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Report of the first 'Time-in-QCA'(TiQ) International Workshop

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Interest in Qualitative Comparative Analysis is burgeoning and has sparked a wide range of methodological developments. One area that deserves attention is the integration of time and process into the logic and workings of QCA as a research approach and technique. To this end, the first 'Time-in-QCA' international workshop was organized in Rotterdam on October 5th, 2022[1] with the support of the QCA community (see www.compasss.org/), The goals of the workshop, were to take stock of the state-of-the-art regarding the integration of time and process into QCA, and to identify the most promising avenues to explore next.

This workshop report, written by Sofia Pagliarin and Lasse Gerrits, has three goals:

1. To show how and why time and process are relevant to comparative research in general and QCA in particular. This is discussed in Section 1.
2. To synthesize the different ways in which participants propose to integrate time and process in QCA. This is discussed in Section 2.
3. To identify a tentative research agenda for time in set-theoretic and configurational comparative methods. This is discussed in Section 3.[2]

[1] The list of participants to the workshop is included below.
[2] The report identifies the key messages from the workshop. It does not summarise the papers, the presentations, or all the details of the roundtable discussions.

1. The relevance of time in QCA

The workshop was based on the underlying argument that any theory or method come with implied notions of causality, even if they are not always articulated clearly and upfront (Illari & Russo, 2014). It was also acknowledged that readers familiar with QCA should be much aware of this, as QCA itself comes with clear propositions of how causality places out in social reality (i.e., 'causal statements', 'causal recipes'). QCA researchers should hence interrogate themselves about which notion of causality is implied in their models and make it explicit.

When notions of causality are allowed to come into the picture of empirical research, it is almost inevitable to start discussing about the 'time dimension.' This is because much of social reality is about processes that play out over time (e.g. Abbott, 2001; Sayer, 1992) (for a review, see e.g. Gerrits et al., 2022). Temporality and temporal information play an important role in how causality plays in out the real world. When a temporal sequence is identified, causality can be hinted or recognised because causes precede effects ("A before B").

However, adding time and process to our understanding of causality also increases the complexity of such understanding manifold. For example, if we adopt a complexity-informed perspective causality is circular: the outcome is not produced by one factor preceded by another one that is also preceded by another factor (i.e., synoptic thinking), but the outcome emerges through feedback structures where causes and consequences are intertwined. Likewise, process theories do not only focus on sequential effects but also on simultaneous instances of parallel causes and consequences. In short, adding time and process enhances but also complicates what we can understand of the world in terms of causality.

In sum, when acknowledging the central role of time for identifying and establishing (approximations of) causality, then we must ask ourselves this key question: which epistemological and methodological role does time play in Qualitative Comparative Analysis (QCA) as a research approach and technique?

2. Approaches to integrate time into QCA

The subsequent discussion tried to identify if, how and when exactly the time dimension matters to produce the outcome in QCA. Temporality was considered relevant in QCA by most of the participants, but even if the role of temporality was considered important, if, how and when QCA can account for them stimulated a range of perspectives that are synthetically presented in the following table (Table 1). The standpoints presented in the table are not necessarily opposed to one another, but we see them rather along a continuum, as described by the arrow.

Table 1. The place of time in QCA.

Relevance of time in QCA	No	Yes, at the level of conditions	Yes, at the level of cases
	←	→	
Is time important in QCA?	Temporal information is important in general, but not central to QCA.	QCA can trace interaction between conditions over time (co-evolution) by focusing on conjunctural causation.	While identifying cross-case patterns is important, the temporality of individual cases should be accounted for in QCA in terms of the sequence through which cases develop and duration of these sequences.
How is time important in QCA?	QCA is fundamentally time-agnostics, and often time is not even a concern/issue in QCA empirical research. QCA assumes synchronic causality: conditions produce the outcome at the same time (level of conditions).	We can account for the temporal ordering of conditions.	We have to look at what happens empirically in groups/individual cases (sequences and duration).
	QCA is fundamentally time-agnostics. Specifically, truth table is time-agnostic because the comparison of multiple cases assumes that time is constant across them.		
When can we see time in QCA?	The time dimension can be accounted for in the qualitative interpretation stage, i.e., by 'going back to cases' to dialogue between theory and data. The explanation of why we see the outcome in a certain case is done through the qualitive interpretation of temporal information, primarily through 'old' historical analysis or process tracing (PT).	'Temporal information is considered when assigning set-membership values during calibration.	We have to look at what happens empirically in groups/individual cases, e.g., conventional qualitative analysis on individual cases and then try to integrate this temporal information into QCA at the case level.
	QCA as an exploratory approach to case studies; the time dimension/causality is 'hidden'/ already implied in the necessity and sufficiency statements		

A take-home-message from the discussion summarised in Table 1 above was that causality can be found and traced from two different angles: it is both case-oriented (focus on case-level, type of cases, comparative research, conditional causal recipes) and condition-oriented (focus on general patterns, either in QCA or e.g., in regression analysis where the focus is on the average trends).

