. From early human societies to modern complex civilizations, survival and social progress have depended largely on the ability to observe patterns, interpret experiences, and make informed decisions about the environment and social relations (Giddens, 2008; Kerlinger, 1986). As social beings, humans interact continuously with dynamic and often uncertain environments that demand explanation and strategic action. This persistent need to make sense of reality has historically driven systematic inquiry and, ultimately, the development of scientific knowledge as an organized and reliable mode of understanding the world (Babbie, 2008; Kothari, 2013). In everyday life, individuals routinely rely on intuition, tradition, and common sense to interpret social and natural phenomena. While such approaches may offer immediate or culturally meaningful explanations, they are often limited by bias, subjectivity, and inconsistency. Scientific inquiry emerges as a response to these limitations by providing a disciplined and systematic means of knowing. Rather than relying on assumptions or

anecdotal evidence, science emphasizes careful observation, logical reasoning, and empirical verification as the basis for credible knowledge. According to Babbie (2008), scientific inquiry involves moving beyond surface appearances to uncover underlying patterns and relationships through structured observation and analysis.

In contemporary scholarship, scientific investigation is increasingly understood as a complex and integrative process rather than a rigid set of procedures. Jakob et al. (2021) and Gyllenpalm et al. (2022) emphasize that effective scientific inquiry requires the integration of inquiry skills, substantive knowledge, creativity, and critical thinking. This perspective recognizes that scientific investigation is not merely mechanical data collection, but an intellectually demanding process that involves problem formulation, theoretical sensitivity, analytical judgment, and reflective interpretation. Such skills are particularly crucial in the social sciences, where phenomena are often abstract, context-dependent, and shaped by human agency. Cipková and Karolčík (2018) conceptualized scientific inquiry as a structured process encompassing question formulation, explanation building, engagement with multiple sources of evidence, scientific reasoning, and the communication and defense of conclusions.

Recent methodological debates further extend the understanding of scientific investigation by emphasizing transparency, replicability, and methodological openness as core components of credible research practice. Scholars argue that the legitimacy of scientific knowledge increasingly depends on clear documentation of methods, openness in data and analysis, and the possibility of independent verification (Freese et al., 2022; Zogmaister et al., 2024). These concerns are particularly salient in the social sciences, where subjective interpretation, contextual variability, and methodological diversity make transparency essential for trust and cumulative knowledge building. Against this background, this article examines the meaning, methods, and skills of scientific investigation and their relevance for social science research.

2. Statement of Problem

Although the scientific method and core inquiry skills are widely discussed in classical methodology texts, the social science literature remains fragmented in how it defines and operationalizes "scientific investigation skills." Many accounts emphasize procedural steps (e.g., observation, measurement, analysis), while others focus on the logic linking theory, facts, and hypotheses. More recent debates introduce transparency and reproducibility as credibility standards. However, these strands are often treated separately, leaving limited guidance on how they integrate into a coherent skills framework for social science research design, evaluation, and training. Hence, the need for this paper which examines the meaning, methods, and skills of

scientific investigation and their relevance for social science research.

3. Research Questions

This article addresses the following research questions: (1) What constitutes scientific investigation in social science beyond everyday reasoning? (2) What core activities and skills structure scientific inquiry in social research? (3) How do research, theory, facts, and hypotheses interact to support explanation and prediction? (4) What contemporary credibility requirements (e.g., transparency and reproducibility) should be treated as part of scientific investigation skills in modern social science?

4. Objectives of the Study

The specific objectives of this article are to:
   i.   Examine the concept and meaning of scientific investigation within the context of social science research.
   ii. Discuss the core activities and skills structure of scientific inquiry in social research
   iii. Highlight the interaction between research, theory, facts, and hypotheses in supporting explanation and prediction.
   iv. Analyze the contemporary credibility of scientific investigation skills in modern social science.

