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From the abstract to the concrete and beyond: the winding road of constructing a conceptual framework

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Abstract

Methodological procedures are frequently described using ideal-typical sequences and relatively linear phases, often covering the whole research process. We aim to uncover the long-term process of construction of a conceptual framework of a study as constituted by cycles using the method of ascending from the abstract to the concrete (AAC) as a starting point. Empirical research often requires the introduction of intermediate concepts between general theory and data. In this paper we follow how a specific intermediate concept – the intermediary object – was constructed and interpreted in two research cases: 1. the use of building information modelling (BIM) in collaboration

1 The article contains equal contributions by two authors. It is based on two conference presentations: 1. Paavola & Vetoshkina, 'Moving from the abstract to the concrete: Opening up the object of activity with intermediary objects' at EARLI SIG17 and SIG25 2018, Cambridge, UK; 2. Paavola & Vetoshkina: 'Intermediary objects: between historically formed and situationally constructed objects' at the FERA Conference on Education 2018, Tampere, Finland. In the text, 'we' refers to Vetoshkina & Paavola, apart from in the Cases and Results sections, where justification for pronoun use is mentioned separately in the footnotes.

between designers, architects and engineers in construction projects; 2. the craft of historical wooden boat building in Russia and Finland. Using 'manuscript archaeology' we follow the construction of a conceptual framework by analysing the development of the key texts and documents in these cases. In both c80-ases the process contained multiple 'episodes'– relatively independent and complete parts of research process, constructed around specific tangible products (like a conference paper or a draft of an article), but forming a sequence when taken together. Each episode contained own cycle of movement from the abstract to the concrete, and the whole research process constituted a relatively autonomous but interconnected network of methodological cycles, where concepts emerged based on conceptualizations from previous episodes. This shows how transmethodological processes of constructing a conceptual framework for a specific study through multiple methodological cycles often develop across a long period, with both vertical movements between theory and data, and horizontal movements between theoretical conceptualizations.

Keywords: *intermediate concept, object of activity, intermediary object, methodological cycles, cultural-historical activity theory, theoretical operationalization, methodological operationalization, transmethodology.*

Introduction

There are multiple ways of reconstructing how a conceptual basis for a specific research case is shaped. Much research on learning and educational sciences, according to Engle, Conant & Greeno (2007) includes progressive refinement of hypotheses, or a dialectic process of constant interaction between data and theory throughout the research process. Within cultural-historical activity theory, or CHAT, Engeström (2015) suggests that the construction of a conceptual framework of an empirical study typically requires the introduction of intermediate theoretical concepts between the 'general theory' and the data (Engeström, 2016). The recently developed transmethodological approaches (e.g. Khawaja & Mørck, 2021, this issue) focuses on building methodology based on transgressive interaction between analytical, empirical and theoretical engagement in a certain field of study. This kind

of breaking away from different theoretical and methodological traditions also requires opening processes of interaction between various theoretical concepts and methods in research practices.

Even when the process and nature of interaction between different elements in research is discussed and elaborated in detail, the sources of the intermediate concepts often remain unclear in methodological descriptions. One reason for this might be that the actual activities of generation of new ideas or the 'context of discovery' has long been a neglected area in methodological literature (Paavola, 2006). How are intermediate concepts typically generated in practice? Where and how does one obtain fertile intermediate concepts? How can their dual nature – a need to match the affordances of the data and help in the theoretical interpretation of the analysis – be articulated?

The aim of this paper is to describe a complex process of constructing a conceptual framework through application and further elaboration of the method of ascending from the abstract to the concrete (AAC) (Ilyenkov, 1982/2008). The AAC method is utilized and applied especially in CHAT to understand the development of theoretical concepts by grasping the essence of a phenomenon by tracing and theoretically reproducing the logic of its development (Engeström et al., 2014; Engeström, 2020).

We describe non-linear and winding processes of constructing a conceptual framework, which includes the development of intermediate concepts, in two research cases. The first case is the use of building information modelling (BIM) in collaboration between designers, architects, and engineers in construction projects. The second case is the craft of historical wooden boat building in Russia and Finland. In these two diverse cases, the guiding theoretical concept was the notion of the object of activity, a central concept of CHAT, which refers to something that defines, drives and directs activity. The central intermediate concept in both cases was the notion of the intermediary object, which originated in the Actor-

Network Theory (ANT) to analyse the material interaction of designers' collaboration (Vinck, 1999).

Both of these cases created complementarities between two theoretical approaches – CHAT and ANT, assuming that the approaches have sufficient grounds for establishing a fertile theoretical and conceptual dialogue (Engeström, 1996; Latour, 1996; Miettinen, 1999; Vetoshkina, 2018). Although the basic building blocks of the cases were similar, the process of constructing the conceptual framework and the purposes of the use of these concepts were different. The parallel analysis of the two cases revealed the long-time scales and complexity of research processes and showed, that similar concepts, applied in different research cases, have different meanings through different needs and challenges of a given research case.

We conceive the research processes not as linear stages, but as complex, dynamic processes with constant movements between different senses of the concrete and the abstract. Through the analysis of these multiple movements in the process of development of concepts we suggest looking at research process as multiple methodological cycles of moving between different meanings of the abstract and the concrete. This complexity and constant construction of connections and complementarities between concepts also challenges understandings of transmethodology. In this paper we suggest understanding of transmethodology, in addition to building methodological bridges and covering the whole research process, as construction of conceptual framework of a study through methodological cycles over a long period of time.

