



Technical Report

A historical analysis method for studies based on the Cultural-Historical Activity Theory

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Abstract: This study presents a historical analysis method grounded in the Cultural-Historical Activity Theory (CHAT), developed to reconstruct the developmental trajectory of an activity system. The method integrates the principle of historicity to identify critical events and phases of development. Based on the case of the Sustainable Swine Production Program (3S Program), the study demonstrates how historical events can be interpreted through analytical concepts such as period, historical events, critical events, phases of development, and the model of an activity system, revealing transformations in its object and structure. The theoretical contribution of the method lies in the operationalization of the principle of historicity in empirical research and in providing analytical tools to understand long-term changes in work activities. From a methodological perspective, the historical analysis method proposed herein offers researchers a systematic approach for examining data generated through formative interventions, such as those conducted within the Change Laboratory. From a practical standpoint, the method offers a framework for researchers and practitioners to analyze and support transformative processes in various contexts for the development of work and the resolution of social problems.

Keywords: Historical analysis; Historicity; Activity theory; History.



1. Introduction

Historicity is a fundamental principle both from a theoretical and methodological point of view in studies using the Cultural Historical Activity Theory (CHAT) (Engeström, 1987, 1999; Scribner, 1985) and the interventionist method of the Change Lab (Engeström et al., 1996; Virkkunen & Newnham, 2013).

Historicity is a concept or principle that proposes that all human activity is a historical process in constant transformation, and that it can only be fully understood if analyzed in its development over time. Historicity is a consequence of the basic philosophical presuppositions of materialist dialectics, on which the theoretical approach is based: contradiction and movement. As mentioned in other publications, CHAT understands the world in motion driven by contradictions (Sannino & Engeström, 2018). Development is driven by contradictions within a system. Therefore, if we want to understand why a system is the way it is, we need to trace the process and the contradictions that led to the current situation.

Because an activity is processual and in motion, the researcher must use a methodology that allows the analysis of the phenomenon in transformation, that is, through an analysis of history. This analysis makes use of longitudinal data at different time scales. Longitudinal data is data collected over time and allows you to observe changes, trends, and patterns of evolution. Among the research methodologies aimed at the analysis and development of an activity, the following stand out: *Developmental Work Research*, proposed by Engeström (1987). According to the author, the understanding of expansive learning requires the combination of methods on different temporal scales, among them: a phenomenology (a description of the problem, actors involved, and functioning of the activity studied), theoretical-historical analysis, object-historical analysis and actual empirical analysis (Engeström et al., 2005).

Here I will focus on the object-historical analysis. Despite the name, this analysis also implies identifying and analyzing the successive phases of development of the activity system. Its objective is not only periodization, but, above all, to reveal the contradictions that give rise to the transitions from one phase of development to another (Engeström, 1987). To do so, data from a broader time scale is used, usually covering months, years, or in some cases even decades. Here chronological times are not so important, but rather capturing the development of a system.

In the Developmental Work Research methodology, the object-historical analysis is typically conducted prior to the actual-empirical analysis, as the object-historical analysis provides general hypotheses about the sources of contradictions arising from changes within the system, which is later on enriched by the actual empirical analysis. The role of historical analysis is to help understand the historical process underlying the formation of the current structure of an activity, that is, how and why the present structure, which is examined in more empirical analysis, has come into being. The focus is on identifying the events and contradictions that have shaped the current structure.

Examples of actual-empirical analyses include discourse analysis of manifestations of contradictions (Engeström & Sannino, 2011) and the analysis of disturbances (Engeström, 2008; Helle, 2000; Querol & Seppänen, 2012). The purpose of the current empirical analysis is to detail the present structure and to test and refine the hypotheses about contradictions generated through the historical analysis of the object. In other words, by reconstructing the sequence of manifestations of contradictions in the present—through a closer, more data-rich examination—it becomes possible to understand in greater detail the tensions within the system that have led



to these manifestations, thereby enriching the hypotheses derived from the historical analysis of the object.

Historical analysis allows the production of generalizations that Davydov (1990) calls genetic-theoretical generalizations, which are explanations of the origin and development of a system (Davydov, 1990). Current empirical analysis may involve, for example, analysis of discursive manifestations of disturbances and innovations. Both historical analyses and current empirical analysis complement each other.

During a Change Laboratory intervention, historical analyses are also conducted (Virkunen & Newnham, 2013). First, a pre-liminary analysis is conducted, allowing the interventionist researchers to orient themselves and plan the learning process. During the sessions, the analysis is resumed as a conceptual and formative tool, supporting both the participants and the interventionist in the creation of new concepts and in the expansion of collective learning. Finally, it can be performed after the intervention, when used as a research method to examine the collected data and answer one or more research questions. The method presented below refers to this last form of analysis — more refined and judicious — conducted by the researcher for analytical purposes. Although it can use data from the analyses carried out before and during the intervention, it is a different procedure, specifically aimed at the production of scientific knowledge.

Many studies have already been conducted conducting historical analyses through CHAT (Kajamaa, 2012; Mäkitalo, 2005; Querol, 2011). Although these previous studies present the method—on which the approach proposed here is based and with which it shares important similarities—their primary focus lies in reporting the results of the analysis rather than the method itself. Consequently, they do not provide detailed guidance on how to apply it in practice. In contrast, this paper focuses exclusively on the methodological dimension, offering more in-depth discussion and practical suggestions for its application and further refinement.