5. Methodology

This paper adopts a conceptual review and narrative synthesis design. It does not report primary fieldwork or original survey data. Instead, it synthesizes classical and contemporary methodological literature on scientific investigation in the social sciences, with particular attention to the scientific method, types of methods used in social research, and the theory–evidence–hypothesis relationship. Sources were selected from foundational methodology texts and peer-reviewed journal literature relevant to scientific inquiry, research design, measurement, theory construction, and contemporary standards of transparency and reproducibility. Materials were included where they (a) defined or conceptualized scientific investigation, (b) outlined core inquiry activities and skills, (c) addressed theory testing and hypothesis logic, or (d) discussed openness, documentation, and reproducibility as credibility conditions. The synthesis proceeded in three analytic steps: (1) extraction of core concepts and definitions; (2) thematic organization of inquiry activities, methods, and theoretical implications; and (3) integrative interpretation to clarify how these elements jointly support explanation, prediction, and cumulative knowledge in social science. This transparent synthesis approach is intended to strengthen the replicability of the article's reasoning and improve scholarly scrutiny of its claims.

6. Conceptual Review

6.1 Scientific Investigation

Scientific investigation refers to a disciplined process of generating knowledge through systematic observation, logical reasoning, and empirical verification. In the social sciences, this process is especially vital because social reality is complex, fluid, and deeply shaped by human agency, cultural meanings, institutional arrangements, and power relations. Unlike everyday knowledge often derived from tradition, intuition, or anecdotal experience, scientific investigation is deliberately structured to minimize bias, enhance accuracy, and allow independent scrutiny of knowledge claims (Babbie, 2008; Kothari, 2013; Bhattacherjee, 2012). Beyond its procedural definition, scientific investigation represents a distinct logic of inquiry that separates scientific reasoning from common-sense understanding. While common sense relies heavily on personal experience and culturally inherited beliefs, scientific inquiry demands explicit articulation of assumptions, systematic linkage between evidence and explanation, and openness to revision when empirical findings contradict prior expectations (Kerlinger, 1986; Popper, 1959). In this sense, scientific investigation is not merely a method of data collection but a normative framework for disciplined reasoning and justified belief.

6.2 Scientific Method

A method, in its broadest sense, refers to an organized and purposive procedure adopted to achieve a defined objective. Within scientific inquiry, however, "method" assumes a more specialized meaning: it denotes the principles, rules, and procedures that guide researchers from an initial state of uncertainty or problem recognition to a defensible explanation grounded in evidence. Kothari (2013) conceptualizes the scientific method as a toolkit of systematic procedures for conducting research, emphasizing its role in structuring the acquisition of reliable knowledge. Bielik (2019) similarly describes it as a disciplined pathway that transforms uncertainty into reasoned conclusions through a sequence of interconnected cognitive and empirical operations.

6.3. Objectives of Scientific Investigation

One central objective of scientific investigation is the cultivation of a scientific attitude. This attitude is characterized by objectivity, critical scepticism, intellectual humility, and a willingness to revise conclusions when evidence contradicts prior assumptions (Kerlinger, 1986; Popper, 1959). In the social sciences, where research topics often intersect with values, beliefs, and political sensitivities, the scientific attitude serves as a safeguard against dogmatism and selective interpretation. It encourages researchers to subject their own assumptions to scrutiny and to privilege evidence over personal conviction.

A second major objective of scientific investigation is systematic problem recognition and clarification. Social issues such as inequality, crime, family change, health behaviour, or governance typically emerge as broad societal concerns. Scientific inquiry begins when these concerns are translated into precise, researchable problems framed in conceptual and empirical terms. Methodological scholars increasingly emphasize that problem formulation is not a preliminary formality but a technical and analytical skill that shapes research design, measurement choices, and the credibility of findings (Creswell & Creswell, 2022; Bhattacherjee, 2012). Poorly specified problems often lead to weak designs and ambiguous conclusions, regardless of analytical sophistication.

Scientific investigation also aims to develop research competence, understood as the capacity to conduct inquiry in a systematic, coherent, and ethically responsible manner. This includes the ability to conceptualize variables, operationalize abstract concepts, select appropriate research designs, gather data using sound procedures, analyze evidence rigorously, and interpret findings within relevant theoretical frameworks (Kothari, 2013; Babbie, 2020). In social science research, competence further involves navigating contextual complexity, competing explanations, and confounding variables that may subtly influence observed outcomes.