First, we introduce the AAC method. Second, we describe the understanding of CHAT methodology, including a brief description of the relevant theoretical concepts – the object of activity and the intermediary object. Then we introduce our methodological framework with a stance on transmethodology and describe the analytical procedure – manuscript archaeology – as a form of historical analysis, focusing on various 'tangible products' – documents and texts from different phases of the research. Next we present the

cases alongside with the results of our analysis in a form of key 'episodes' – relatively independent and complete research processes, resulted in specific tangible products – that constituted the development of the conceptual framework of each of the research cases. Thus, we present a network of methodological cycles, based on the AAC method, which includes an overall representation of the elements in the long-term process of constructing a conceptual framework. This long-term perspective brings forth horizontal movements between theoretical conceptualizations in different phases of research processes in an empirical study.

Ascending from the Abstract to the Concrete

The AAC method has its roots in Marxist dialectical philosophy, currently applied and developed in CHAT to analyse the formation of theoretical concepts (Ilyenkov, 1974, 1982/2008; Davydov, 1990; Engeström, 2020; Miettinen, 2000; Dafermos, 2018). The method was outlined by Marx in *Grundrisse* (1858/1973) and applied in the *Capital* (1867/1976) as a 'dialectic method'. The core of AAC is grasping the essence of a phenomenon, e.g. modes of production in Capital, by tracing and theoretically reproducing the logic of its development through the emergence and resolution of its inner contradictions.

Dialectical logics, unlike the 'traditional' logics, distinguishes two meanings of both the concrete and abstract (Ilyenkov, 1982/2008; Dafermos, 2018). The concrete may be understood as either a sensory perception of an object or a developed unity of different aspects of a phenomenon. The abstract, in turn, may be defined either as a partial feature of a phenomenon or one of multiple definitions of a phenomenon. Concrete (in the second sense above) in Marxist tradition refers to a developed entity, a 'unity in a totality'. In this sense, concrete is something adherent and related, an objective interconnection of all the necessary planes of a phenomenon or a process, existing in reality. Abstract is something partial, withdrawn from its concrete relations and concrete whole (Ilyenkov, 1982/2008). For example, in a study of home care by Engeström with colleagues (2012), the abstraction of

physical mobility of elderly was concretized in a movement of standing up from the chair without support, which addressed the general contradiction between safety and autonomy in old people's life.

Miettinen (2000) has succinctly depicted the whole process of AAC in three basic steps on the basis of Marx's depiction in Grundrisse (1858/1973):

a) The first step starts from the concrete, chaotic conception of the whole.

b) The second step is the formation of theoretical abstraction. It descends to the abstraction of the basic determining categories.

c) After this it 'rises' again to the concrete whole as 'a rich totality of determinations and relations'.

Dafermos (2018, p. 258) depicts the same process in two steps – as 'a contradictory unity of two distinct and opposite movement of thinking':

a) a movement from sensory-concrete perception to abstract thinking and

b) an ascent from abstract thinking to the mentally concrete and from the mentally concrete to practice.

For Ilyenkov (1982/2008), the AAC process provided a basis for genuine theoretical thinking and for reflecting the process of constructing and developing theoretical concepts as a central part of the research process. Practice, according to Ilyenkov (1982/2008) is the ultimate criterion of the objectivity of concepts, as the essence of a conceptualized thing lies in its actual connections with other things. Movement from the concrete to the abstract and from the abstract to the concrete have both been essential for dialectical logics. However, the starting phase of the AAC – moving from the concrete 'chaotic whole' to the abstraction – has been developed less. This phase is specifically important for understanding how the conceptual framework is constructed in a research process.

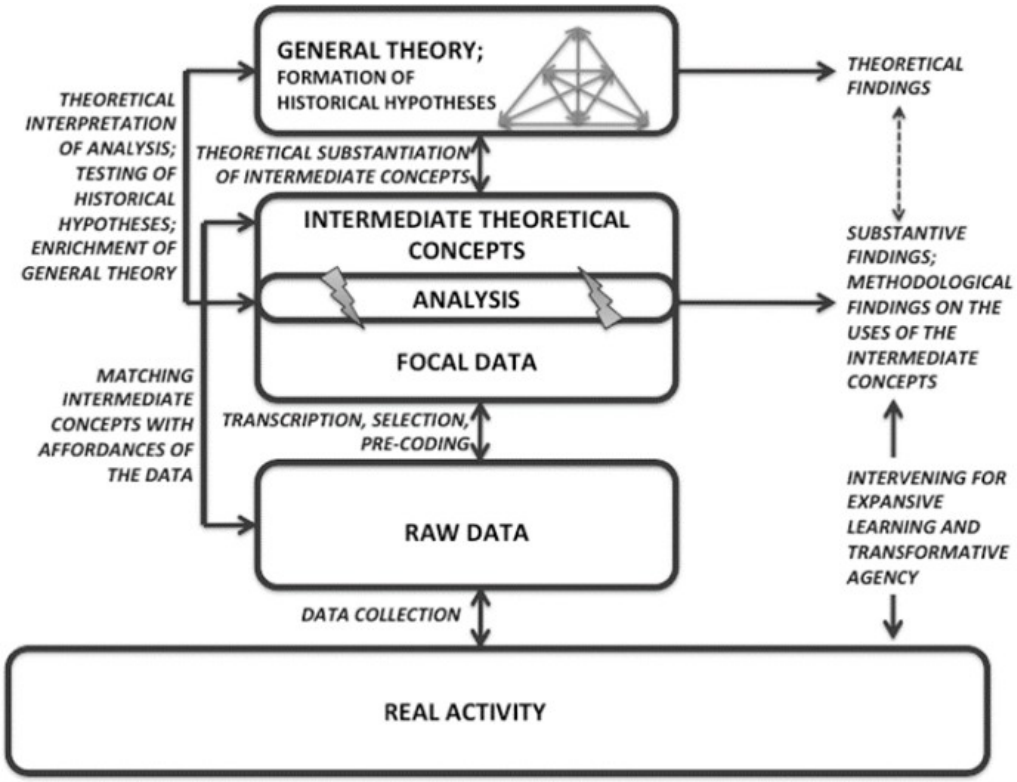
In dialectical Marxist philosophy, this starting phase was developed on a theoretical level among others by Vazjulin (1985, 2005, see also Dafermos, 2018). The process starts with a guess, then a hypothesis, which also includes movement from the simple to the complex. In other words, in Vazjulin's interpretation the process of moving from the chaotic concrete to the abstract contains both analysis (which is primary) and synthesis (Davydov, 1990; Vazjulin, 1985). The same works for the process of AAC in general, but the synthesis is seen to play a lead role, although analysis does not completely disappear: they are carried out together. At the same time, the whole process of dialectical thinking should not be built on analysis or synthesis alone; it should include a deep understanding of a phenomenon or a process that reveals its nature and relations to other phenomena. The processes cannot exist on their own. In dialectical logics, the unity of the opposing processes of movement from the concrete to the abstract and from the abstract to the concrete is the basis for the theoretical understanding of the world or abstract thinking (Ilyenkov, 1982/2008; Vazjulin, 1985, 2005).

