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Flexible pattern matching approach: Suggestions for augmenting theory evolvement

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Abstract

Qualitative research can provide rich insights that help understand firms' actual and future changes, social contexts, and technology development. In this way, qualitative methods substantially promote theory development. Nevertheless, the interaction between observational and theoretical realms often remains fuzzy. Recently, the flexible pattern matching approach was developed, allowing for continuous iteration between extant theories with empirical evidence from qualitative data while maintaining space for theory development. The current paper presents the logic of the flexible pattern matching approach and its strength in unraveling social and technological changes. We advance the flexible pattern matching approach by providing avenues for a longitudinal design and a seven-step roadmap integrating procedures from the Gioia method. We also present the underlying scientific development process.

Keywords: Flexible pattern matching; Bridging theories and data; Qualitative methods; Longitudinal; Qualitative rigor

1. Motivation: Why a new qualitative approach is needed

Today, a substantial increase in qualitative research has demonstrated its legitimacy and usefulness for management studies. Qualitative studies provide insights that uncover latent mechanisms and allow informed predictions about future behavior (Cassell et al., 2006; Glaser and Strauss, 1968; Strauss and Corbin, 1998). For example, ethnographic and ethnomethodological approaches have long been used in organization and management research to get "inside the minds" of those studied (Bittner, 1965; Fetterman, 1989). Yin (1994a, 1994b) introduced the case study as a research strategy, and Eisenhardt (1989) further elaborated on the theory building from cases. Gioia (2004) provides an approach that helps detect latent constructs and find relationships among them by a three-order hierarchical data structure. Qualitative methods especially hold great promises for disentangling latent drivers in society and technology areas (Learner and Phillips, 1993; Reay and Jones, 2016; Reuschl et al., 2021). An analysis of the last volume of TFSC, which consists of 65 articles, shows that 38,5% (25) use qualitative methods, 53,8% (35) quantitative, and 7,7% (5) others. In addition, 7 of the analyzed articles were (exploratory) case studies. See also Table 1 that lists exemplary qualitative research published in Technological Forecasting & Social Change in recent years. Still, researchers call for acknowledging and

utilizing the interdependence of theory and reality to bridge theoretical progress and management science and also re-examine the established conceptual categories by utilizing theory-laden observation, facts, and data (Huarng and Ribeiro-Soriano, 2014; Learner and Phillips, 1993; van de Ven, 2007). For technological and social development and change processes, addressing this challenge underpins the possibility of forecasting and investigating future trajectories, since the intensive interplay between theories and evidence contributes to problem formulation, the test of existing theories, and the development of new theories and concepts. Hence, a key challenge of adopting qualitative methods in management studies lies in connecting theory and reality and explicating their interaction patterns to generate compelling insights (Langley and Abdallah, 2011; Ribeiro-Soriano et al., 2018; van de Ven, 2007). The flexible pattern matching approach (FPMA) provides a solution that evolved to facilitate theory development while ensuring an intimate connection between extant theories and empirical evidence in qualitative studies (Bouncken and Barwinski, 2021; Sinkovics et al., 2019). The flexible pattern matching approach draws attention to the interplay between theoretical and empirical realms. It is claimed that theory can be developed through the (in)consistency and breakdown from the comparison between sets of theoretical and empirical patterns (Bouncken and Barwinski, 2021; Bouncken et al., 2021; Sinkovics, 2018). The number of qualitative studies adopting the approach has witnessed significant growth (Bouncken and Barwinski, 2021; Gatignon and Capron, 2020; Matthews et al., 2018; Sinkovics et al., 2019; Sinkovics et al., 2014), along with some scholars suggesting the applicability and advantage of it (Brooks and King, 2012; Burchell and Kolb, 2003; King et al., 2018; Sinkovics, 2018; Trochim, 1989). However, there is a lack of clarity about the underlying mechanism, fitting context, strengths of this approach, and the process of building theory with this approach. This paper attempts to contribute to the literature from two directions. First, we advance the understanding of FPMA for studying and theorizing the changes in prevalent social and technological areas by presenting and arguing its logic, advantages, prior studies, and complement with longitudinal study design. These arguments synthesize previous works on qualitative methods, the groundwork of the FPMA, and prior studies adopting this method. Second, we outline a roadmap for building theories with the approach. We elaborate insights on seven critical steps for unraveling latent concepts with FPMA by integrating the Gioia method and the scientific development process (see Fig. 1 and the underlying scientific development process in Fig. 2).

2. Flexible pattern matching approach

2.1. Fundamentals

Pattern matching involves a process that relies on “the comparison of a predicted theoretical pattern with an observed empirical routine” (Sinkovics, 2018). Flexible pattern matching pursues an iteration between theories and data. The iteration differs flexible pattern matching from full pattern matching, which rigorously matches data with theoretical patterns, and partial flexible pattern matching, which draws on investigators’ mental models (Alvesson and Kärreman, 2007; Sinkovics, 2018). The attention on the interplay and matching between theoretical and empirical patterns in the flexible pattern matching process detects (in)consistencies and breakdowns, so helps problematize and develop theoretical ideas (Alvesson and Kärreman, 2007; Shane, 2000). Also, the

matches and consistencies between theoretical and empirical patterns can help testing or expanding the contextual boundaries of existing theories (Ross and Staw, 1993). Patterns in the flexible pattern matching approach compose two crucial components: theoretical patterns and observed practical patterns. A pattern indicates the arrangement of objects or entities that are non-random and describable (Trochim, 1989). Even though all the theories imply some patterns, theories indicate structural relationships that enable the generation and deduction of predicted theoretical patterns. Similarly, observed patterns are distinct from collected data. They are inducted from the “constellation” of observations or social logics whose independence and ordering compose items that can be identified as a pattern (Jancsary et al., 2017). For example, in Nastjuk et al. (2020) study on the acceptance of autonomous driving, initial theoretical patterns, as acceptance categories in the study, were derived