Another important objective of scientific investigation is explanation and prediction. Explanation involves identifying underlying mechanisms and relationships that account for observed social patterns, while prediction involves anticipating likely outcomes under specified conditions. Although prediction in the social sciences is often probabilistic rather than deterministic, the ability to generate informed expectations remains central to scientific understanding and policy-relevant research (Kerlinger, 1986; Giddens, 2008).

Closely linked to explanation and prediction is the objective of theory development and refinement. Scientific investigation contributes to theory by generating evidence that supports, modifies, or challenges existing explanations. Through this process, theories evolve rather than remain static, reflecting the self-correcting character of science (Merton, 1968; van der Waldt, 2021). In this sense, empirical research and theoretical development are mutually reinforcing rather than sequential or hierarchical.

Beyond these objectives, scientific investigation also serves a practical and evaluative function. In applied social research, scientific inquiry provides the basis for evaluating policies, programs, and interventions. By clarifying assumptions about causal mechanisms and contextual conditions, scientific investigation enables researchers to assess not only whether interventions work, but why they succeed or fail (Rengasamy, 2016). This evaluative capacity underscores the social relevance of scientific investigation beyond academic discourse.

6.4. Core Activities of Scientific Method

The first core activity is systematic observation, which provides the empirical foundation of scientific inquiry. Observation involves deliberate and purposeful attention to social phenomena, patterns, regularities, or anomalies that provoke intellectual curiosity and demand explanation. In social science research, observation extends beyond direct sensory perception to include structured access to evidence through surveys, interviews, archival documents, administrative records, and digital data sources (Babbie, 2008; Bhattacherjee, 2012). Whether qualitative or quantitative, all scientific data ultimately originate from some form of observation, making it the indispensable starting point of inquiry.

Next to observation is problem definition and question formulation. This activity translates general social concerns into focused, researchable questions that specify what is to be studied, among whom, under what conditions, and for what purpose. Clear problem formulation is critical because it determines the scope of inquiry, guides methodological choices, and shapes interpretation of results. Methodological scholars emphasize that well-constructed research questions enhance analytical precision and prevent conceptual ambiguity, whereas poorly framed questions often lead to unfocused analysis and weak conclusions (Creswell, 2013; Kothari, 2013).

The third core activity is conceptualization and operationalization which involves defining key ideas or constructs in precise theoretical terms, while operationalization translates these abstract concepts into observable and measurable indicators. This step is particularly important in the social sciences, where many core concepts such as power, social capital, stigma, or inequality are abstract, multidimensional, and context-specific. Careful operationalization enhances validity and reliability by ensuring that indicators accurately capture the intended concepts and can be consistently measured across cases or studies (Kerlinger, 1986; Babbie, 2020).

Closely linked to conceptualization is theory engagement, which constitutes another core activity of scientific investigation. Theory provides the interpretive lens through which observations are understood and research questions are framed. It informs what counts as relevant evidence, suggests relationships among variables, and offers explanations for observed patterns. Rather than being an optional or post-hoc addition, theory actively shapes research design, data collection, and interpretation throughout the inquiry process (van der Waldt, 2021).

Another central activity is research design and data collection. It involves selecting appropriate strategies such as surveys, experiments, ethnography, case studies, historical analysis, or mixed methods that align with the research question and theoretical orientation. Data collection, in turn, entails the systematic gathering of evidence using ethically sound and methodologically appropriate procedures. Decisions made at this stage directly affect data quality, validity, and the generalizability of findings. Ethical considerations, including informed consent, confidentiality, and respect for participants, are integral to this activity and contribute to the legitimacy of scientific inquiry (Creswell & Creswell, 2022; Babbie & Mouton, 2015).