Methodology in Cultural-Historical Activity Theory

The CHAT approach suggests certain methodological principles and a specific understanding of methodology. For example, Engeström (2016) has elaborated the significance of intermediate theoretical concepts for methodology by suggesting that CHAT methodology should be understood as building a 'bridge between theory and data' (Engeström, 2016, p. viii). The methodology in this framework is both theory-driven and grounded in data. Figure 1 depicts the meaning of the different kinds of layers and levels in the construction of the study design.

Figure 1

Ideal-typical design of an activity-theoretical study (Engeström, 2016, p. vii).



Originally published in Engeström, 2016, p. vii

The general theory helps formulate a more specific historical hypothesis of the research case in question and determine the unit of analysis. Researchers transform raw data, collected from real activities, into focal data by means of data management and organization techniques: transcription, selection and pre-coding. A rigorous analysis in this framework requires intermediate theoretical concepts, which match the affordances of data and help in the theoretical interpretation of the analysis. The main objective of this type of design is to create constant communication between all levels of data, intermediate concepts, theory, and theory development. This understanding of methodology does not restrict researchers' application of only a specific set of techniques and methods, but rather provides them with a set of theory-driven principles. These principles guide researchers in their choice of a specific method. Engeström's framework (Figure 1) is important for emphasizing the significance of intermediate concepts in research design. The framework itself, however, does not reveal how researchers come up with intermediate concepts that become useful in their cases.

In the cases discussed in this paper, CHAT constituted the general theory, and a general theoretical concept in both cases was the notion of *the object of activity* (Leont'ev, 1978; Engeström, 2015). The intermediate theoretical concept constructed in both cases was the notion of *intermediary object* (Vinck, 1999), stemming from ANT. Both analysed cases drew on the idea that the two theoretical approaches – CHAT and ANT – offer means for establishing a fertile theoretical and conceptual dialogue (Engeström, 1996; Latour, 1996; Miettinen, 1999; Vetoshkina, 2018). The dialogue was constructed differently in each of the analysed cases. Before introducing the two cases, we explain the notions of the object of activity and intermediary object, which were central conceptual building blocks for the analysed cases.

General Theory: The object of activity

The object of activity is one of the central concepts of CHAT, in which the object-orientedness of activity is a key principle. Leont'ev (1978) classically defined the object of activity as something withstanding, to which an act is directed and to which a human is related, and as 'its [activity's] true motive' (p. 98). Engeström (2015), in his conceptualization of activity as an activity system, suggested understanding the object of activity as raw material or a problem space to be worked on and gradually shaped into a product or an outcome. The object of activity concept helps us understand not only what people are doing, but why they are doing certain things – the long-term 'why?' of actions (Engeström, 1995, p. 411; Kaptelinin, 2005).

Currently, various perspectives exist on the object of activity. They are understood as carriers of motives (Miettinen, 2005; Kaptelinin, 2005). There is also a distinction between the generalized object of a historically developed activity, and a specific object as it appears for a specific subject in a given action in a specific time and space (Engeström et al., 2003; Jahreie & Ottesen, 2010). In collective activities with multiple participants and networks, the

object of activity may be conceptualized as complex, having a variety of instantiations (Toiviainen & Vetoshkina, 2018).

The classical conceptualization of the 'object is the true motive of activity' was developed as an abstraction, from which one needs to ascend to the analysis of concrete activities in empirical research (Kaptelinin, 2005; Vasilyuk, 1991; Vetoshkina, 2018). Originally a theoretical abstraction, it is utilized as both a practical and a theoretical concept with multiple functions pointing towards the different time scales and layers, tensions and contradictions around activities. In a specific research case, the object of activity cannot be taken for granted; it unravels during the research process.

Intermediate Concept: Intermediary object

The concept of the intermediary object was developed by Dominique Vinck (1999) and colleagues within the sociology of science and innovation in the analysis of designers' cooperation networks (Vinck & Jeantet, 1995; Vinck, 2011). Using the notion of intermediary object in the ANT tradition, Vinck and colleagues emphasize a more prominent role of all kinds of 'objects' or artefacts in human cognition than traditionally conceived. Intermediary objects have been used to refer to a variety of all kinds of physical and electronic artefacts such as sketches, drawings, guidelines, models, documents, or instruments that are used and exchanged in design work but also evolving nature of artefacts in different intermediate stages of design process (see Paavola & Miettinen, 2019). Intermediary objects have been seen especially relevant for designers' and engineers' work, where all kinds of sketches, drawings and manuals are central means of collaboration (Ewenstein & Whyte, 2009).