The objective of this study is to discuss what it is, its importance and how to make a historical analysis of the object. The study aims to answer the questions: what is a story? What data can be used? How to build a historical narrative? What analytical concepts can be used? And how to interpret and formulate hypotheses of contradictions? To illustrate the method and the concepts presented, I will use as a basis a previous study conducted by me on the development of a sustainability program in pig production in Brazil called the 3S Program.

Below I present the concept of history and the main analytical concepts used. The following will be exposed the type of data that can be used and how to prepare it for analysis. Then I present the method, that is, the step-by-step process for writing the narrative and the process of theoretical interpretation. I continue to present the results of the empirical analysis of the history of the 3S Program and finally the conclusions.

2. History and analytical concepts

According to the definition of the Cambridge dictionary, history is “the study or record of past events considered together, especially events of a specific period, country or theme” (Cambridge Dictionary, 2025). History can be understood both as the science that studies past events, and its product, that is, a narrative that relates a sequence of historical events. Here it is important to differentiate with the notion of story (*Story* which can refer to both real and fictional events. The story refers to real events. An event can be defined as something that has occurred, being either an action in which someone, an actor or agent (individual, group, organization, community, country) did something; and a natural event (e.g., a landslide, a storm, the eruption



of a volcano). However, no matter how real an event is, it does not mean that a story is totally impartial. What we can do is make the criteria as explicit and clear as possible in order to avoid bias and allow the reader to judge and understand the perspective and potential biases.

Due to the complexity of reality, it is not possible to count all the events that occurred in the past. Some events must be chosen to enter the narrative. When choosing certain events, others are inevitably excluded. Depending on the events chosen, one perspective may be favored and others excluded. History was and is used as a way to exercise power.

In order to be considered scientific and minimize the bias of a historical narrative, researchers must explain the criteria for selecting events, as well as the theoretical and analytical concepts used in their interpretation. Below I will present some of these analytical concepts that can be used in a historical analysis of the object based on CHAT (Querol, 2011).

2.1 Historical and critical events

To analyze the historical development of a system, a historical event can be used as a unit of data. Unit of data refers to the smallest element of information that is collected, recorded, and analyzed in the study. Sewell Jr. (1992, p.16) defines historical events as “occurrences that have significant consequences in history”. As he suggests, events are conceived as sequences of occurrences that result in transformations of structures (Sewell Jr, 1996, p. 17). But what does structure mean? According to Sewell Jr. (1992), a concept of structure must be able to (1) recognize the agency of social actors, (2) incorporate the possibility of change in the concept of structure itself, and (3) overcome the division between semiotic and material views of structure. To formulate his concept of structure, Sewell (1992) uses Giddens’ theory of structuration, in which structures are considered processes and not fixed states.

The analysis of a sequence of events should not consider all events, but only those that alter the relationships between the elements of the system, which represents the structure of a human activity. The concept of historical event proposed by Sewell Jr. (1992) is quite similar to the concept of a historical event proposed by Poole (2000), who defines it as actions that transform the structure of an activity (Poole et al., 2000, p. 170). This concept is also close to the concept of critical events, understood as events that result in a change in the structure of a system of activity (Toiviainen, 2003).

CHAT is compatible with Sewell’s idea that structure and processes are dialectically connected: structure shapes the process, and process affects structure. An activity is always a process of production of an object that directs and motivates the actions of the subjects, which is mediated by a structure of an activity, by the model of a system of activity (Engeström, 1987).

The relationship between actions and activity in CHAT is dialectical; they cannot be understood in isolation. This implies that, to analyze the developmental process of an activity, it is necessary to examine its building blocks—the actions that have shaped its constituent elements. Both events and historical events encompass the actions that have contributed to the formation of an activity system.

Adopting events and historical events as the unit of data (the minimal unit of empirical evidence) does not mean neglecting collective activity. On the contrary, since an activity is constituted by actions, focusing on these events allows us to trace the concrete processes through which the activity itself has evolved.

It is important to distinguish between the unit of data and the theoretical unit of analysis. The theoretical unit of analysis refers to the activity system as a collective, object-oriented



structure under investigation. The unit of data, by contrast, refers to the minimal empirical fragments that we examine—in this case, actions captured as events or historical events. In historical analysis, these events—representing actions at the micro level—serve as the building blocks through which the collective activity and its transformations can be reconstructed. Thus, while the activity system is the theoretical lens through which change is interpreted, the events and historical events provide the empirical entry point for understanding how the system emerged and developed over time.

2.2 Developmental cycle and developmental phases

To understand the qualitative changes during development, the concept of period is necessary. A period is a “stretch” of history in which something essentially new develops and can alter the direction of development. A period is generally understood as a time during which the principle and direction of development remain the same, and the period changes when they change (Querol, 2011).