Once data are collected, scientific investigation proceeds to analysis and interpretation. This involves applying appropriate analytical techniques (statistical, thematic, comparative, or historical) to identify patterns, relationships, or meanings within the data. Interpretation goes beyond technical analysis to situate findings within theoretical frameworks, empirical literature, and broader social contexts. This stage requires both methodological competence and theoretical sensitivity, as researchers must balance empirical evidence with conceptual explanation while avoiding overgeneralization or unwarranted inference (Giddens, 2008; Bhattacherjee, 2012).

The final core activity is communication and scholarly scrutiny. Scientific investigation culminates in the presentation of findings through publications, conferences, or other academic platforms. This stage is not merely about dissemination but about subjecting research to peer review, critique, and possible replication. Transparent reporting of methods, data sources, and analytical decisions allows other scholars to evaluate the credibility of findings, build upon existing work, or challenge conclusions with new evidence. Contemporary methodological debates emphasize that cumulative science depends heavily on this communicative dimension of inquiry (Freese et al., 2022; Zogmaister et al., 2024).

7. Literature Review

7.1 Types of Scientific Methods in Social Science Research

Social science research relies on a plurality of scientific methods because social phenomena differ widely in complexity, meaning, scale, and measurability. Unlike the natural sciences, where controlled experimentation is often feasible, social inquiry must contend with human agency, ethical constraints, and historical contingency, and contextual variation. As a result, no single method is sufficient for addressing all research problems in the social sciences. Methodological appropriateness is therefore determined by the nature of the research question, the level of analysis (individual, group, institutional, or societal), and the type of explanation sought whether descriptive, relational, causal, interpretive, or historical (Babbie, 2008; Kothari, 2013; Creswell & Creswell, 2022). Contemporary methodological scholarship increasingly emphasizes the principle of fitness for purpose, which holds that methods should be selected based on their capacity to generate credible answers to

specific research questions rather than adherence to a single methodological orthodoxy. This pluralistic orientation reflects recognition that social reality is multi-dimensional and that robust explanation often requires different kinds of evidence and analytical strategies (Bhattacherjee, 2012; Yin, 2018).

(a) Empirical Method

The empirical method is foundational to scientific investigation in the social sciences. It involves the systematic collection and analysis of data derived from observation and experience, with the aim of grounding explanations in evidence rather than speculation. Empirical research may employ quantitative, qualitative, or mixed-methods approaches, depending on the nature of the phenomenon under investigation and the type of insight required (Babbie & Mouton, 2015; Creswell, 2013). The strength of the empirical method lies in its commitment to observable indicators whether numerical patterns captured through surveys and experiments or rich contextual data obtained through interviews, focus groups, and ethnographic observation. By relying on systematically gathered evidence, empirical methods enable researchers to identify regularities, test relationships, and assess the plausibility of theoretical claims. However, empirical research also faces challenges, particularly regarding measurement validity, data quality, and contextual interpretation, underscoring the need for careful design and analytical rigor (Kerlinger, 1986).

(b) Experimental and Quasi-Experimental Methods

Experimental methods are primarily concerned with establishing causal relationships between variables. They involve the deliberate manipulation of one or more independent variables under controlled conditions to observe their effects on dependent variables. Core features include random assignment, control groups, and standardized measurement, all of which strengthen internal validity and causal inference (Campbell & Stanley, 1963; Kerlinger, 1986). In the social sciences, true laboratory experiments are often constrained by ethical, practical, and contextual considerations. Consequently, researchers increasingly employ field experiments, natural experiments, and quasi-experimental designs, particularly in policy evaluation, education, economics, and public health research. While these approaches enhance causal inference relative to purely observational studies, they may face limitations related to external validity and contextual complexity (Shadish, et al., 2002). Nonetheless, experimental and quasi-experimental methods remain vital tools for testing causal mechanisms in real-world settings.