However, an open question posed by Federica Russo remains to be answered conclusively (here not reported *ad verbatim*): where is temporal information important for producing and explaining the outcome? In other words, if we have a set of conditions leading to the outcome for a certain group of cases, how exactly do these conditions "arrange" temporarily to produce the outcome?

In the attempt to replying to this question, we identified some themes and (old and new) techniques to integrate time into QCA.

2.1 Themes

In this report, we can identify three main themes that emerged during the workshop and that were cross-cutting the perspectives that did consider the integration of time into QCA as possible and desirable.

Fluidity. The first theme relevant for the integration of time in QCA is the concept of fluidity (Neale, 2021). Reality is fluid and in-flux, therefore we also need methods that can capture that fluidity. For QCA, this implies a strong focus on the development of cases over time. Qualitative Longitudinal Research (QLR) offers a theoretical and methodological framework to trace cases over time. QLR acknowledges that we cannot fully capture the complexity and the fluidity of cases because there are no discrete states nor a specific chronological order. Neale likened it to ebbs and flows that escape capturing. However, by using our 'analytical hats' as social scientists, we can try to 'make a map' of how cases develop (see e.g. the 'formal sociology/sociology of forms' introduced by Simmel). Some key topics within the theme of fluidity that can be relevant for integrating time in QCA are:

- Temporal case analysis: a form of semi-structured comparative analysis through time qualitatively identifying patterns, similarities and differences across cases;
- Temporal thematic analysis: not housing, but housing journeys, to highlight the processual/temporal character of cases (processes).

However, as a time-sensitive qualitative analysis, QLR is based on a narrative framework to identify patterns and does not use any operations for structural comparison (such as quantification in calibration). At the same time, the potential to integrate the above two aspects of QLR into QCA was also recognised (see Section 3).

Time-sensitive data and casing. The second theme we considered relevant during the discussion on time and QCA was casing and the handling of data. To be able to integrate the time dimension into QCA, we have to look at the data from the perspective of time and being in-flux, e.g. by preparing them in a sequence or through a set of stages (e.g., temporal casing; (see Gerrits et al., 2022)) or by using data that have been explicitly collected by including time (e.g. time stamps, or same variable measured over different time points).

During the workshop, the importance to collect, use and organise time-sensitive data was acknowledged to enable the integration of time into QCA, but no exhaustive list of all the potentially available time-sensitive data was made. This is one area where the community could make progress (see Section 3). Furthermore, the mere availability of time-sensitive data (e.g. panel data; (see Garcia-Castro & Ariño, 2016)) does not necessarily mean that those data are 'ready-made' or even appropriate for being used in QCA. Rather, QCA researchers must ask themselves a more fundamental question, namely how temporal data properly represent cases (i.e., if and how temporal data make sense in QCA).

Longitudinal / Panel data. Connected to both the first and second themes, the third theme discussed during the workshop captures the role of longitudinal qualitative and quantitative data in QCA research. Provided that QCA researchers can reply to the above question and justify the meaningfulness of tuning their data to become more temporally sensitive, then more questions emerge: how to do a time-sensitive QCA? And which strategies are already available or are being currently developed to use time-sensitive data into QCA? During the workshop, these questions also stimulated more general considerations regarding the differences between a more case-oriented small-/intermediate-n QCA and a more condition-oriented, large-n QCA (see Greckhamer et al., 2013). It seems clear that time can conceptualised and operationalised in the data used for small-/intermediate-n QCA differently than for large-n QCA.

2.2 Methods

There are various ways to integrate time and process into QCA. This means that there is heterogeneity regarding the methodological strategies that QCA researchers have adopted to capture the time-dimension in empirical QCA research.

The table below (Table 2) is adapted from Pagliarin and Gerrits (2020, p. 2) to accommodate the different ways in which time can be integrated into QCA, as discussed during the workshop. The different versions presented in the workshop are highlighted in bold.

Table 2. Different strategies to integrate time into QCA.