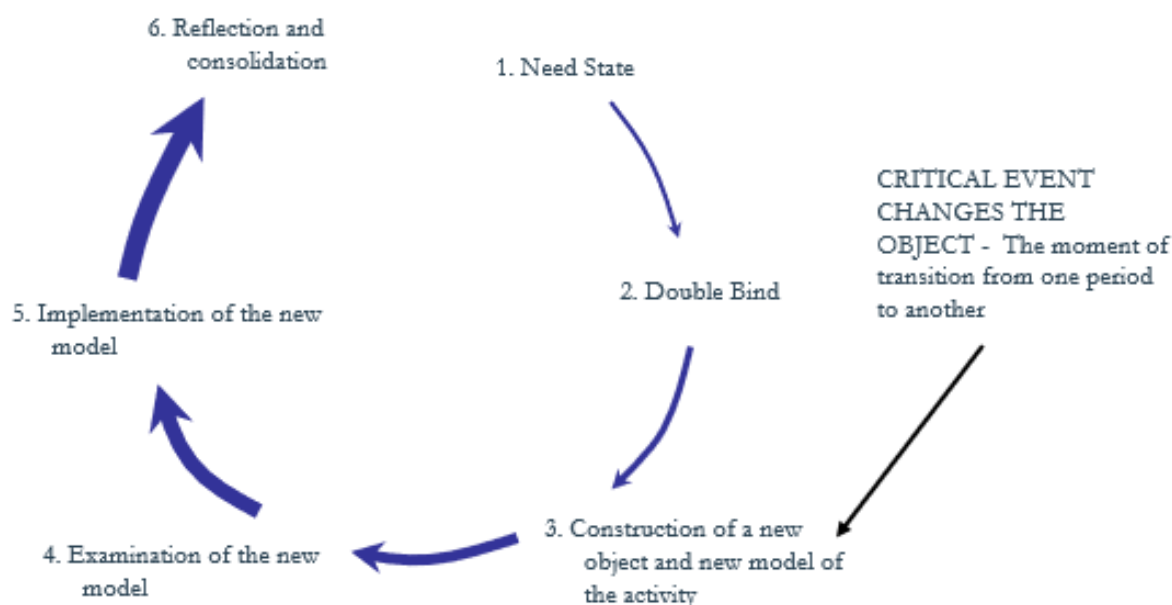


Figure 1. Representation of the relationship between cycle of expansive learning and the transition from one period to another

In this definition, it is necessary to deal with the concept of developmental directions. It is important to differentiate between historical periods and developmental periods. All periods are historical, but not all are developmental. Something can change, but it does not necessarily constitute development. Development here, means overcoming an essential internal contradiction of a given system under study. It is related to a value or a preferable direction to be followed. In research, the researcher is not interested in all types of periods, but specifically in those in which there is development of the object under study. Periods always refer to time. A period is a stream of historical events that share a significant characteristic of their own. In the analysis of the periods of an activity, the periods are related to the object of an activity or a network of activities (Querol, 2011).



A developmental period can be compared to a period of expansive transition. It is important, however, to distinguish two complementary representations of the same phenomenon: the cycle of expansive learning actions and the expansive learning cycle. As the name suggests, the cycle of expansive learning actions describes the learning actions carried out by the subjects (such as questioning, analyzing, modeling, and implementing), while the expansive learning cycle represents the phases of transformation and development of the collective activity itself.

A developmental period would be a space of time in which the object remains unchanged, and a new period begins when the object of activity changes. The point in the expansive learning cycle at which a new object of the activity is created is considered to be the point at which a new period arises. In this interpretation, a period can refer to either an expansive, repetitive or retractive cycle. This classification is directly related to the object of the activity. Expansive cycles occur when the object of the activity expands—that is, when it acquires new qualitative characteristics and becomes enriched. In contrast, in a repetitive cycle, the object remains largely unchanged, while in a contractive cycle, the object becomes diminished, losing some of its previously established qualities.

Using the expansive learning cycle as a framework for analyzing a period, we can divide it into phases, according to the nature and dynamics of the change process. A phase corresponds to a moment in the development process in which a specific type of contradiction predominates in the system. These contradictions are the driving forces that generate the dynamics of change characteristic of each phase (Querol, 2011). In the expansive learning cycle we have the phases of need state, double bind, phase of emergence of a new object, implementation and consolidation (Engeström & Sannino, 2010).

The identification of developmental periods can represent an analytical challenge, especially because the boundaries between one period and another are not always clearly demarcated. A useful strategy is to use the periodization proposed by the participants or interviewees themselves, observing how they narrate the changes in their activities over time.

Next, in order to illustrate the analytical concepts mentioned, an analysis of a sustainable pig production program called the 3S program implemented by a large Brazilian agribusiness in the early 2000s will be presented. The objective of the analysis was to evaluate whether or not the changes within the period are expansive (Querol et al., 2010; Querol & Seppänen, 2009).

3. Historical data and collection methods

Here I will address the questions: what data can be used in a historical analysis and how to collect it?

3.1 Type of data

It is important that historical analysis is based on different types of data that complement each other in order to increase their validity and reliability. Two types of data commonly used in historical analysis are interviews with key informants and documents. The interviews provided the advantage of showing and situating the research by giving an “overview” of the sequence of events and outcomes, which helped to identify the most important events (Poole et al., 2000). However, this process is biased and can be flawed as it depends on people’s memory. People forget events that could be relevant. Also, people can’t accurately remember the dates of events. To overcome this limitation, it is recommended to use documents. Archived data has



several advantages, such as the fact that it takes much less time to collect and details events that people may have forgotten (Poole et al., 2000).