(c) Hypothetico-Deductive Method

The hypothetico-deductive method represents a central logic of scientific explanation and theory testing. It begins with general theoretical propositions from which specific, testable hypotheses are logically derived. These hypotheses are then subjected to empirical testing, and the results are used to confirm, modify, or reject the underlying theory (Popper, 1959; Kerlinger, 1986). This method plays a crucial role in cumulative knowledge building by linking abstract theoretical reasoning to observable evidence. When hypotheses consistently receive empirical support, confidence in the associated theory is strengthened, albeit provisionally. Conversely, when evidence contradicts hypotheses, theoretical assumptions are re-examined, leading to refinement or replacement of explanations. The hypothetico-deductive approach thus exemplifies the self-correcting nature of scientific inquiry (Bhattacherjee, 2012).

(d) Observational Method

Observation constitutes one of the oldest and most fundamental methods of scientific inquiry. In social science research, observational methods involve the systematic recording of behavior, interactions, and social processes as they occur in natural or structured settings. Observation may be participant or non-participant, structured or unstructured, depending on the research objectives and theoretical orientation (Babbie, 2008). Observational methods are particularly valuable for studying social practices and interactions that may be difficult to capture through self-report instruments, such as surveys or interviews. They enable researchers to access contextual nuances, non-verbal cues, and routine behaviors that are often central to understanding social life. However, observational research also requires careful attention to reflexivity, observer bias, and ethical considerations, especially when studying vulnerable populations or sensitive settings (Creswell, 2013).

(e) Measurement Method

Measurement refers to the systematic assignment of values or categories to attributes of social phenomena through operationalization. Because many social concepts such as attitudes, norms, power, or social status are abstract and multidimensional, measurement is a critical methodological challenge in social science research (Kerlinger, 1986). Effective measurement enhances validity, reliability, and comparability across studies by ensuring that indicators accurately represent the underlying constructs. Methodological rigor in measurement involves careful scale construction, testing for reliability and validity, and transparent reporting of measurement procedures (Kothari, 2013; DeVellis & Thorpe, 2022). Weak measurement practices can undermine even the most sophisticated analytical techniques, highlighting the centrality of this method to scientific credibility.

(f) Historical Method

The historical method involves the systematic examination of past events, processes, and social structures using archival documents, records, oral histories, and material evidence. It is indispensable for understanding social change over time and for situating contemporary phenomena within broader historical trajectories (Giddens, 2008; Tosh, 2015). By

tracing continuity and change, the historical method enables researchers to identify long-term patterns, institutional legacies, and critical turning points that shape present social conditions. Although historical research may face limitations related to data availability and interpretation, it provides depth and contextual richness that are often inaccessible through cross-sectional designs.

(g) Phenomenological and Interpretive Methods

Phenomenological and interpretive methods focus on understanding social reality from the perspectives of social actors themselves. Rather than prioritizing external measurement alone, these approaches emphasize meaning, consciousness, and lived experience. Their central aim is to uncover how individuals interpret their social worlds and construct meaning through interaction (Schutz, 1967; Creswell, 2013). These methods are particularly suited to research on identity, culture, religion, stigma, and everyday social practices. While interpretive approaches may not seek generalization in the statistical sense, they provide deep contextual insight and theoretical richness, contributing significantly to explanation and theory development in the social sciences.

(h) Dialectical and Critical Methods

Dialectical and critical methods analyze social phenomena through the lens of contradiction, conflict, and power relations. Rooted in critical theory and political economy, these approaches view social change as the outcome of tensions between competing interests and structural inequalities (Marx, 1976; Levy, 2018). Such methods are widely employed in studies of class, gender, race, and global inequality, where structural domination and resistance are central explanatory themes. By foregrounding power and ideology, dialectical approaches challenge taken-for-granted assumptions and broaden the scope of social critique within scientific inquiry.

(i) Inductive Logical Method

Inductive methods involve drawing general conclusions from specific observations, allowing concepts, patterns, and explanations to emerge from the data. This approach is especially common in exploratory research and qualitative studies, where existing theory may be limited or inadequate (Babbie, 2008). Although inductive conclusions are probabilistic rather than certain, they play a vital role in theory generation and conceptual innovation. Inductive reasoning complements deductive approaches by expanding the theoretical repertoire of the social sciences and opening new avenues for empirical investigation. Importantly, contemporary social science research increasingly integrates multiple methods through triangulation and mixed-methods designs. By combining quantitative and qualitative approaches, researchers can offset the limitations of individual methods and enhance the robustness of findings (Creswell & Plano Clark, 2019). This methodological

integration reflects the practical reality that complex social problems often require diverse forms of evidence and multi-layered analytical strategies.