The term 'intermediary' within the notion of 'intermediary object' highlights the interrelations between the different actors in design processes, and what happens when these artefacts are circulated or exchanged between actors. Based on different interpretations of the concept, Paavola & Miettinen (2019) suggested a following meaning: as editable and

modifiable artefacts (such as digital models of the building in construction design) which can be flexibly constructed, used and transformed collaboratively during the design process. This means that these objects are not static, but during design processes they are transformed in a variety of ways (constructed, modified, conserved, shared, used, equipped with something, etc.). Intermediary objects play an active role in design processes, and therefore refer to the open and evolving nature of these processes. A design process can be analysed through intermediate stages instead of being seen as a predetermined linear and sequential process (Vinck, 2011; Vinck and Jeantet, 1995; Ewenstein and Whyte, 2009).

Interaction of the concepts

The goal behind the interaction of concepts at different levels, coming from different approaches is to define and redefine their dissimilarities and complementarities to potentially create new understandings of complex phenomena from practice. Analysis of the object of activity reveals the dynamics of motivation and intentionality behind human actions, where basic concepts of ANT are not so useful (Miettinen, 1999; Vetoshkina, 2018). Objects, especially in the analysis of collective activities, networks and communities, appear as complex entities (Toiviainen & Vetoshkina, 2018). This requires further concretization to bring forth different aspects of the object of activity. On the other hand, the notion of intermediary object offers the means to dynamically refer to the co-developed, tangible and at the same time modifiable intermediate versions of the 'object' used in different phases of activity (Miettinen & Paavola, 2018; Paavola & Miettinen, 2019; Vetoshkina, 2018). Usually the object of activity and intermediary objects have not been analysed together, although interestingly, Leont'ev in his 'classic' understanding, also refers to something very close to intermediary objects by 'intermediate partial results, which are achieved by separate participators of collective work activity' (Leont'ev, 1978, p. 99), but which are different to the proper object of activity.

Methodological Framework

The focus on constructing a complex conceptual framework for a specific research case across different theoretical and methodological traditions, requires also going beyond one methodological tradition, even relatively flexibly. Transmethodology can be understood in a variety of ways, but the overall idea of transmethodological approaches is that of crossing traditional boundaries between theories, methods and analytical approaches. Khawaja & Mørck (2021, this issue) see transmethodology as focusing on the changing interaction between the analytical, empirical and theoretical engagement in a field of study. In this type of conceptualization, transmethodology works on multiple levels: as movement between different theories, movement between different methodologies and methods, and movement between different positions of researchers.

In our paper, we understand transmethodology primarily in two ways. First, we understand it not just as crossing theoretical, methodological or subject-related boundaries in research, but also as creating complementarity through differences and interconnections between theoretical concepts, methods and researchers in the process of constructing the methodological framework of a study. Transmethodology is not only about crossing boundaries, but also about building bridges, based specifically on complementarities between different points of view. In our cases, this was about defining interactive uses of the concepts of object of activity and intermediary object which required several rounds of experimenting to create new ways of conceptualizing of the complexity of practical activities.

Second, we understand transmethodology as a framework with which to develop an outlook of methodology as a whole and from the long-term perspective: as a practical process cutting through several rounds of the whole research process, not just a set of data collection and data analysis methods. It covers several versions of documentation in which researchers

develop their own ideas, hypotheses and artefacts in relation to the object of research, other researchers, and previous and subsequent research (Paavola & Hakkarainen, 2005).

Analytical procedure: Manuscript Archaeology

In order to reflect manifestations of AAC in different phases, we implement, what we call, *manuscript archaeology*[2] as interpretation of historical analysis (Engeström, 1999), Practically, we have collected all possible versions of the manuscripts and texts that were produced in the process of writing the analysed cases. The analysis moved backwards in time in order to trace the process of development and emergence of ideas and concepts. Manuscript archaeology is implemented here as a focused and descriptive form of historical analysis, aiming to trace the development of theoretical concepts in the long-term research processes.

Ilyenkov (1982/2008, p. 142), in his analysis of Marx's thinking, criticized attempts to reconstruct Marx's scientific methods through drafts and notes, as the method of AAC was most clearly presented in the final and developed form in the *Capital*. However, we think that in order to understand methodological processes 'in the wild' it is important to take into account both the end result and the processes that have led to it. The importance of the relationship between the process and the end result is also stressed in Vygotsky's (1997) genetic method in reference to human anatomy as the key to the anatomy of the ape. To understand the history of the development of a phenomenon, we need to see the 'final' form and trace it back to 'rudimentary' forms. However, the relations between the different, often

2 The term refers to a process of searching and collecting all relevant texts connected to the analysed cases, which reminds the work of an archaeologist digging out historical artefacts from the ground. In our analysis these artefacts were different manuscripts and texts. The name was inspired by the practices of analysis and does not have specific connections, for example, to Foucault's *The Archaeology of Knowledge*.

partial drafts and versions (such as conference presentations and papers) of texts are also important for understanding the 'evolution' of the ideas.

We maintain that the processes of constructing a conceptual framework, and a scientific method do not become clear by merely analysing the final texts. These final texts are, like scientific texts in general, restricted in size and structure, and provide only a partial picture of those methodological processes that have shaped them. Not only notes and drafts for specific articles but also different versions, and related papers and presentations form a basis for the final texts.

In our two cases, the whole process included tens or even hundreds of different texts – presenting all of them here would be impossible. We needed to focus on crucial elements in the process of developing the conceptual framework, so the process is described as evolving through 'episodes'. These episodes differentiate certain relatively independent and complete parts from the whole research processes which led to a final product, similarly to episodes of a television series. Each episode is constructed around a specific tangible product – an outcome of an episode, such as a paper draft or a conference presentation, which was significant in the development of the ideas and formed a version of the conceptual framework.