Qualitative Comparative Analysis (QCA) and time		Cross-case level (temporal order of conditions; sequences of events)	
		No	Yes
Within-case level (time variation in cases)	No	a) • Conventional/Pooled QCA (crisp-set, fuzzy-set, multi-value)	b) • Time-QCA (TQCA) (Caren and Panofsky, 2005; Ragin and Strand, 2008); • two-step QCA (Schneider and Wagemann, 2012: ch. 10) • **Multiple QCAs at different time points (Verweij & Vis, 2021); Iannacci et al. (work-in-progress)**
	Yes	c) • Time-series QCA (TS/QCA) (Hino, 2009); **Time-differencing QCA (Hino and Niikawa, work-in-progress)**; • Panel data QCA (PD-QCA) (Garcia-Castro and Ariño, 2013)	d) • **Time-lagged QCA (Aversa et al., 2015), Niessen work-in-progress** • Trajectory-based QCA (TJ-QCA) (Pagliarin & Gerrits, 2020) • **Configurational Event-type Analysis (CLEAN) (Gerrits and Spekkink, work-in-progress);**

Below, we will briefly comment upon the strategies highlighted in bold, and we refer readers to Pagliarin and Gerrits (2020) for an overview about the other approaches included in the table above.

<u>Cell b)</u>

- Sequences of QCAs for multiple data points in longitudinal research. This approach requires longitudinal data to be available for the cases. For each time point, a QCA is performed. The result are multiple QCAs whose results are then compared to identify 1) core conditions that remain central over time; 2) how overall consistency changes over time (visualisation). This approach is presented in Verweij & Vis (2021) and was presented during the workshop by Federico Iannacci. The main comment from the workshop participants to this strategy was that the multiple QCAs remain static/time-agnostic.

Cell c)

- Time-differencing QCA: This strategy looks at precisely the 'triggering' point when a condition becomes relevant to produce the outcome. Time-differencing QCA pivots around the concept of 'change point' (P) and makes use of time-series data. The data for each case at two time points is subtracted to account for within-case time variation and to find time-variant vs. invariant conditions across cases. A comment from the workshop participants was that the focus is on change and less on continuity, which is very much important in processes as continuation and stability are processes, too.

Cell d)

- Time-lagged QCA: In this approach, the time variation within cases is considered and possible true logical contradictions (TLCs) emerging from the multiple times points per single cases are solved by creating a "lagged" condition representing the sequence e.g., "B after A". The lagged conditions can also have "causal" power as they show when the outcome is produced or not (see above on Time-differencing QCA). The time-lagged QCA approach has been introduced and empirically tested by Aversa et al. (2015).
- Configurational Event-type Analysis (CLEAN): This approach extends the logic of QCA to processes and focusses on sequences of events. Those sequences can happen as one-time occurrences or recurrently (e.g., elections, job changes, bank runs). Configurational Event-type Analysis conceptualises events as nodes (QCA cases) and the links across them become the combinations of conditions in QCA terminology. The focus of Configurational Event-type Analysis is on the co-occurrence of sequences of events (so beyond a cause-effect logic), which is identified through the reconstruction of the narrative networks. Remarks to this approach from the workshop participants were mainly: the difficulty to define and identify what 'events' are; the difficulty to account for all before-after combinations of conditions; the absence of information on the duration of sequences.

3. Outlining a research agenda for Time-in-QCA

The depth of the discussion and the range of approaches and strategies presented during the workshop indicate that the main topic of the workshop is relevant and in need of more targeted work. Looking ahead, we can expect that Table 2 above will become more populated with more approaches, revisions and strategies to include time in QCA. Following the discussions in the workshop, we will trace some avenues for further research in the attempt to outline a research agenda for time and QCA.

On the one hand, the combination of QCA with more qualitative approaches to time, in particular with Qualitative Longitudinal Research (QLR), seems very promising. The depth and granularity of qualitative research when analysing the development of individual cases can be made more synthetic and abstract to allow formalisation. We see a continuum

between the richness of data at the level of individual cases and the synthesis of information when defining the cases and conditions necessary to carry out QCA. This avenue for further research is also in line with the understanding that causality can be approached from multiple angles (see above). Furthermore, some of the workshop participants highlighted that causality is also multi-layered. This means that the time dimension (and causality) at the level of the conditions might be different than the time dimension (and causality) characterising the individual cases (case level). It however remains an open question on how to conceptualise this and in case integrate it into the logic and workings of QCA.

Acknowledging the continuum between longitudinal qualitative research and QCA, and strengthening the link between them makes because of five reasons:

1) QCA as an approach has its roots in qualitative research (Ragin, 2000);
2) casing and calibration can be the obvious link between in-depth longitudinal qualitative research and time-sensitive QCA;
3) QCA is iterative as QLR, and requires causal recipes that can account for differences across cases; and
4) qualitative researchers would also benefit from QCA as a formalised method, as they will be stimulated to be more articulated and transparent on how they inductively identify patterns and processes in the analysis of their data and from the replicability of the results.