7.2 Research and Theory in Social Science

Research and theory occupy a central and interdependent position in social science inquiry. Together, they form the intellectual backbone through which social reality is systematically examined, interpreted, and explained. Research provides empirically grounded evidence derived from observation and analysis, while theory offers conceptual frameworks that organize, interpret, and give meaning to empirical findings. Without theory, research risks degenerating into a disconnected inventory of facts; without research, theory remains speculative and insulated from empirical correction (Babbie, 2008; Kerlinger, 1986; van der Waldt, 2021).

Research is generally understood as a systematic and disciplined process aimed at discovering new knowledge or verifying existing knowledge through the application of scientific procedures. Kothari (2013) defines research as an organized inquiry designed to uncover facts or validate theoretical propositions, emphasizing methodological rigor and logical coherence. Similarly, Bhattacherjee (2012) describes research as a structured process of inquiry that seeks to explain phenomena by linking theoretical assumptions with empirical evidence. These definitions underscore the idea that research is not a casual activity but a deliberate and methodologically guided enterprise.

Within the social sciences, research performs several critical functions. These include description, which documents social conditions and patterns; explanation, which identifies underlying causes and mechanisms; prediction, which anticipates likely outcomes under specified conditions; and evaluation, which assesses the effectiveness of policies, programs, or interventions (Kerlinger, 1986; Creswell & Creswell, 2022). These functions are most effectively realized when research is anchored in sound theoretical frameworks that guide inquiry and interpretation.

Theory, on the other hand, represents a structured system of interrelated concepts, definitions, and propositions developed to explain aspects of social reality. Owoyemi (2013) defines theory as an organized body of ideas that systematically relates concepts to one another in order to explain observed phenomena. Giddens (2008) similarly emphasizes that theory enables researchers to move beyond surface description by identifying patterned relationships, social mechanisms, and structural influences that shape human behavior. In this sense, theory serves as both an explanatory tool and an interpretive lens.

A critical role of theory in social science research is its capacity to guide the research process. Theory influences the formulation of research problems, the selection of variables, the construction of hypotheses, and the choice of appropriate

methods. It also provides the criteria by which findings are interpreted and assessed. When theory is clearly articulated and consistently applied, it enhances the coherence, credibility, and analytical depth of research outputs (van der Waldt, 2021).

Methodological literature commonly distinguishes between theory-generating (theory-building) research and theory-testing research. Theory-generating research is often exploratory and inductive, aiming to develop new concepts or explanations based on observed patterns in data. This form of research is particularly valuable in areas where existing theories are inadequate or underdeveloped (Merton, 1968; Babbie, 2008). In contrast, theory-testing research is deductive in orientation, seeking to assess the validity of existing theories by deriving hypotheses and subjecting them to empirical testing. Both forms of research are essential for cumulative knowledge development and should be viewed as complementary rather than competing approaches.

The relationship between research and theory is therefore iterative and cyclical rather than linear. Theories generate research questions and hypotheses, empirical research tests and refines theoretical propositions, and revised theories, in turn, generate new questions for further investigation. This continuous feedback loop is fundamental to the advancement of social science knowledge and reflects the self-correcting character of scientific inquiry (Kerlinger, 1986; Popper, 1959).

Contemporary methodological debates caution against treating theory as a ceremonial or isolated component of research. van der Waldt (2021) argues that theory should not be confined to a standalone chapter but should actively inform all stages of the research process, from problem formulation to interpretation and contribution to knowledge. Related scholarship further emphasizes that theoretical frameworks shape not only analytical outcomes but also the credibility and explanatory power of research findings (van der Waldt, 2024). When theory is weakly integrated, research risks becoming a theoretical and analytically shallow.