The episodes depict a broad outline in chronological order, but branching with parallel development that influenced the end result. This also makes the episodes different from clear stages; episodes were also unique and not predetermined in both cases. The analysis of each episode focuses on the outlined elements of the AAC method, which we call *chaotic concrete, abstract* and *interconnected concrete*[3]. In our analysis, chaotic concrete refers to the initial

3 'Chaotic concrete' and 'interconnected concrete'' are used as substitute terms for 'sensory concrete' and 'mentally concrete', which occur often in the classic literature on the AAC method. For the modern reader, the terms sensory concrete and mentally concrete may be associated with individualistic psychologisation and mentalism, which is not in line with the basic idea of the method (this association was also pointed out by one of the reviewers of this paper). Thus, chaotic concrete

theoretical focus of the research with related data (often raw), abstract refers to main theoretical and conceptual tools defined and utilized in the research case, and interconnected concrete refers to a refined set of concepts and conceptualizations, grounded in the systematically analysed data.

Cases and Results

Our two research cases have different research topics and used the notion of intermediary object as an intermediate concept differently. In the first case, the topic was the use of BIM in designers', architects', and engineers' collaboration in construction projects; and in the second case the craft of historical wooden boat building in Russia and Finland. Our aim is not to show the similarities between the two cases or claim that the notion of intermediary object is used similarly in them, but to trace how the same notion of intermediary object was taken up and reconstructed in these cases as an intermediate concept, depending on the nature and features of each case. The cases exemplify the dynamics of constructing a conceptual framework and the use theoretical concepts as parts of research methodologies.

Building Information Modelling case

The BIM case was part of a research project (2010–2013) on the uses of BIM in construction projects. BIM refers to novel technologies that enable the combining of 3D models (basically the design plans of a building) and various kinds of data on a building produced by different disciplines, including architects and engineers of different fields (Eastman et al., 2011). A specific focus in this part of the project was on following the designers' collaboration in the design phase of a renovation of a school in Eastern Finland

refers to the chaotic whole at the start, and interconnected concrete to the interconnected whole at the 'end' of the AAC cycle.

(during 2011–2012), and on how the use of BIM was organized. The data included thematic interviews and observation of planning and design meetings (Miettinen & Paavola, 2018; Paavola & Miettinen, 2019). In this paper we follow key 'episodes' that led to a journal article in which the concept of intermediary object played a central role. The process was a joint endeavour of Sami Paavola and Reijo Miettinen[4]. The whole process followed took several years, from 2012 (conference presentations on this subject) to 2018 (a published article), partially because the authors took breaks with the papers and also because of several rounds of revisions. The paper had tens of versions (with bigger and smaller changes).

In the BIM case we identified four 'episodes' (see Table 1). These episodes were identified by tangible products after each episode: 1) three conference papers, 2) a submitted version of a journal article, 3) a published article, 4) two parallel articles. Next we will present these episodes shortly describing "chaotic concrete", "abstract", "interconnected concrete" and "tangible product" in each episode.

Table 1.

A Summary of the episodes in the BIM case.

Episode	**Chaotic concrete**	**Abstract**	**Interconnected concrete**	**Tangible product**
1. BIM as a Multifunctional Instrumentality	Theoretical interest with interview data and videotaped meetings	Basic conceptualizations of CHAT with experiments on various intermediate concepts (also intermediary	Simple and scattered empirical analyses	Three conference presentations

4 From this point on, in the analysis of the BIM case, by 'the authors' we refer to Sami Paavola and Reijo Miettinen.

		object)		
2. BIM as Evolving Instrumentality	BIM as evolving instrumentality focusing on data from a specific construction project	Discussions on various theoretical approaches on functions of artefacts; Intermediary object with intermediary artefact emphasizing dual nature of these concepts	Various analyses: one focusing on intermediary objects/artefacts as a way of organizing collaboration across design areas	A submitted paper to a journal
3. BIM Models as Intermediary Objects	Same data as in the previous episode; The focus of the paper needed clarification	The paper was constructed around the notion of intermediary objects with additional theoretical concepts, especially 'virtual materiality'	Intermediary objects were analysed both as a way of organizing the use of BIM models in the project, and as used in the face-to-face design meetings	A published article
4. On Objects and Artefacts in Human Activity	Theoretical interest on interpreting novel digital technology from the point	Challenging classic distinctions between tool and sign, or between tool and object;	The BIM case as an example of novel kind of instrumentality, and object construction;	A paper in a special issue, and a paper in a handbook

	of view of activity theory; Data excerpts from the BIM project	Intermediary objects related to the object of activity	Different kinds of object concepts were analysed	

Episode 1: BIM as a Multifunctional Instrumentality

The papers and presentations at the start of the BIM project had a strong theoretical focus. The authors tried to capture the historical development of the field in order to understand changes in the BIM field by reading the literature on the development of software, standards and projects, and following meetings in which the uses of BIM were agreed on. There was also data on interviews, and videotaped design meetings where BIM was used.

Abstract. One theoretical focus was on 'digital objects', and discussions on how they are material or immaterial. The main conceptualization at this stage was to treat BIM as a multifunctional instrumentality. Basic ideas of CHAT on cultural mediation, mediating artefacts, and remediation were important starting points. It seemed to the authors that something else was needed, and they tried different kinds of conceptualizations related to artefacts, objects, tool use, and infrastructures. The intermediary object was introduced as one option, showing 'the dynamic, evolving nature of BIM models', but it was quite separate from the other conceptualizations. From the start it was felt that it should be interpreted slightly differently than in papers by Vinck and colleagues.