In interventionist research, historical data is typically gathered prior to the intervention. Such data help the researcher grasp the underlying contradictions and the need for change, while also serving as mirror data to inform participants' historical analyses during the sessions. However, for research purpose, it is also possible to conduct historical analysis after the intervention, enriching the pre-intervention data with additional historical material generated during the process. This approach may enable the researcher to contrast and enrich the initial analysis, thereby enhancing its depth and validity.

3.2 Data collection and organization

3.2.1 Historical documents

Documents can be collected in different ways. In the study on the history of the 3S Program for sustainability in swine production, the type of document varied according to the period analyzed. I collected documents during my visit to the company's offices and obtained from the Internet, from official websites of institutions or from other sources. These documents include project documentation, letters, guidelines, checklists, reports, presentations, online news and newspaper articles, scientific articles from research institutes, and articles in journals specializing in swine production.

It is important that the collected documents refer to the specific local activity under study. In the case of the research illustrated by the 3S Program, most of the documents were related to the company and its network of supplying farmers. However, because the company operated at a national level, for the earlier decades of the 1980s and 1990s—when the goal was to understand broader contextual and historical transformations in the market and production model—I used documents that reflected the evolution of Brazilian pig farming more generally. For the subsequent periods, I focused on documents explicitly addressing the specific problems faced by the company's pig suppliers, as well as the actions and projects developed by the company to address them.

To cover the analysis of the period between the 1980s and the end of the 1990s that anticipated the emergence of the program, I used data from empirical studies (theses, publications in magazines and news). The objective of analyzing this phase was to understand the context in which the activity was found and the general changes that occurred in the production system. This period was mainly covered by empirical studies that presented the history of pig production and its related environmental consequences in the region (Miranda, 2005).

The data collected in the period between 1999 and 2003 was based mainly on documents in the form of news reports, company annual reports and power point presentations available on the internet. These were found through Internet search programs, combining the name of the company that initiated the Sadia program and keywords such as pig manure management, environmental certificates, biodigesters and bioremediation. The main source of documents was the company's website, which had an archive of internal news since 2003 and annual reports to investors since 1998. Other Internet pages that provided useful data on new events and on the design of documents were also used. The events of the 2003 and 2007 periods were based on documents available on the internet, but also documents provided by the company during the visit to the company's offices, and the interviews.



The documents collected were separated into three groups: report documents, operational documents and explanatory documents. Report documents are those that describe what happened or was happening, such as news or field reports from technicians. Operational documents refer to those used as tools to explain how tasks should be accomplished, such as guidelines, standards, or design documents. Empirical documents, on the other hand, are scientific studies. In practice, this differentiation is not very clear, as documents can have multiple characteristics. For example, they can report something and also include a study. In addition, it is possible to argue that all documents are operational, as they have meaning and function for someone. However, the choice was still made to differentiate them to facilitate their use for analysis.

3.2.2 How to conduct historical interviews?

Initially, interviews were conducted with key actors, such as managers, engineers, field technicians, farmers and a consultant. The interviews were open and semi-structured. Some examples of initial questions were: could you tell me how the program started? Who started it? Despite trying to avoid cutting off the interviewee's line of reasoning, it was sometimes necessary to obtain more detailed information. Why did this happen? What important events preceded it? Do you remember when this occurred?

Regarding the selection of interviewees, it is advisable to ask the stakeholders themselves for suggestions of people who are familiar with the history of the activity. Naturally, the researcher must start somewhere—often with individuals whose names appear in public reports or news articles. As the process unfolds, each interview can lead to the next through the *snowball method*, where interviewees recommend additional relevant participants.

The number of interviews should be determined by the principle of saturation: once the information begins to repeat and no new insights are emerging, it is reasonable to stop. In the historical analysis of the 3S Program, for example, I began by interviewing an engineer whose name I found in a news article. Subsequently, I interviewed the company's director of the sustainability institute, another engineer, and a consultant involved in projects assessing the potential for carbon credit generation, and so on.

In addition to recording the audio interviews, I asked the informants to prepare a timeline containing the events they considered most relevant (Figure 2). The timeline essentially consisted of a blank sheet of paper with a horizontal line, serving as a guide for chronological organization. This instrument proved to be particularly useful, as it helped the interviewees to systematize the events and to mentally revisit different periods, favoring the recollection of facts and allowing them to move forward and backward in time in a more orderly way.