from prior research on technology acceptance model and acceptance of autonomous driving. The observed patterns were then inducted from 20 interviews by coding statements, assigning them to the pre-defined categories, or revising the categories with unmatched codes and statements. This theory-reality iteration provides the reasoning and analyzing process with imagination and discipline (Alvesson and Kärreman, 2007; Sinkovics et al., 2019). As Nastjuk et al. (2020: 5) stated, "the analysis relied on a solid theoretical ground which does not allow much space for subjective interpretations.". Flexible pattern matching serves as not only a data-analysis technique but also a logic. This logic builds on the assumption that we understand the social world through iterating between prior theories and empirical observations (Burchell and Kolb, 2003; Reay and Jones, 2016; Sinkovics, 2018). This reasoning line is consonant with the nature of qualitative studies that human observers observe and think with the subconscious mind composed of experiences, insights, and musing of ours and others (Learner and Phillips, 1993; van de Ven, 2007). In this way, the theory development derives from comparing and contrasting prior knowledge with empirical observations. Furthermore, the FMPA acknowledges, utilizes, and reviews researchers' viewpoints or

Table 1
Qualitative studies in Technological Forecasting & Social Change.

Authors	Research Question	Data source	Output	Approach
Defil'Ezu et al. (2020)	What are the mechanisms that enable capturing value through adopting an open innovation approach remain largely?	Three cases; Interviews; Web speeches; Books; Websites.	Four internal assets enable value capture in radical circles	Case study
Santoro et al. (2020)	How individual in micro-foundations of open innovation draw upon their networks to support them in this role?	Eight cases; Eight interviews; Reports; Social media; Press releases.	The interplay among entrepreneur, employees, and firm level factors for SMEs openness	Case study
Hammerschmidt et al. (2021)	How and by what means international PFCs are responding to the COVID-19 crisis?	Ten cases; Interviews with CEOs of professional football clubs.	Entrepreneurial behavior and crisis management of elite sport organizations for survival in crisis	Case study
Dong (2019)	How digital startups may take "disruptive" entrepreneurial actions with digital platforms to overcome the regulatory inhibitors and barriers of business?	Interviews; Participant; Observation; Survey; Archival data.	Three mechanisms leading to the success of digital startups in regulatory environment	Longitudinal single case study
Kaur et al. (2019)	How cognitive computing technology can facilitate ambidextrous orientation in organizations with global strategic partnerships?	20 interviews with executives.	Cognitive computing as a potential enabler for organizational ambidexterity	Grounded theory
Horvath and Szabo (2019)	How far the various driving forces and inhibiting factors will have different effects on small and medium-sized enterprises and multinational enterprises	26 interviews; Company website; Annual reports.	Five main driving forces and five barriers to the application of new digital technologies in manufacturing processes	Grounded theory
Mariotti and Haider (2020)	Which network configurations are responsible for novel knowledge recombination and how firms develop a capability at managing diversity	42 interviews; Observation.	Two different network configurations and three overarching network management capabilities	Inductive and deductive
Nastjuk et al. (2020)	What drives the acceptance of autonomous driving from end-user perceptions	20 interviews.	Ten acceptance criteria of autonomous driving from end-user's perspective	Inductive and deductive

Table 1. Qualitative studies in Technological Forecasting & Social Change.

perspectives while observing with the use of theoretical (a priori) patterns, building on existing theories and deducted from relevant studies. In studies with a flexible pattern matching logic, the iteration between prior theories and empirical observation functions run through the entire study design. The initial research question can be theory-driven or phenomenon-driven (from observation), on the condition that the convergence of observational and theoretical realms formulates significant research problems. The later generated theoretical patterns are subject to modification through the comparison with empirical data. The data analysis also requires particular attention to the interplay between theories and data by focusing on how insights from empirical data break down or challenge those theoretical constructs. We will discuss more details of the process in the guidelines of conducting studies with flexible pattern matching and further present it in Fig. 1. A stream of scholars in organization and management research started incorporating the flexible pattern matching approach to rigidly analyzing and generating insights from qualitative data, e.g., on interorganizational knowledge transfer (Bouncken and Barwinski, 2021; Gatignon and Capron, 2020; Rindova et al., 2007), entrepreneurship (Chiles et al., 2007; Shane, 2000), institutional changes (Jancsary et al., 2017; Reay and Jones, 2016), and organizational culture (Ainsworth and Cox, 2003; Canato et al., 2013; Montealegre, 2002).

2.2. FPMA for unraveling changes in social and technological areas

The advancement in technology is an accumulative and continuous process that introduces new technological functionalities into existing technologies or systems (Parraguez et al., 2020; Ribeiro-Soriano and Peris-Ortiz, 2011). It is often seen as a primary source of economic growth and social evolution (Walsh et al., 2020; Wang et al., 2020). As such, numerous scientific studies have sought to underpin the theoretical foundation of real-world evolution, providing references for the future of technology and society (Bouncken and Kraus, 2021; Kraus et al., 2019). However, technological development is the product of multiple combined drivers, including institutional environment, potential markets, existing knowledge, and individual acceptance, creating various possible technological directions and changes (Rey-Marti et al., 2016; Ribeiro-Soriano, 2010). Therefore, the underlying dynamics and complexity, along with the combination with existing systems, bring considerable challenges in developing a thorough understanding of technological change mechanism. Recently, the FPMA logic integrating deduction and induction analysis is increasingly adopted in forecasting and change-oriented studies (Table 1 lists some of the studies). The qualitative nature allows researchers to unravel the numerous technological, social, environmental factors involved and the complex relationships (Ribeiro-Soriano et al., 2018). More specifically, the iterative pattern matching process between prior theories and observed reality leverages rich prior studies as a solid foundation for analysis (König et al., 2019; Ribeiro-Soriano and Berbegal-Mirabent, 2017; Scheiner et al., 2015), and therefore can guide the practice of technological forecasting and strategic planning through rigid theorizing. For example, the (in)consistencies and breakdowns derived from the pattern matching process may help address the role of new technologies and the subsequent emerging social phenomena while problematizing or complementing the existing theories (Alvesson and Kärreman, 2007; Bouncken et al., 2021; Shane, 2000). The consistencies between theoretical and practical patterns can help test or expand the contextual boundaries of existing