Interconnected Concrete. The presentations and papers had a strong theoretical interest, complemented by simple and slightly scattered empirical analyses. These analyses included a list of software that different partners were using, how BIM was used in face-to-

face design meetings, and a short excerpt showing indexicality in face-to-face meetings (showing the tangibility that 3D models bring to meetings).

Tangible product. The first episode resulted in two joint conference presentations (EGOS 2012; WSSMLB 2013) and a long conference paper (EGOS 2013) by Paavola and Miettinen, which formed the basis for the later developments. In their presentations, the authors aimed to develop ways of conceptualizing BIM as a novel kind of instrumentality within the area of research on construction projects which was new to both authors.

Episode 2: BIM as Evolving Instrumentality

Chaotic Concrete. After making conference presentations the aim was to publish a journal article. The main idea was to describe BIM as an evolving technology rather than as an infrastructure. In addition, the authors focused on the uses of BIM within a specific construction project, and also on how BIM was used in face-to-face meetings. The data were basically the same as in the previous episode, that is, observations of key events and design meetings from the school renovation project.

Abstract. CHAT was used as a central background somewhat implicitly as the paper based on discussions on various approaches that took into account the functions of the artefacts and the novel features of digital objects: 'We ask what concepts are needed to understand BIM as a mediating artefact'. During the process, discussions were related to ANT, sociomateriality, and the theorizing of artefacts in organizational studies. Some of these discussions were cut off from the submitted version. Virtual materiality was a new concept and is mentioned at the end of this paper. In addition to the term 'intermediary object', the term 'intermediary artefact' was used in the paper to stress the dual nature of these concepts.

Interconnected Concrete. The paper focused on descriptive analyses of the various software used in the project, on two ways of organizing the use of BIM models, on moving in the 3D models, and on showing the meaning of indexical pointing (with a short excerpt).

Intermediary objects/artefacts were used specifically for showing how collaboration in combining the BIM models of each design area were organized in the project.

Tangible product. The episode resulted in a paper submitted to the Computer Supported Cooperative Work (CSCW) Journal 'Intermediary artefacts of design collaboration: Building Information Modelling as an evolving instrumentality' (early 2016) based especially on the EGOS 2013 conference paper. Because of many practical delays, the process took much longer than intended, and several versions of the draft were produced.

Episode 3: BIM Models as Intermediary Objects

Chaotic Concrete. The paper (tangible result of the previous episode) had to undergo two rounds of 'major revisions' before being accepted. There was some controversy between the reviewers. The main editor and some of the reviewers were more willing to accept the paper, but others were not. There were four reviewers in the first round, when usually two is enough. The comments of the reviews forced the authors to clarify the focus of the paper, both conceptually and empirically. The empirical analyses were broadened with sharpened focus, and the concepts were clarified.

Abstract. At this point, the focus of the paper was constructed around the 'intermediary objects', and the other theoretical discussions of the paper were removed. The authors also realized that the indexicality and tangibility issues were a central part of BIM models as intermediary objects, that is, the BIM models also played a strong organizing role in the face-to-face meetings. In order to emphasize these features of indexicality and spatiality and how they bring tangibility to designers' collaboration, 'virtual materiality' as an additional theoretical concept was introduced which required clarifications. Before this episode, these analyses on indexicality and spatiality had been seen as separate from the notion of intermediary objects, but now they were centrally linked to it.

Interconnected Concrete. Two ways of organizing the use of BIM as intermediary object were analysed: a mechanical clash detection and a parallel collaboration in face-to-face design meetings. But besides this, the use of BIM models in face-to-face design meetings were analysed in detail showing to the prevalence of indexicality in these meetings. At the same time the notion of intermediary object was more explicitly connected to the 'object of activity', which was also a suggestion by one reviewer. The idea was that the object of activity gives directionality to the analyses of intermediary objects (which is often missing in the treatment of artefacts).

Tangible product. The episode resulted in a published article called 'Dynamics of design collaboration: BIM models as intermediary digital objects' (Computer Supported Cooperative Work – CSCW).

Episode 4: On Objects and Artefacts in Human Activity

Chaotic Concrete. The article process (described above) took so long that the authors (Miettinen & Paavola) ended up using and developing similar ideas in two other, more generally targeted articles constructed in parallel. Both of these articles aimed at discussing and developing an activity-theoretical approach for research on the uses of novel digital technology. The research project on BIM provided data to give concrete examples on the meaning of 'intermediary objects'. The articles gave an opportunity to develop theoretical ideas in relation to information systems research (in the special issue) and in relation to the sociocultural and cultural historical approach (in the handbook article).

Abstract. The papers analysed the way in which the use of digital technologies and objects such as BIM raise novel theoretical issues. The uses of these technologies challenge classic distinctions between tools and signs, and between tools and objects. These papers analysed objects and artefacts from the CHAT perspective: 'how the concept of the object of activity is related to certain object concepts introduced by the social sciences'. One focus was

on describing the relationship between the object of activity in the CHAT tradition and how to present the work using intermediary objects (in this case using BIM models) in relation to this. As a link between these two, Ilyenkov's notion of a 'special object' was analysed, which claims that something is operated or constructed without changing the real object (like an architect's plan of a building in relation to a building).

Interconnected Concrete. The BIM case was analysed as an example of a novel kind of instrumentality, and the object construction and objectification issues were specifically discussed.

Tangible product. One paper was published in a special issue of 'Activity Theory in Information Systems Research' (writing started in the summer of 2015, published 2018), and another in a handbook on sociocultural psychology (writing started in May 2016, published 2018).