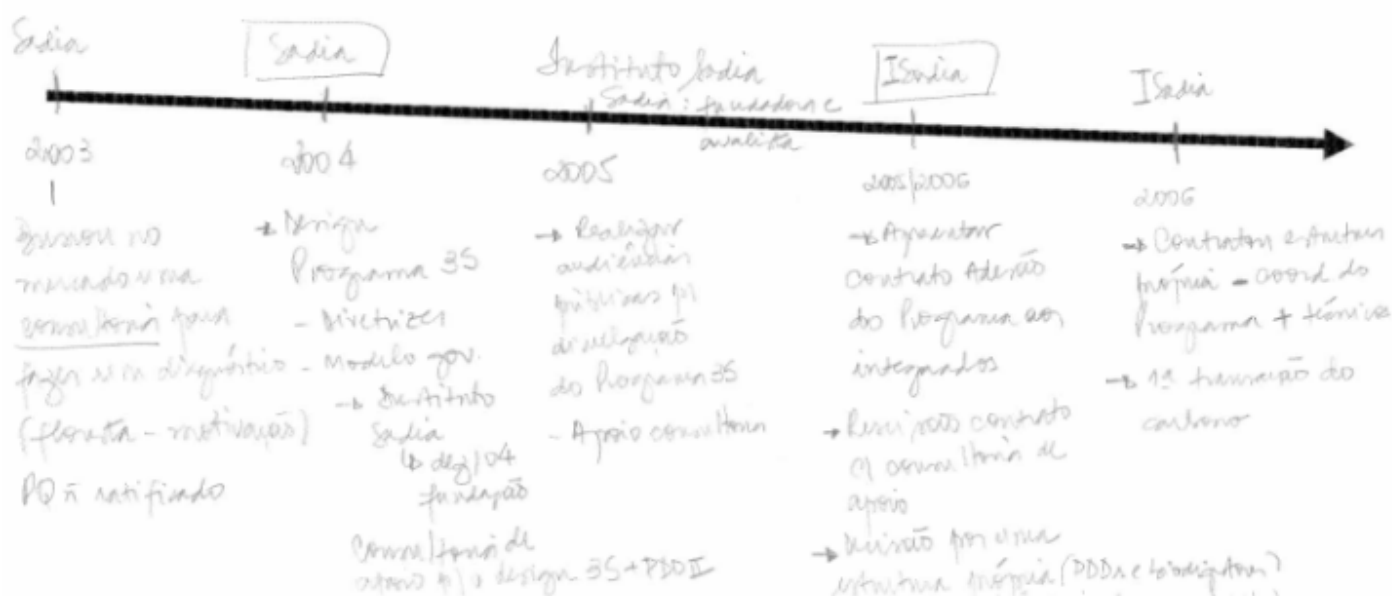


Figure 2. Example of a timeline produced by one of the interviewees

In the period from 2003 onwards, there was a much richer availability of documents, such as PowerPoint presentations and program descriptions, which help confirm the accuracy of observations about events. Historical events were, when possible, confirmed by means of documents.

4. Analysis method (step by step)

The first step in object-historical analysis is to identify all the historical events you can find in the data. The researcher, when reading the documents or transcripts of the interviews, can underline with a certain color the parts where historical events are mentioned (actions in which someone does something that changes the structure of the activity).

The concept of a historical event is operationalized as *an instance in which a subject takes an action that leads to a change in activity*. Some examples of events from Excerpt 1 are highlighted in bold. A series of events are pointed out that lead to relevant changes: replacement of fossil fuel to renewable fuel in the plant's boilers and the emergence of the idea of using it for obtaining carbon credits. Therefore, these series of events are considered historical events as they change the structure of the activity that is considered in the analysis. The interview presents a sequence of events. For instance: the engineer moves to São Paulo to work at the energy unit; people begin discussing the Kyoto Protocol; the engineer develops the idea of using forests to obtain carbon credits; he learns how to replace the factory's fuel from liquefied gas to wood and gains further knowledge about the Kyoto Protocol; subsequently, the company ceases using fossil fuels in the plant's boilers.



Excerpt 1. Excerpt from the interview with the company's engineer 12/22/2006

Interviewer: But how did the idea of producing biogas come about? Why...?

Engineer: Good.

Interviewer:... That Sadia has begun...

Engineer: Let me tell you the story. **In 2003, I had... I came here to São Paulo and started taking care of the engineering area**—project engineering and, more specifically, energy engineering. At that time, the Kyoto Protocol had just started to gain attention. **People began talking about it** more, because for several years it had been kind of forgotten, locked away somewhere, and no one really mentioned it.

Since we have a lot of eucalyptus forest for our boilers—to produce steam, as our boilers basically run on wood—and we manage large areas of planted eucalyptus, **the idea came up that we could use these forests to claim carbon credits**. After all, eucalyptus is carbon neutral, and we constantly maintain and renew our forests. **So, we started to study what could be done.**

As I began to look into the issue, I learned about fuel substitution and began to understand what the Kyoto Protocol was really about. That same year, we were working on twelve projects to replace fossil fuels with wood in some of our units. For example, we had a small gas boiler in Ponta Grossa, and we modified our central boiler system to stop using that gas boiler and instead supply steam from our central unit to that part of the factory. In this way, we stopped consuming fossil fuel—LPG in that case—and switched to burning wood. We also replaced a heavy oil boiler in Chapecó.