theories on forecasting new phenomena or technologies (Ross and Staw, 1993). In general, flexible pattern matching logic presents four critical advantages for qualitative studies, especially those investigating technological and social changes. First, as Yin (1994) suggested, the pattern matching logic can help a case study strengthen its internal validity. The initial patterns deducted from literature ground the later analysis in existing theories solidly, legitimizing established causal relationships and guiding the generation of observed patterns from collected data. Second, the complemented inductive and deductive approaches address complications in forecasting with multiple sources. Technological and social changes are processes with the integration of new elements into existing systems, whereby involve multiple perspectives. In this case, deducting initial patterns helps to disentangle the complex reality (Bechara and van de Ven, 2007), and the associated deduction and induction contribute to revealing latent influencing factors and the underlying mechanism (Phillips, 2008). Third, the iteration between prior studies and empirical evidence justifies the analysis process in qualitative studies. On the one hand, drawing upon previous research provides an analytical framework and basis to develop well-reasoned findings, prohibiting arbitrary interpretation and digression. Moreover, the theoretical framework systemizes the evaluation of findings. It explicates the “complex phenomena” involved in studies to guide the readers along with the analysis and presentation of findings, increasing qualitative rigor (Gatignon and Capron, 2020). Fourth, flexible pattern matching logic equips longitudinal or(and) single-case studies with a comparative lens to generate insights that can help forecast the future and potential changes. The theoretical frameworks deducted from the literature provide materials to compare or corroborate qualitative data from single-case studies. We will further discuss its integration with longitudinal studies later.

2.3. Study designs: Lessons from previous research

An increasing number of researchers adopt the integrated inductive and deductive logic to address the issues of changes in technology and society. The logic is the same as the essence of the flexible pattern matching approach to compare deducted theoretical patterns with inducted observed patterns, just without terming it as a flexible pattern matching until after the categorization of pattern matching suggested by Sinkovics (2018). This section explains previous studies to explicate further the

applicability and advantages of the FPMA for investigating technological forecasting and social change. Following Yin's (1994a, 1994b) suggestion, scholars began to adopt pattern matching to increase internal validity, establishing trustworthy findings in qualitative studies (Lee et al., 1996; Lin et al., 2006; Peters and Saidin, 2000). Blume et al. (2020) aimed to conceptualize the evolution of disruptive threats. Given the existing literature on disruptive threats and market signals, they first developed a disruption evolution framework as the study's analytical lens. In the data analysis, the disruption evolution framework was adopted to analyze coded data and identify consistency between them while challenging the framework and adjusting it. This iterative process creates replication logic and thus enhances the internal validity, because they compared the insights from data (as observed patterns) with the concepts of the disruption evolution framework deducted from literature (as theoretical patterns), which iteratively validate or refine the concepts in the framework. Moreover,

the in-depth deductive and inductive analysis helps eliminate alternative interpretations, while Blume and his colleagues compiled insights from both literature and practical evidence to draw sound conclusions. The study of Wu and He (2020), which examined how biopharma DIY laboratories' innovative findings can be transferred to existing networks and eventually converted into products, illustrates how the FPMA addresses complications with multiple sources in qualitative studies. The topic of this research involves multiple branches of literature, including research and development outsourcing, contract research organizations, inclusive innovation, business ecosystem (Wu and He, 2020: 2). In this case, the data collection and analysis process might be entangled in the intricate elements and relationships, leading to divergence from the focus. Wu and He (2020: 3) pre-developed a conceptual framework deductively navigate the research, which, as they stated, "help focus our study on two analytical categories". The two preset analytical categories then functioned in synthesizing and refining the themes and concepts derived from observed data. Simultaneously, when inconsistency was founded, the analytical framework deducted from the literature is also subject to revision to reflect emerging insights from the practical observation. In their study of sustainability-oriented innovation dynamics, Inigo and Albareda (2019) adopted a circular inductive-deductive process to justify the analytical process by structuring the cross-case study and developing protocols for data collection and data analysis. They started with a literature review on dynamic capabilities and sustainability-oriented innovation, which derived them an initial conceptual framework that guided the interview design, sample selection, and data analysis. More specifically, they deducted three different levels of dynamic capabilities of increasing complexity and five aspects of dynamic capabilities from the literature. Therefore, the interview data and evidence from other data sources serve to test or challenge the theoretical patterns. Moreover, cases were also purposively selected "to guide our research in a way that best addressed the research problem" (Inigo and Albareda, 2019: 338). The codifying process was further anchored in theories solidly by using an iterative process that continuously contrasts data and theory to find (mis)match between data and theory. Accordingly, the research design is grounded in the theoretical base, with space for exploration from empirical evidence. Gatignon and Capron's (2020) study investigates the inconsistency between the suggested patterns from literature and the case of Natura regarding how it overcame voids in market-based institutions. Therefore, they conducted a longitudinal single-case study with a flexible pattern matching approach for re-examining existing patterns and shared assumptions by contrasting them with the empirical case and data. In light of Ostrom's (2005) design principles and the literature on addressing voids in market-based institutions, they first deducted and presented two patterns that capture two approaches suggested by prior studies. Then through the lens of these patterns, they compared them with the collected data and analyzed if and how the data (mis)match these patterns. A highly distinctive pattern from the two deducted patterns emerged based on the analytical framework of Ostrom's (2005) design principles and the iteration between theory and data. Analyzing the single case with the FPMA enabled the authors to analyze the case and data in relation to prior work and reveal the work's implicit "mental models", facilitating readers' understanding and re-evaluation of the qualitative study. As Gatignon and Capron (2020) stated, we should draw more attention to "the benefits of applying pattern matching techniques to longitudinal case studies of single organizations and to phenomenon-based research more generally". These papers adopted both deductive and inductive approaches with continuous iteration between

theory and data, which refers to the features of a flexible pattern matching logic. After Sinkovics (2018) systematically categorizes pattern matching into three broad categories: full pattern matching, flexible pattern matching, and partial pattern matching, we can term this iterative deduction-induction process as a flexible pattern matching approach. It is not only a methodology that

guides the investigation of the questions in the studies mentioned above, but also a logic that functions throughout and leads to the rigorous reasoning and exploration from qualitative data. As Sinkovics (2018: 2) stated: "Flexible pattern matching is most suited for exploratory research designs.".