Wooden Boat Building case

The wooden boat building case draws on the data gathered through ethnography in two wooden shipyards in Suomenlinna, Finland and the Solovetsky Islands, Russia. The primary data consisted of interviews with key practitioners (including boat builders, shipwrights, managers, historical community members, and apprentices), and were supported by ethnographic data (Vetoshkina, 2018; Vetoshkina at al., 2017). This analysis was part of a doctoral thesis, which started as part of the 'Concept Formation and Volition in Collaborative Work' research project[5], which studied the processes of collective concept formation and volition in collaborative work activities through cognitive ethnography. Wooden boat building was one of the settings of the project. The data for the thesis, in addition to the

5 Annalisa Sannino and Yrjö Engeström were the supervisors of the thesis. The members of the research group, in addition to the mentioned supervisors, were Marco Querol, Swapna Mukhopadhyay, Irene Vänninen, Anu Kajamaa, and Liubov Vetoshkina. In the description of this case, 'the authors' refers to Vetoshkina and the supervisors, and 'LV' to Vetoshkina.

mentioned sites, included ethnographic data from a shipyard in India, where groups of carpenters build traditional fishing and cargo boats. The whole thesis process lasted from 2012 to 2018.

In the wooden boat building case we identified five episodes (see Table 2). These episodes were identified by tangible products after each episode: 1) a research plan, 2) a conference presentation, 3) a short conference paper, 4) a book chapter, and 5) a final draft and a final version of the thesis. Next we will present the episodes shortly describing the movement between "chaotic concrete", "abstract", "interconnected concrete" and "tangible product" in each episode.

Table 2.

Summary of the episodes in the wooden boat building case.

Episode	**Chaotic concrete**	**Abstract**	**Interconnected Concrete**	**Tangible Product**
1. Agentive Dimension of Crafts through 'Subjectness'	Theoretical interest, pragmatic factors and existing project data	CHAT's general theoretical framework with focus on 'subjectness'	Hints from data and outline of potential historical analyses	Research plan for the thesis with four articles

2. 'Subject' though 'Object'	Collection of additional semi-structural interviews, focusing on the development of wooden boat building activities	New theoretical abstraction – from subjectness – to the object of activity. A new intermediate concept – the 'power of the object'	Anecdotal preliminary data analysis around history	Conference presentation, focused on one of the thesis articles
3. Power of the Object through History	Data only from Finnish site, due to short paper length and timetable of transcription and translation	Definition of the intermediate concept of the power of the object, again using Scribner's (1985) analysis of levels of history	Systematized historical analysis, and identification of threads of history in the data from one of the sites	Short conference paper
4. Skilful Performance as History-Making	Previously identified lines "tested" on Russian data. New focus of the book chapter on skilful performance	Defining skilful performance as shaping and production of objects	Connecting theoretical and analytical framework through triangular model of the activity system (Engeström, 2015)	A book chapter on skilful performance
5. Development of Activity as Working on	New focus and theoretical framework of the thesis, previous	Theoretical connection the object of activity through the notion of	Identification of concrete tensions and intermediary objects in the data	Final draft and published doctoral

an Object	analyses as starting points	intermediary object to the analytical framework of the lines of history, which was modified from a thread of history	on each line of history	thesis

Episode 1: Agentive Dimension of Crafts through 'Subjectness'

Chaotic Concrete. The goal was to produce a research plan which would have a supplementary perspective of the Concept Formation project. At the start, the project had two research sites – shipyards in Finland and India. LV separately found the third research site in Russia as potentially suitable and accessible. The plan was based on the already existing raw project data, which was focused according to the project goals on collaborative work and the collective use of concepts. In the discussions and interviews, elements of motivation to engage in traditional craft, as well as the history and endangered future of the craft activities, became evident.

Abstract. Drawing on hints from the data, with the aim of applying the CHAT framework, and along with more pragmatic factors such as a background in psychology (Russian school) and native Russian language skills, LV chose 'subjectness' as a general theoretical concept to investigate. The aim was to introduce subjectness, which was developed in Russian activity theory, into the international discussion, and to address the agentic dimension of crafts. The dissertation articles, included in the plan, focused on different intermediate concepts, such as common ground, power of the object and contradictions.

Interconnected Concrete. The movement stayed at the level of theoretical abstractions. Data and theory were not substantially connected through intermediate concepts, as the analysis was not yet performed. LV only outlined potential ways of conducting historical analyses, based on Scribner's (1985) analysis of Vygotsky's (1978) levels of history and Engeström's (1999) analysis of the history in activity.

Tangible Product. A research plan 'Subjectness and the Revitalization of a Traditional Craft: an Activity-Theoretical analysis of wooden boat building', including a plan for four articles as part of the thesis.

Episode 2: 'Subject' through 'Object'

Chaotic Concrete. The data were complemented with semi-structured interviews, focusing on the development of the activity of wooden boat building. Data targeted the shipyards in Finland and Russia as cases of historical craft.

Abstract. The focus moved from one theoretical abstraction – subjectness – to another – the object of activity as a way of addressing the subject-object relationship in activity. The way of tackling this relationship and rethink the classical understanding of the object of activity in CHAT as the true motive of activity (Leont'ev, 1978) and as a generator of motivation and meaning (Engeström & Blackler, 2005) was to introduce a new intermediate concept – the 'power of the object'.

Interconnected Concrete. The notion of the power of the object did not have a clear definition and was loosely grounded in the data. The preliminary data analysis was anecdotally constructed around history as the past, present and future.

Tangible product. 'The power of the object. History-making in wooden boat and ship building' (by LV), a presentation in the Finnish Educational Research Association (FERA) 2012 Conference of the preliminary results of one of the thesis articles.

Episode 3: Power of the Object through History

Chaotic Concrete. For the conference short paper, data from one research site - the Finnish shipyard - were used due to the length constrains and timetable: part of the interviews from the Russian research site had been just collected and needed to be transcribed and translated.