In applied and policy-oriented research, the integration of theory and research is equally important. Theoretical frameworks clarify assumptions about how interventions are expected to work and under what conditions outcomes may vary. This allows researchers to move beyond simple success failure judgments and toward deeper explanations of why particular programs or policies produce specific effects (Rengasamy, 2016). Thus, theory enhances both the analytical and practical relevance of social science research.

7.3 Facts, Theory, and Hypotheses

Facts, theory, and hypotheses constitute three distinct but interdependent components of scientific reasoning. In social science research, they function as an integrated system through which empirical reality is observed, interpreted, and explained. Facts provide the empirical reference points of

inquiry, theory supplies explanatory and interpretive frameworks, and hypotheses serve as the testable link that connects theoretical reasoning to empirical verification. The strength of scientific investigation lies not in any single component, but in the dynamic interaction among all three (Babbie, 2008; Kerlinger, 1986).

Facts refer to aspects of reality that are observable, measurable, and verifiable through systematic investigation. In the social sciences, however, facts are rarely simple or self-evident. Unlike physical facts in the natural sciences, social facts are often abstract, relational, and embedded within social structures, institutions, and cultural meanings. Durkheim's classic conception of social facts emphasizes that they are external to individuals and exert constraint over behavior, yet they cannot be apprehended through direct sensory observation alone (Durkheim, 1961, cited in Giddens, 2008). Phenomena such as norms, values, social roles, and institutional practices must therefore be accessed indirectly through indicators, records, narratives, and patterned behavior.

Because social facts are constructed through measurement, interpretation, and institutional definition, they require careful methodological handling. Statistical indicators such as poverty rates, crime figures, or educational attainment are not merely neutral reflections of reality; they are shaped by conceptual definitions, measurement choices, and data-collection procedures. As Kothari (2013) and Bhattacherjee (2012) note, methodological rigor is essential to ensure that social facts are reliable, valid, and comparable across contexts. Without such rigour, empirical claims risk reflecting artefacts of measurement rather than substantive social conditions.

Theory plays a central role in organizing and interpreting facts. It provides the conceptual structure that gives meaning to empirical observations by identifying relationships, mechanisms, and patterns within data. Rather than being opposed to facts, theory determines which facts are considered relevant, how they are interpreted, and what explanatory significance they carry (Owoyemi, 2013). Through theory, isolated observations are transformed into coherent explanations of social processes.

At the same time, theory in scientific inquiry is inherently provisional. Scientific theories are not immutable truths but explanatory frameworks that remain open to evaluation, refinement, and replacement in light of new evidence. When empirical findings consistently support theoretical expectations, confidence in the theory is strengthened, though never conclusively confirmed. Conversely, when empirical evidence contradicts theoretical claims, theories are re-examined, modified, or abandoned in favor of more explanatory alternatives (Kerlinger, 1986; Popper, 1959). This openness to correction is a defining feature of scientific knowledge and distinguishes it from dogmatic belief systems.

Hypotheses function as the critical bridge between theory and empirical research. A hypothesis is a tentative, testable statement derived from theory or prior empirical findings that specifies an expected relationship between variables. By translating abstract theoretical propositions into concrete expectations, hypotheses make scientific explanation empirically assessable (Kerlinger, 1986; Kothari, 2013). In this sense, hypotheses operationalize theory for systematic testing.

Hypotheses serve several important functions in scientific investigation. First, they sharpen the focus of research by clarifying what relationships are being examined. Second, they guide measurement and data-collection decisions by specifying which variables are relevant and how they should be operationalized. Third, they inform analytical strategies by indicating what outcomes would support or contradict theoretical claims. These functions enhance logical coherence and analytical discipline in research design and interpretation (Bhattacherjee, 2012).

In social science research, hypotheses are commonly distinguished between research (alternative) hypotheses and null hypotheses, particularly in quantitative analysis. Research hypotheses state the expected relationship or difference between variables, while null hypotheses assert the absence of such relationships and provide the basis for statistical testing. Although qualitative research may not always employ formal hypotheses, it often relies on sensitizing concepts, propositions, or expectations that perform analogous guiding functions (Babbie, 2008).