2.4. Longitudinal design of the flexible pattern matching approach

for forecasting The future and its processes unfold over both time and space (Phillips and Linstone, 2016). For this reason, studies on technology forecasting and social changes could generate more rigid and holistic insights through building on the extended time available in longitudinal design (Holland et al., 2006: 22; Koro-Ljungberg and Bussing, 2013). Neale and Flowerdew (2003) highlight the significance of (qualitative) longitudinal studies in the social sciences by describing them as "movie", more informative than the "snapshot". When combined with a qualitative design, longitudinal studies reach more significant potential in understanding the complexity of technological and social changes, from the continuities of patterns to contingencies on events, to the effects of context on outcomes, and to the interaction or intersection of them (Grossoehme and Lipstein, 2016; van de Ven and Huber, 1990). For example, interviews, observations, and other data sources over an extended period of time can be integrated to examine the existence and context of changes and identify potential drivers, indicating the direction of technological progress and different possibilities of future development (Holzmann et al., 2020; McDonald and Eisenhardt, 2019). As such, longitudinal qualitative studies would be especially fruitful in investigating why, when, and how technologies and social factors change and evolve. However, despite the importance of understanding changes when transformation occurs worldwide, the time's role in change has been still little understood (Chiles et al., 2007; Giaever and Smollan, 2015; Langley and Abdallah, 2011). Some of the primary reasons are the complexity in conducting longitudinal studies, the challenges in analyzing the vast amount of data, and difficulty in generating insights from the data over time (Greenwood et al., 1994; Koro-Ljungberg and Bussing, 2013; Leonard-Barton, 1990). Adopting a flexible pattern matching logic can help address these difficulties while playing the full advantages of longitudinal qualitative studies. There are multiple aspects that longitudinal qualitative research design and flexible pattern matching complement each other for conducting studies in forecasting and change. First, the flexible pattern matching approach provides longitudinal data with a theoretical lens to capture changes over time. The theoretical patterns or initial template establish a firm and consistent base that allows analysis of changes in events, behavior, or emotion, revealing the underlying dynamics. Montealegre (2002) mapped out the sequence of resources and capability development at different times based on the array of resources and capabilities derived from a firms' resource-based view. With these findings, he further entangled their influence on the formation and implementation of the electronic commerce strategy in the case. Furthermore, the identified change also discretizes the stages in the time range, enabling researchers to determine the saturation point from the seemingly endless and complex longitudinal data collection process. Second, the comparison between data from multiple time points offers the opportunity to view the evolution of patterns closely. The comparison among patterns in different time periods helps discern changes and generate historical narration because cross-phase comparison allows for the emergence of key properties of order and sequence of events and patterns (de Haan and Rotmans, 2011; König et al., 2019). Langley (1999) introduced and suggested a temporal bracketing strategy to decompose processes into successive and adjacent periods, enabling examining how patterns change between time phases and the influence from the context. In their study of information system implementation, Lapointe and Rivard (2007) conducted a longitudinal study in three

cases with the temporal bracketing strategy to investigate the outcome from implementing the same project or set of projects with different models. The within-phases analysis generated seemingly paradoxical insights: one suggests that at a specific phase, the outcome is better explained by a prominent model situated at the same level, and the other, instead, suggests that other phases can be

explained with the complement from other levels. By conducting cross-phase analysis and considering the time's role, Lapointe and Rivard explained the seeming paradox: the evolution and interaction among factors over time causes the difference in different phases, which, at first, appears paradoxical. Third, longitudinal data with pattern generation and comparison together provide the basis to reveal causation and connectivity in change. The longitudinal qualitative data identifies patterns that allow for examining continuous processes with context, instead of only outcomes. Thus, it underpins a way to understand how the discrete events compose the experience of change and how the process of change unfold along with interaction with the context, where the established theories can potentially facilitate the understanding as guidance and a possible explanation. Canato et al. (2013) studied the implantation of culturally dissonant practices with a three-year investigation into 3 M company's coerced implementation of Six Sigma. Their interview data reveals three phases of the implementation characterized by varying degrees of fidelity and extensiveness, changing practices, and organizational culture. By comparing with current theoretical arguments and disentangling the evolution and interaction of patterns, Canato (2013) suggests that the implementation of culturally dissonant practices in poor cultural fit results in the ongoing mutual adaption of organizational practice and culture. Implementation differs from the adaption of practice, as suggested by prior literature. Fourth, the flexible pattern matching logic and longitudinal data together increase the rigor of theorizing for further forecasting future trends. The flexible pattern matching approach advances reasoning processes with both deduction from literature and induction from empirical data. It thus allows for the test of generated insights and patterns from empirical data with the support or analytical foundation

from literature (de Haan and Rotmans, 2011). The longitudinal data further connects every single change with historical or retrospective activities, linking events with context and influencing factors, thus preventing fictitious or incomplete inference (Parraguez et al., 2020; Wiener et al., 2020). Therefore, these two combined approaches reveal reliable findings on the cause and effects of changes, which support the forecasting of future trends and preparing for actions strategically.