New strategies and refinement of existing strategies that can both account for the development of cases over time (case-based evolution) and integrate it into the workings of QCA appear to be particularly relevant considering the points identified above.

On the other hand, the participants to the workshop found formalisation of time-sensitive data, in particular in the forms of guidelines and visualisation, to be particularly important when advancing in the integration of time in QCA research. Further research could possibly focus on the following research areas:

1) clarify how the collection and management of data for time-sensitive QCA can be carried out in a methodologically sound way;
2) identify the similarities and differences, advantages and disadvantages in the treatment of time-sensitive or longitudinal qualitative and quantitative data in QCA;
3) identify and compare the different goals, advantages and disadvantages of the different strategies mapped so far for time-sensitive QCA (see Table 2) to help researchers select which variant would be most appropriate for their research aims;
4) develop measures that can account for the temporality of configurations (e.g., more 'weight' to more frequent configurations to represent stability; identification of 'trigger points' where cases change configuration, or conditions or combinations of conditions having a particularly strong 'causal' power to produce the outcome, besides measures of coverage; representing the different duration of configurations and the different rate of change across cases) and solutions ('temporal' conjunctural causation, equifinality);

5) develop visual tools[3] beyond the truth table and the presentation of findings that can do justice to the time dimension of conditions, cases or both;
6) use already existing (both qualitative and quantitative) datasets to empirically test time-sensitive QCA approaches, also with the aim to diffuse knowledge about how it works (i.e., to move beyond just proposing interesting prototypes);
7) make QCA students, researchers and scholars more aware of the time dimension and of the heterogeneity of strategies currently existing and in development to deal with and integrate time-sensitive data in QCA.

Cross-cutting to both domains for further research is the strengthening of the epistemological relevance of including time in QCA, in particular from a complexity-informed perspective (e.g., complex causality, equifinality and multifinality over time).

3.1 Outlining some topics for the next Time-in-QCA (TiQ) workshop

The organisers of TiQ 1 aim for a workshop series to take place bi-annually. The following themes are considered for the next workshop:

- Casing and data preparation (i.e., data collected and prepared with the express purpose of setting standards for QCA)
- Further empirical testing and refinement of existing approaches. There are already have quite a few promising approaches within the community, but they need to be tested more thoroughly to see if they yield interesting results.
- Conversations with people outside of the community but adjacent to QCA. We find that it can be very helpful to listen to alternative angles on topics such as time and temporal causality.

[3] For instance, at the workshop Brian Castellani (see participants' list) presented COMPLEX-IT, an online toolkit written in R Studio that is freely available for non-experts to engage in case-based configurational research using the latest advances in computational modelling. Given that COMPLEX-IT is a case-based configurational approach that differs from QCA, and because of its emphasis on temporal modelling, this presentation was useful to explore, as a comparison, if and how it might help the integration of time in QCA (or how QCA can help COMPLEX-IT).

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5. Scholars attending the event (on-site / online)

Surname	Name	Affiliation	Country	Attendance
Cai	Min	IHS/Erasmus University Rotterdam	Netherlands	Onsite
Castellani	Brian	Durham University	United Kingdom	Online
Choi	Misook	Governance in Emerging Economies	Germany	Online
Gianoli	Alberto	IHS/Erasmus University Rotterdam	Netherlands	Online
Gerrits	Lasse	IHS/Erasmus University Rotterdam	Netherlands	Onsite
Hino	Airo	Waseda University	Japan	Online
Iannacci	Federico	University of Sussex	United Kingdom	Online
Mello	Patrick	Vrije Universiteit Amsterdam	Netherlands	Onsite
Neale	Bren	Leeds University	United Kingdom	Online
Niikawa	Sho	University of Kobe	Japan	Online
Pagliarin	Sofia	DPAS/Erasmus University Rotterdam	Netherlands	Onsite
Rihoux	Benoît	Université catholique de Louvain	Belgium	Onsite
Rubinson	Claude	University of Downtown Houston	USA	Onsite
Rupietta	Christian	University of Wuppertal	Germany	Onsite
Russo	Federica	University of Amsterdam	Netherlands	Online
Rutten	Roel	University of Tilburg	Netherlands	Online
Spekkink	Wouter	Erasmus University Rotterdam	Netherlands	Onsite
Vis	Barbara	Utrecht University	Netherlands	Onsite