The interaction between facts, theory, and hypotheses underpins the self-correcting nature of scientific inquiry. When hypotheses are tested transparently and results are reported clearly, empirical findings feed back into theory development. Supported hypotheses strengthen theoretical explanations, while unsupported hypotheses prompt critical reassessment of assumptions and conceptual frameworks. This iterative process ensures that scientific knowledge evolves in response to evidence rather than remaining static or insulated from critique (Kerlinger, 1986; van der Waldt, 2021).

Contemporary methodological debates further emphasize that the credibility of this system depends heavily on transparency in how facts are established and how hypotheses are tested. Freese et al. (2022) argue that scientific progress relies not only on producing findings but on documenting methods and reasoning clearly enough to permit evaluation, replication, or reanalysis. Meta-research has shown that inconsistent reporting and limited reproducibility practices can undermine confidence in published results, even when findings appear theoretically plausible (Hardwicke et al., 2020). As such, careful documentation of measurement choices, analytical decisions, and hypothesis-testing procedures has become an integral component of robust scientific investigation.

8. Discussion and Implications

The review underscores that scientific investigation in social science is best understood as an integrated competence system rather than a linear checklist of steps. Classical methodological accounts emphasize systematic observation, conceptual clarity, measurement quality, and logical inference (Babbie, 2008; Kerlinger, 1986; Kothari, 2013). Contemporary debates extend these expectations by emphasizing transparent reporting, openness in data and analysis where feasible, and methodological documentation sufficient for independent scrutiny (Freese et al., 2022; Hardwicke et al., 2020; Zogmaister et al., 2024). Treated together, these perspectives imply that the 'skills' of scientific investigation include both technical procedures and credibility-oriented practices.

For research design and training, the implication is that competence should be assessed across four linked domains: (1) problem formulation and conceptualization; (2) methodological fit-for-purpose (design selection and ethical data collection); (3) analytic judgment (valid inference, interpretation within theory, and recognition of limits); and (4) transparency practices (clear documentation of measures, assumptions, analytical decisions, and evidence pathways). This integrated view helps reduce the tendency for studies to be method-heavy but theoretically thin, or theory-heavy but empirically under-specified.

The pluralism of methods reviewed (experimental, observational, interpretive, historical, and critical approaches) is a strength of social science because research questions differ in causal structure, measurability, and ethical feasibility (Creswell & Creswell, 2022; Yin, 2018). However, methodological pluralism increases the need for explicit justification of design choices and careful alignment between research questions, evidence, and the level of inference claimed. This is particularly important in policy-relevant research, where overgeneralization from limited evidence can mislead decision-makers.

Finally, the theory–facts–hypotheses relationship remains the principal engine of cumulative knowledge. Hypotheses translate theory into testable expectations and provide a disciplined pathway for confirming, refining, or rejecting explanations (Popper, 1959; Kerlinger, 1986). Where formal hypotheses are not employed (as in many qualitative designs), equivalent rigor is maintained through explicit propositions, systematic evidence trails, and transparent interpretation. In all cases, scientific investigation remains self-correcting when evidence is reported clearly enough to allow critique, replication, or reanalysis.

9. Conclusion

Scientific investigation remains central to credible social science because it provides a systematic, evidence-based, and transparent framework for understanding complex social

phenomena shaped by human agency, culture, institutions, and power relations. This article, as a conceptual review, synthesizes methodological principles on inquiry, methods, and the theory–facts–hypotheses relationship, highlighting how empirical research and theoretical frameworks jointly support explanation, prediction, and cumulative knowledge advancement. It further shows that contemporary expectations for transparency and reproducibility strengthen scientific credibility by making research design, measurement, analysis, and reasoning open to scrutiny. Strengthening scientific investigation skills therefore requires not only procedural competence, but also conceptual clarity, analytical judgment, and clear documentation that supports evaluation and learning across studies.

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