3. Implementation guidelines and future research

3.1. Guidelines

The deduction-induction research design has been increasingly adopted among technological forecasting and social change studies, referring to a growing acceptance and legitimacy of the flexible pattern matching approach. However, the procedures for conducting a study with the FPMA have often been tenuous. This section describes seven steps to build valid theories for further change analysis and forecasting. Fig. 1 outlines these steps and the involved iteration between theoretical and practical realms. We further discuss the thinking patterns underlying the scientific development process and summarize them in Fig. 2. Developing research question(s). For studies adopting a flexible pattern matching design, a clearly defined research question(s) is a critical start, as in general explorative studies (Cassell and Bishop, 2019; Cassell et al., 2006). The iteration between theoretical and observational realms in flexible pattern matching can formulate theory-driven or phenomenon-driven questions. Theory-driven research questions are derived from conceptual bases where voids or conflicts in extant theories are found. Studies with theory-driven research questions attempt to answer the questions in light of insights from rich and in-depth qualitative data (Eisenhardt, 1989; Eisenhardt and Graebner, 2007), where flexible pattern matching technique enhance the connection among research question(s), relevant theories, and investigated objects. For example, Sinkovics et al. (2014) first identified a research gap of how business models and social value creation are interrelated in

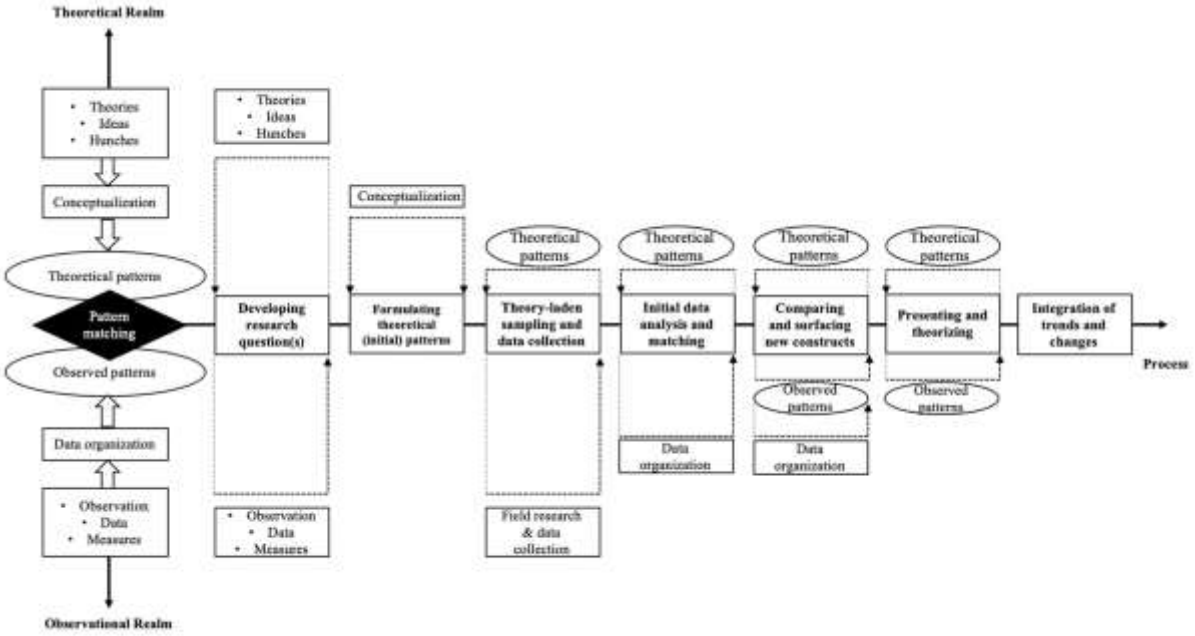

Fig. 1. Iteration between theoretical and observational realm in conducting flexible-pattern matching research.

Figure 1. Iteration between theoretical and observational realm in conducting flexible-pattern matching research.

base-of-the-pyramid countries. Adopting flexible pattern matching logic supports the rigorous field study and data analysis with strong links to extant theories. Phenomenon-driven research questions contribute to existing theories through a specific phenomenon and the lack of plausible extant theory to explain it (Bouncken et al., 2020, 2018; Eisenhardt, 1989; Eisenhardt and Graebner, 2007). For instance, the study of Bouncken and Barwinski (2021) was motivated by the explicit and tacit knowledge exchange among nascent 3D printing industry firms globally, which shed new light on the knowledge ties in global digital business where firms risk unintended knowledge spill-over. Formulating theoretical (initial) patterns. In flexible pattern matching logic, initial patterns/constructs/templates are generated from preexisting theoretical knowledge before collecting empirical data (Bitektine, 2008; Kauppila, 2010; Sinkovics et al., 2019). The generation of a priori patterns differs the flexible pattern matching approach from widely-adopted ground theory and the Gioia method, where the inductive exploration of data consults the literature during and after the coding process, namely after empirical data collection. This feature of flexible pattern matching logic bestows on studies a firm anchor in related literature, a directional theoretical design of the research, and pre-identified potential constructs. This process also invites researchers to studiously define the initial patterns' scope and configuration since too many pre-defined patterns might incite exploration out of objectives and lead analysis astray. On the contrary, too few patterns bear the risk of neglecting insights for data analysis (King, 2004; King et al., 2018). As such, we suggest that both following a clear-defined research focus and conducting an in-depth literature review are essential to formulate patterns with a decent number and rigid structure. Gatignon & Capron's (2020) study provides a good example. They started from a hunch that a fast-expanded company in Brazil overcame institutional challenges in a way distinct from mechanisms suggested by prior studies. In light of the analytical framework from Ostrom's (2005) design principles, they find two approaches from the prior theories suggesting how firms address these institutional voids. Furthermore, the analytical framework guides the emergence of a new approach from the investigated case and collected data, complementing the two initial patterns deducted from the extant works. Theory-laden sampling and data collection. The generated initial patterns from the previous step serve as a liaison between theories and the following field research, providing the existing theoretical basis of explaining investigated social activities. Therefore, the selected cases or objects should ground to the theoretical base, serving to examine, test, or extent the mechanisms involved in the established patterns. The number of selected cases is contingent on the nature and accessibility of the case(s) and its connection with the research development. A single case might be selected because of its uniqueness, revelation to