Once identified, the events are placed in a file and organized in chronological order. For example, a table with the events and dates, organizing them according to the sequence in which they occurred. Some events can be repeated across different data sources. In some cases, for example in interviews, the informant may provide a very broad estimate of the timing of the events, such as a year or half a year. To organize in chronological order, the researcher will need more detail of the date of the event. By cross-checking the events mentioned in the interview with other data sources (e.g., documents), one can refine the dates and define them more precisely, such as months or days. Another way to refine and validate events is by cross-referencing interviews with different people, asking for more details after the interview when necessary, or conducting collective historical analyses, as is the case with interventional research.

The second step is to write a historical narrative. Based on the events listed in the table or list, a narrative of the story is constructed, aiming to obtain a more logical sequence of events. A narrative not only cites the events but connects them in a way that can be understandable to the reader. To exemplify how the events from the raw data becomes a narrative, I present in excerpt 2 a piece of the historical narrative that was written by combining the data from the interview with the Engineer from Excerpt 1 with data from other documents and interviews. The sequence of events was organized in a logical order to form the narrative.



Excerpt 2. A piece of the historical narrative referring to the interview with the Engineer from the company in December 2006

At the beginning of 2003, Sadia's Chief Financial Officer, a member of the executive board, became aware of the Kyoto Protocol and came up with the idea of obtaining carbon credits from the company's forests. The forests were already used as a source of firewood for the boilers of food processing units. The initial idea was to use the mechanism of the Kyoto Protocol to increase the areas of eucalyptus forests more efficiently (Interview, December 22, 2006).

The third step is to identify critical events, i.e., events that change the structure of activity systems (see definition above). To this end, events can be interpreted using the elements of the activity system (subject, instrument, object, rules, community, and division of labor) as analytical instruments. One strategy for identifying critical events that I used in the analysis of the 3S Program was to return to the interview data for clues that indicated that the event was important. For example, I compared interviews and verified which events were highlighted by the informants as relevant. Another indicator is how many respondents mentioned the same event.

A fourth step is to “cut” the narrative into periods. As mentioned above, a period is a temporal stretch of the sequence of events where an activity presents a certain object. To “cut” the narrative, one seeks the critical events that changed the object of the activity. The object determines when one period ends and a new one begins. The process of changing the object can be sudden, coming from a critical event (e.g., a new law or a visit, a lecture) or gradual that occurs gradually during months, years or decades. The researcher should look for events that show the change or manifestation of the change of the object in the activity. (e.g., something is discovered, a project is launched, a pilot is tested, a first patient with a new approach, etc.). Identifying critical events can be made easier by using the timeline, where respondents themselves point out the most important events and insert them into the line.

The fifth step is the theoretical interpretation, reconstructing the system of activity and the contradictions of the specific local activity that is being analyzed. It is up to the researcher to decide whether or not to analyze the system of activity of all periods or to concentrate on the most recent periods. This will depend on the object under analysis, the interest of the research, and the availability of data, among others. The researcher may also want to make an interpretation of the developmental phases for each period using the expansive learning cycle as a model.

In presenting the results of historical analysis, the question arises of how to articulate theoretical interpretation with historical narrative: should they be presented together or in separate sections? Both approaches have advantages and limitations. The main advantage of presenting the results of the historical narrative separately from the theoretical interpretation is to allow the reader to clearly distinguish the facts and empirical results from the interpretation carried out by the researcher. On the other hand, the disadvantage of this separation is that the reader may have difficulty retaining the sequence of events when they reach the interpretation section, requiring the researcher to resume or re-present the events to contextualize the theoretical analysis.

An intermediate solution consists of indicating to the reader, from the beginning, that the theoretical interpretation will be presented at the end of each historical period. In this way, the distinction between empirical facts and interpretations is kept explicit, without requiring the reader to memorize the entire sequence of events in order to understand the analysis. In addition, it is important, whenever possible, to explain the reasons that underlie the interpretations



presented, allowing the reader to understand not only the conclusions, but also the analytical process that supported them.

Figure 3 represents the main stages of the method of historical analysis of the object proposed in this study.

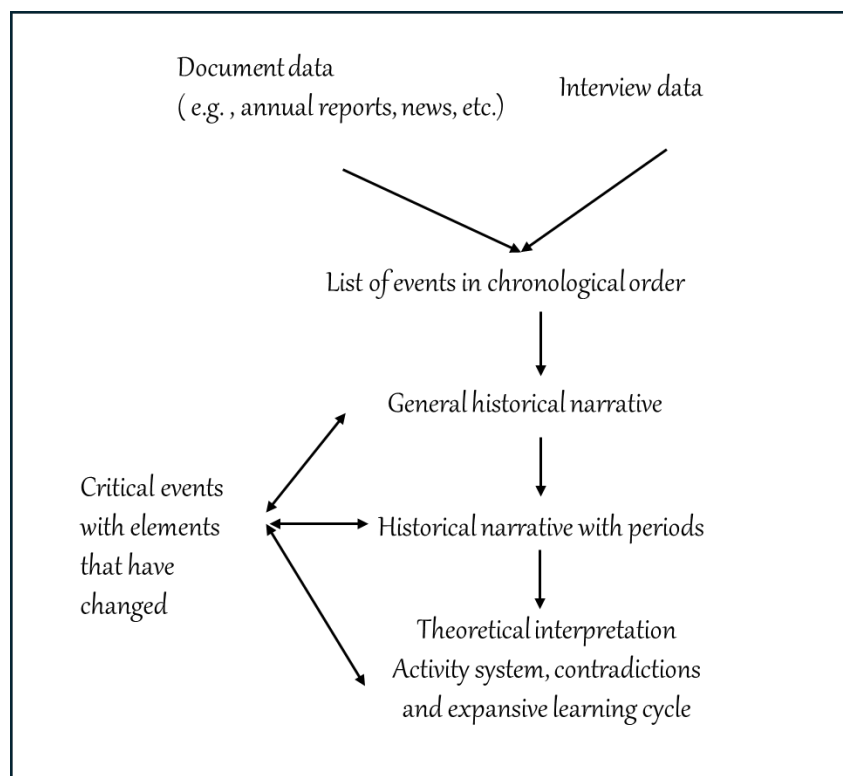


Figure 3. Representation of the process of historical analysis

In summary, the historical analysis of the object is composed of four basic steps:

1. the identification of historical events in the raw data;
2. the organization of the events identified in a list, in chronological order;
3. the elaboration of a metanarrative that presents the events in a logical sequence of events;
4. the “cutting” of the narrative into periods using as an analytical concept critical events;
5. theoretical interpretation, for example, using the activity system model, contradictions, and the expansive learning cycle.

5. An example of historical analysis: The emergence and development of the 3S program

For reasons of space, I will not present the entire result of the historical analysis of the 3S Program. The intention is only to illustrate the use of analytical concepts and the stages of analysis. Anyone interested in reading the results in full can do so by accessing my doctoral thesis (Querol, 2011).

To briefly contextualize the reader, the 3S Program aimed to increase sustainability in pig production. The program was financed by the company Sadia, which bought pigs from third-party producers for use in food production. In the late 1990s and early 2000s, the context was



one of increasing pollution of local water resources caused by pig manure, which led to the signing of a term of adjustment of conduct between the State Public Prosecutor's Office and local agribusinesses to face the problem.

The 3S Program consisted of the implementation of biodigesters for the production of biogas and carbon credits. The central idea was to reduce the emission of greenhouse gases from pig production, mainly methane, by capturing and burning biogas. The project was prepared and submitted for validation by the UNFCCC (*United Nations Framework Convention on Climate Change*), allowing carbon credits to be traded to finance biodigesters and generate additional income for farmers.

Next, I will present an example of data, historical narrative and its interpretation. In excerpt 2 you can read a piece of the historical narrative where I present the exact moment when pig waste changes meaning from a pollution-causing waste to an income opportunity through carbon credits. In the narrative, I put in parentheses the source of the data of the main events.

At the beginning of 2003, Sadia's Chief Financial Officer, a member of the executive board, became aware of the Kyoto Protocol and came up with the idea of obtaining carbon credits from the company's forests. The forests were already used as a source of firewood for the boilers of food processing units. The initial idea was to use the mechanism of the Kyoto Protocol to increase the areas of eucalyptus forests more efficiently (Interview, December 22, 2006).

To evaluate the possibilities, in the first half of 2003, Sadia hired a consulting company (here called Empresa Sigma) to diagnose and prepare a project to obtain carbon credits. In March 2004, the consulting firm issued a report in which it indicated that only three of the twenty projects identified were considered viable to apply for carbon credits. **These projects aimed to produce biogas from the treatment of pig manure** (Interviews of December 22, 2006 and May 16, 2007).

At this stage, the importance of pig waste treatment changed: it is no longer just a technology to solve an environmental problem and has become an opportunity to generate extra income for the company. Sadia's Sustainability team was created to design and implement the project (Document, PDD1). The technology related to the biodigester and the burning of gas was acquired in the market, from a company called Sansui. Sadia's engineers called the model "engineered", referring to the fact that the installation required the supervision of engineers.

As the Project Design Document (PDD) was drafted, the team identified several economic and environmental benefits arising from the production of biogas to obtain carbon credits. The project was presented to Sadia's executive board, whose members were surprised by the large amount of potential tons generated in the project (242,000 tons in 10 years). The executive board decided to implement the project and expand it to all 24 Sadia swine breeder production units, which initiated a second set of "carbon projects", PDD2 (Presentation, May 30, 2005). In October 2003, the carbon credit project began operating at Sadia (Notícia, March 4, 2008).

To summarize, during this period, the objective of waste management on Sadia's own farm changed from a means of adjusting the farm to the requirements of environmental legislation to a way of obtaining extra income. The event that marked this transition was the evaluation of opportunities to request carbon credits within the company. The company found that only BP projects could be used to apply for carbon credits. The technologies adopted, as well as the methodology to be applied, were suitable for large farms.

The design of the 3S Program (2004–2005)



During the first half of 2004, Sadia's Sustainability team realized that the carbon project could also be used as a potential instrument to adapt the farms of outsourced pig producers to environmental legislation, in addition to representing an opportunity to improve the sustainability of the entire pork production chain. They realized that the carbon project could be extended to the entire production chain, helping to achieve fully sustainable waste management and solve environmental problems that were hampering the productive capacity of some farms due to the difficulty of obtaining environmental permits (Interview with Kátia, May 2007).