the investigated topic, and potential in developing theories. In contrast, multiple cases can be selected based on their theoretical relevance and study design, emphasizing replication, diverse profiles, alternative explanations, or extending the scope of theory (Eisenhardt, 1989; Eisenhardt and Graebner, 2007; Yin, 1994b). For instance, a single case was selected by Ross and Staw (1993), aiming for both theory testing and development, because the case fit the research focus on organizational escalation and exit, and its scale, amount of investment, and the escalated result all form its uniqueness and revelation. In contrast, three cases, one large and two medium-size Japanese companies in the UK, were selected in Saka's (2004) study because they aimed at a rigorous comparison of the cross-national diffusion of work system through flexible pattern matching. Researchers should also be conscious of other "boilerplate" in qualitative studies, including consulting industry experts on the appropriate time, sites, and informants for data collection, triangulate data sources to avoid informant biases (Aguinis and Solarino, 2019). Initial data analysis and matching. The appearance of initial data analysis and matching after theoretical sampling and data collection does not necessarily mean that it should be conducted after completing

the previous step. On the contrary, overlapping preliminary data analysis with data collection, which is termed the constant comparison approach (Eisenhardt and Graebner, 2007), is recommended for adopting flexible pattern matching. It enables researchers to glean predominant and characteristic patterns from data, identify saturation point of data collection and adjust the initial collection method when a new line of thinking emerges (Glaser and Strauss, 1968; Montealegre, 2002; Strauss and Corbin, 1998). Still, the order comes from the reason that all the analysis is based on and follows the collection of a certain amount of data. The analysis process starts with examining the fit between each code segment with the theoretical patterns. In this process, code segments can either agree to the theoretical patterns deduced from the literature, challenge them, or present insights that indicate a new domain (Shane, 2000). This step classifies data into categories that generally include "theory testing", "theory modification", and "theory development", depending on the degree of (in)consistent with theoretical pattern or revelation of new themes. The groups of data that challenge or mismatch the theoretical patterns form the basis for further exploration. There is no universal order or format for the initial analysis process (Manić, 2020). For instance, researchers can adopt a constant comparison approach from case to case in studies with multiple cases, or analyze chronological data analysis from time to time in longitudinal studies. When analyzing impacts of environmental factors on individuals in longitudinal single case studies, it is also optional to analyze from a data source to another data source. Comparing and surfacing new constructs. The comparison and generation of new insights arise from the groundwork of initial data analysis and matching. Data segments that stand out from the existing constructs, namely theoretical patterns, should be piled up for uncovering further novel insights. Here, the inductive Gioia (2004; 2013) approach can be integrated to distill insights on a) latent concepts and their relationships systematically and b) hidden processes that become visible from all the data collected in the inventory. Following the Gioia (2004; 2013) template, researchers can develop first-order categories through "open coding" that are pure write-ups of the code segments to describes the key information. This presents the first step of untangling hidden concepts. Linkages and differences between first-order categories lead to second-order themes situated at a higher level of abstraction, thus informs how the hidden concepts might be aggregated and how they surface (Manić, 2020). Through further analysis, comparison and integration, the researchers generally arrive at a number of "observed patterns" that summarize the key elements of the stand-out data and function as the counterpart of the theoretical patterns (Gioia et al., 2013). Therefore, the research approach can unravel hidden concepts and their relationships. Also, some studies with the FPMA adopt an analytical framework deducted from the literature to generate theoretical patterns. The suggested comparison between two sets of patterns and inclusion of different level order themes provides more insights into the latent foundations and connections among concepts. Combining the flexible pattern matching logic with Gioia method improves the deep dive into empirical data and theory for theory building. This induction process yields a hierarchical "data structure" usually in the form of a horizontal tree-shaped figure (Gioia et al., 2013; Langley and Abdallah, 2011). Using this presentation can additionally facilitate the presentation of findings while adopting the FPMA. Presenting and theorizing. While adopting a

flexible pattern matching approach, insights, findings, and theory development arise from the interaction between theoretical and observation realms. Emerging findings draw on mismatches between theoretical patterns and empirical observation (Bouncken and Barwinski, 2021; Sinkovics et al., 2019) or matches between modified theoretical framework and observational patterns (Jobber and Lucas, 2000). Consistent with general qualitative studies, its presentation of findings also involves showing a coherent story interspersed with context description, informants' articulation, and other supporting materials. Nevertheless, the narrative way to capture insights from the flexible pattern matching logic should be

neither restrained in displaying each case's details, giving rise to theory losing and text balloon, nor landed in generating digressive insights. Instead, the theoretical framework or mechanism of the theoretical patterns should guide the evolvement of the story through the comparison and iteration between theoretical patterns and empirical data. What is (in)consistent, to which degree, and why? How do these constructs synergize to function in the investigated objects? In this way, the "story" displays the interesting and contributing findings from data while testing, modifying, or complementing prior theories. Multiple ways have been adopted to present the comparison and findings from flexible pattern matching, including template analysis, tables, matrix, figures, and narratives. Template analysis applies hierarchical coding as the initial template to "produce a list of codes ('template') representing themes identified in their text data", where the initial template is subject to revision under the ongoing data analysis (King, 2004). Tables and matrix efficiently compare differences between sets of patterns and present insights from the findings. In most cases, an analytical framework deducted from prior studies is adopted as the underlying structure for comparison. Figure is an approach that enables the clarification and visualization of more complicated relationships and interactions between constructs. There is no one-size-fits-all form, so that the approaches should be adapted to each study according to the research focus, extant literature, scope, and aim. Integration of trends and changes. While initial patterns are developed from previous theory and inform the prior understanding of constructs and mechanisms in a specific area, the emerging trends and phenomena in the social and technological area potentially challenge and induce modification on existing systems. In this way, combination and comparison among the dynamics of social or technological trends, theoretic patterns, and observed patterns could generate a more informative and comprehensive base for further prediction and preparation for further changes. Therefore, apart from the refined and completed concepts and frameworks derived from the integrated theoretical patterns and observed patterns in the research, researchers might condense and list actual trends of change gathered through secondary information. Then researchers can create rationales and tables on how these trends relate to the theorized patterns and how they relate to the gathered empirical patterns. This comparison informs future developments and first process models. A recursive iteration among theoretical patterns, social and technology trends, and observations will help understand processes and develop theories that are contextualized in time.