As previously mentioned, after the elaboration of the narrative, the historical events are interpreted in the light of the constituent elements of the system of activity. In this stage, the objective is to identify the events that triggered significant transformations in the system. This classification is fundamental for the modeling of the system of activity in a given period and for the formulation of hypotheses about possible internal contradictions. Table 1 presents an excerpt of the critical events identified in the analysis of the 3S program.

Table 1. Examples of critical events and the respective elements of the activity system that they modified.

Historical event	Element in the activity system that has changed
Regional meetings to discuss the problem of pollution caused by pig production (1993)	Subject: Pollution from pig production becomes a problem
Signing of the TAC – Conduct Adjustment Agreement (June 2004)	Rules: Agreement that obliges agribusinesses to help outsourced farms to comply with environmental legislation
Idea of using biogas for carbon credits to adjust outsourced farms (first half of 2004)	Subject: Sustainable pig production through the production of biogas for carbon credits
Consultancy hired to help design the program (2004)	Division of Labor: Consultant Community: Consultant
Foundation of the Sadia Institute of Sustainability (December 2004)	Division of labor: The Sadia Institute becomes responsible for the design and implementation of the 3S Program

Below I will present an excerpt from the theoretical interpretation carried out in the historical analysis of the 3S program. In the study in which I conducted the historical analysis (Querol, 2011), I analyzed only a single cycle of expansive learning in which Phase I corresponded to the need state, in which there was a social recognition of the problem of pollution caused by pig waste. Below, I illustrate with Phase III, the moment when the new object of the activity is constructed. This moment marks a change in the object, therefore representing the end of one period and the beginning of a new one. In this case, the object — pig manure — changes its meaning: from being regarded as a source of pollution to being seen as a potential source of income and renewable energy through the production of biogas and carbon credits. This is the “birth” of the 3S Program. In the example, the critical events are interpreted using as a theoretical apparatus the elements of the activity system and the concept of contradiction.

[...]

Phase III – Construction of the new object/motive: The conception of the 3S Program (2004–2005)

In 2004, Sadia's Sustainability team identified a new object — biogas (BP) and carbon credits — as a potential financial and technological instrument for the adaptation of outsourced farms.



This new object could solve, or contribute to solve, the contradiction in the food production chain related to the inadequacy of outsourced farms to comply with environmental legislation. The idea was presented to the company's top management and approved.

As the team began to model the project, they realized that it could favor the environmental sustainability of pig production as a whole. The inclusion of waste management and carbon credits through biogas (BP) in the object of pig production on outsourced farms would expand the object of the activity.

With the launch of Sadia's **Sustainable Pig Production Program**, or **3S Program**, Sadia expanded the object of its own activity by assuming responsibility for the development of production systems on outsourced farms. Biogas (BP) then became an instrument to achieve sustainable pig production.

[...]

This phase corresponds to the **construction of the new object**: a more sustainable pig production, in which biogas (BP) was used as an instrument to make its realization viable.

[...]

In the description above we can observe the moment of appearance of a newly expanded object. Pig manure is no longer seen as a source of pollution and has become a source of income through biogas and the sale of carbon credits. This change represents the occurrence of expansive learning. This change is a critical event in which the object changes and characterizes the emergence of a new period of development. The analysis can go on to present the structure of the system of activity at the end of the period and the potential historical contradictions that have affected the system in the past and present.

6. Conclusions

The present study presented a method of historical analysis based on the Cultural Historical Activity Theory, with the objective of explaining how to reconstruct the development of an activity system over time. The proposal emphasizes the importance of historicity as an epistemological and methodological principle to understand the transformations driven by internal contradictions in the systems of activity.

The article contributes by systematizing, in detail, an analytical procedure capable of operationalizing the principle of historicity in CHAT. The proposed method integrates concepts such as historical event, critical event, developmental period and expansive learning cycle, articulating them in a step-by-step methodological script. This systematization offers an analytical tool to understand the genesis and development of objects of activity and their contradictions. In addition, by proposing the combined use of different scales and data sources, the method reinforces the reliability and validity of the results.

The suggested method can be applied in empirical research aimed at understanding the emergence and development of human activities. The application illustrated through the analysis of the 3S Program demonstrated how the method allows the identification of the critical events that configure the development trajectory of an innovation.

The method presented in this study constitutes a possible proposal, which should always be adapted to the object of analysis, the types of data available and the specific objectives of the research. The version developed here is designed to examine the historical development of a



relatively well-defined phenomenon—a corporate program of sustainable pig production—and thus configures a clearly defined system of activity. However, the growing complexity of contemporary social practices, marked by the intensification of the social division of labor and the interdependence between multiple systems of activity, demands the adoption of broader and more dynamic theoretical units of analysis, such as networks of systems or heterogeneous coalitions of activities. This scenario points to the need for new studies that adapt the method proposed here or develop alternative approaches capable of dealing with these more complex forms of interconnection and historical transformation.

Despite these restrictions, the proposed method offers a relevant contribution to the methodological advancement of studies based on CHAT, by making the procedures for analyzing the historical development of human activities more explicit. Future research may extend and refine the method, applying it to networks of activity systems and heterogeneous multilevel coalitions, as well as to emerging phenomena related to sustainability and social innovation.

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