3.2. Scientific development process

The whole process of conducting research with the flexible pattern matching logic, as we can see from the seven steps above, involves continuous iteration between theory and reality, since the logic builds on the assumption that it is iterations between prior theories and empirical observations construct our understanding of the social world (Burchell and Kolb, 2003; Reay and Jones, 2016; Sinkovics, 2018). This assumption indicates that the subconscious mind with underlying knowledge guides the way we observe and understand reality, and in reverse, allows for testing and challenging the prior knowledge. Furthermore, unforeseen phenomena and problems should encourage extending knowledge into new contexts and elements. The combination of prior explained elements and systems, namely previous theories, and the new constructed elements and systems together progressively extend our understanding of the social world, thus enhancing the availability of supporting structures and validity of forecasting and planning for the future.

Fig. 2 depicts the above-mentioned scientific development process in the flexible pattern matching approach, with the role of deduction and induction therein, and the position of each step included in the

guideline. Researchers in business and management observe the social world with the intention to address specific issues, either with a question promoted from some experience (e.g., in theories) or emerged from the observation on some unexplained phenomenon (Bouncken et al., 2008; Learner and Phillips, 1993). Since the world consists of both explained elements, explicated by prior knowledge, and unstructured problems, which are still underexplored areas, observers, implicitly or explicitly, apply the prior memory, experience, and knowledge to define the investigated field and formulate the problem. A systematic review of related prior knowledge with a deductive analysis not only acknowledge the existence and influence of subconscious mind of observers as human invention in the research (Learner and Phillips, 1993), but also present exhaustive inventory and sound constructs on the explained elements of the investigated field in the form of theoretical patterns. With the subconscious mind and the targeted research question, the researchers systematically collect data from the observed objects and phenomenon and then distill insights from the qualitative data in the form of observed patterns. The observed patterns might reflect arrangements of insights that fall into the sphere of the theoretical patterns and also surface new constructs or elements that explain the prior unstructured problems. In the end, a comparison between the theoretical patterns deducted from prior knowledge and the observed patterns inducted from empirical data provides reflections on the existing theories and extend our understanding to the underexplored areas. In this way, we accumulate substantial evidence for the explained elements and develop understandings of the unstructured areas. The scientific development process of the flexible pattern matching approach indicates that the advancement of theories draws on the prior knowledge and empirical observation or experience, as well as insights generated from the interactions of these two ends. Therefore, this approach is particularly appropriate for qualitative studies that anchor on existing theories or already researched topics and aim at or arrive at complementing, extending, or challenging them with empirical evidence. For example, a novel phenomenon may present some features that explain unaddressed issues of current theories or dispute current perspectives. In some cases, the ongoing data collection may suggest a strong connection with existing theories in initially inductive-oriented research. In sum, the FPMA can be a powerful tool for explorative research built on existing perspectives or topics.

3.3. Limitations and future research

The FPMA is a qualitative research approach based on the linkage and iterations between theory and observation (Bouncken et al., 2021). It enhances qualitative rigor by balancing discipline and imagination, which further helps to inform why, how, and in what direction changes evolve. Still, there are some limitations. First, it is challenging to deduct and generate inclusive and focused theoretical patterns from various relevant theories and prior works. Overcoming this challenge is not an easy task where a carefully-considered research aim and a specified but comprehensive literature review within this sphere are needed (Brooks and King, 2014). Words and sentences, as the medium of logical deduction, should not weaken the logicality and reasoning of this process, but as convincing as theoretical pattern deducted from mathematical deduction (Lee, 1989). As Lee (1989) stated, “deductions with verbal propositions (i.e., qualitative analysis) therefore only deprive itself of the convenience of the rules of algebra; it does not deprive itself

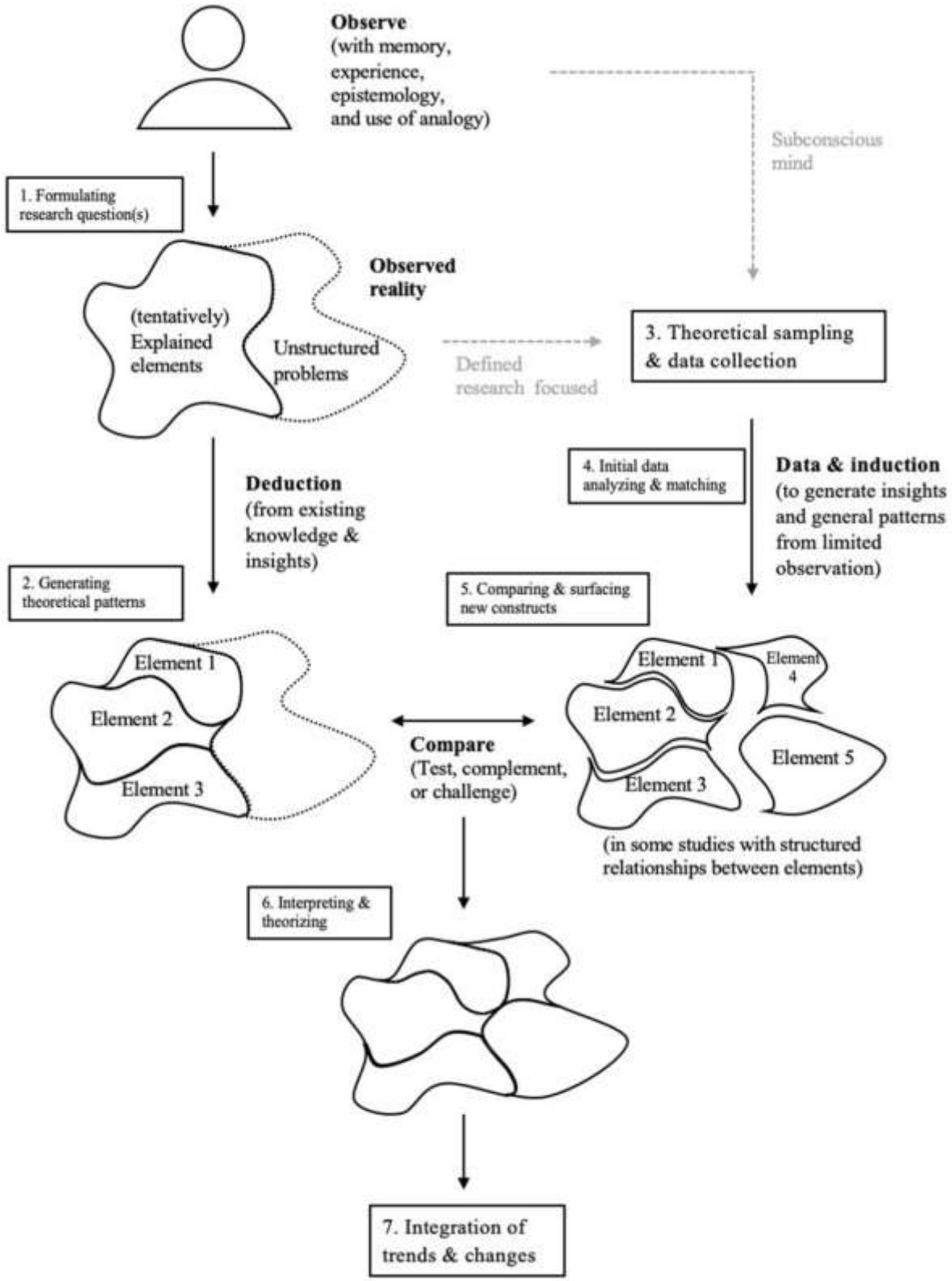

Fig. 2. Scientific development process of the FPMA and the position of each step.

Figure 2. Scientific development process of the FPMA and the position of each step.

of the rules of formal logic.". Additionally, considering recent changes that tremendously vary upon industries, societies, and locations, the understanding of changes requires more in-depth perspectives beyond the reach of secondary data sources. Second, it is a particularly time-consuming and studious process to generate sets of patterns, before and after data collection, and repeatedly iterate between them. (Reay and Jones, 2016). As the flexible pattern matching logic is based on the development of

patterns from theoretical and observation realms, it necessitates the insights and essence distilled from both ends, where exhaustive reading and rigorous insight generation are required during the whole process. For studies with a longitudinal design, the formation of observation patterns further involves data analysis across time and tracing on the evolution of focal events, apart from the iteration between pieces of empirical data and theoretical patterns. A team-based approach may ensure the research project's continuity and eliminate bias in such arduous work. Third, concerns on the generalizability of findings, as a common discussion on some other qualitative methods, may also arise from studies adopting a flexible pattern matching approach. It can help to adopt the developed theory to articulate and define the object of interest within a context that includes key-related elements (Langley, 1999; Trochim, 1989). As Allison and Zelikow (1971) argued, "Refining partial paradigms, and specifying the classes of actions for which they are relevant, maybe a more fruitful path to limited theory and propositions than the route of instant generalization.". Furthermore, adopting the FPMA involves the a priori patterns deducted from the literature where the theoretical perspectives and focus can increase the external vitality of the generated findings. The flexible pattern matching approach becoming increasingly prevalent is still in a developing stage. Therefore, this paper explained its logic, advantage, and application while providing guidelines on the process of theory development and the underlying scientific development. Researchers from multiple domains have reached a consensus on the promising for theory development using this method, including on organizational culture (Ainsworth and Cox, 2003; Burchell and Kolb, 2003; Meisiek and Barry, 2007), institutional logic (Jancsary et al., 2017; Reay and Jones, 2016), entrepreneurship (Chiles et al., 2007; Shane, 2000), international business (Burgelman, 2011), and general studies with phenomenon-driven research design (Gatignon and Capron, 2020). Specifically, the continuous iteration between theoretical and observational realms (as presented in Fig. 1) leverages and balances both the in-depth investigation from qualitative data and underlying rationale from the literature (Scheiner et al., 2015), and thus paves a way to acknowledge, review, problematize and complement the extant theories (as presented in Fig. 2) (Holzmann et al., 2020). The advancement in theories lays a foundation for more convincing and valid planning and forecasting on social, environmental, and technological issues. Furthermore, when combined with longitudinal research design, the flexible pattern matching approach facilitates the capture of changes and processes in the investigated issues and factors (de Haan and Rotmans, 2011; Hemert and Nijkamp, 2010). To unlock the full potential of the flexible pattern matching approach, additional work could further push the refinement of the process. For instance, there need more guiding rules on constructing overarching and parsimonious theoretical patterns from massive prior studies, and on assessing the degree of (mis)match to validate the matching results. Furthermore, the elaboration in this article might stimulate the adoption of the approach in more studies and advance researchers' understanding of it by conducting research projects and further completing the roadmap with more insights.

Author statement

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