Abstract. The intermediate concept of the power of the object as the ability to drive human efforts across the past, present and future was defined, with understanding drivenness in Sannino's terms (2013) as 'a movement of attraction that mobilizes the subject in the pursuit of an object'. To ascend from this theoretical abstraction, the authors conducted a systematized historical analysis, again using Scribner's (1985) analysis of levels of history.

Interconnected Concrete. The theoretical idea of levels, in which the power of the object worked across the past, present and future, concretized in the data into four intertwined threads of history. These were described as '1) Personal history of the craftsmen; 2) History of the wooden boat community; 3) Political history of nations and their relations; 4) History of the boats themselves'.

Tangible product. A Nordic ISCAR 2013 a short conference paper 'On the power of the object: History-making in wooden boat building' (by Sannino and Vetoshkina). The FERA conference presentation comments clarified two central directions in the further development of the paper: the systematization of the analysis and the definition of the key concepts.

Episode 4: Skilful Performance as History-Making

Chaotic Concrete. The same analytical procedure from the Finnish site was applied and tested at the Russian site. The focus of the book chapter required a substantial modification of the conceptual framework, and the authors had to provide their understanding

of skilled or skilful performance, which they did through history-making – history as an outcome of skilful performance.

Abstract. On the theoretical level, the authors conceptualized the skilful shaping and production of objects as a way to stabilize, transform and produce durable ways of organizing life.

Interconnected Concrete. The newly developed conceptual framework around skilled performance required connecting it with the existing analytical framework – threads of history. This connection was made by concretizing and placing the lines of history on a triangular model of the activity system (see Vetoshkina et al., 2017 for more detail). The power of the object in these cases of historical wooden boat building was a drive deriving from the object of activity — an assertive orientation to be part of history.

Tangible product. A book chapter called 'On the Power of the Object: History-Making through Skilled Performance in Wooden Boat Building' (Vetoshkina, Engeström and Sannino, 2017). The second supervisor was invited to contribute to the book on Skilful Performance, and the focus of the article was modified accordingly.

Episode 5: Development of Activity as Working on an Object

Chaotic Concrete. The dissertation was changed into a monograph due to time constraints in completing the PhD and the affordances of the interviews, which majorly focused on the object of the wooden boat building activity. The aim of the dissertation changed to understanding the potential of objects in craftwork by analysing the 'object as an intercultural and intertemporal unifying factor'. The general theoretical framework was built on CHAT (the object of activity), with contributions from ANT and the actor network (Latour, 2005), as well as the epistemic approach of Knorr Cetina (1997) and sociality with the objects. The previous analysis and the book chapter provided grounds for the thesis

chapter. The practical aim was to describe the process of the historical development of crafts activity using the example of wooden boat building.

Abstract. The notion of the thread was modified to a notion of a line and grounded in theory: Vygotsky's understanding of historical development (1978; Scribner, 1985) and Hutchins's view on development of practice (1995). The four identified lines of history appeared to be 'unobjectified' and needed to be connected with the general theoretical aim of understanding the significance of the object of activity, new intermediary concepts were constantly searched for by reading the literature, asking for comments on the draft, and discussions with colleagues, including the second author of this paper, who suggested looking at the concept of intermediary object in his article drafts. In the first full draft of the thesis the analytical framework of history lines on a theoretical level was connected to the notion of the object of activity through the intermediate concept of the intermediary object. The intermediary object referred to a certain instantiation of a general object of activity, relevant for a specific line of history, and to different stages to show the movement of an object of activity in time history.

Interconnected Concrete. This movement along the lines was depicted as a constant resolving of tensions and contradictions, which were resolved by working on an intermediary object, specific for each line. The specific tensions and objects were identified through re-reading of the data: 1) the line of personal history – tension between professional pride and constraints of the trade - a concrete boat or an element of a boat as an embodiment of skill.; 2) the line of community history – tension between 'self' and 'the other' - a boat as a product for a customer; 3) the line of general history – tension between replicating old and creating new - a boat as an object of cultural and historical heritage; 4) the line of the object history – tension between agency and rules of practice - a boat as an embodiment of contradiction between the exchange and use value.

Tangible product. A full draft and a published version of the doctoral thesis 'Anchoring craft: The object as an intercultural and intertemporal unifying factor' (Vetoshkina, 2018).

Summary of the Results

The notion of intermediary object was used in both cases as an intermediate concept, connecting general theory and data. In the BIM case, the concreteness of the intermediary object highlighted the importance of tangible 3D models in face-to-face meetings. In the wooden boat building case, the notion of intermediary object unravelled the modifiable, concrete and dynamic nature of the object of activity and its role in the process of the historical development of craft activities. As seen from the manuscript archaeology, the conceptual framework and the role of different concepts with their relations to each other have significantly transformed during the research process.

Start from theory and data

In both cases, the search for relevant concepts started both with engagement with theory and with data. Although the focus was on theoretical development, it was supported by becoming acquainted with practices and relatively simplistic engagement in the analysis. For BIM, an important starting point was understanding the role of objects and artefacts in the different theoretical approaches (drawing on approaches of CHAT, ANT, sociomateriality). For wooden boat building it was the CHAT framework and development of the notion of 'subjectness' as a way of understanding of the relationship between the subject and object.

Focus only on theory as an obstacle

The theoretical search for novel conceptualizations was necessary in both cases, but the focus on theory was somewhat hampering the research process. In one of the episodes (Episode 2 for BIM, and Episode 2 for wooden boat building), the development of the

theoretical framework required the development of the empirical analysis and analytical concepts. Theoretical ideas had to be applied and verified in the data, which required additional intermediate concepts, connecting the theory and the data.

Multiplicity of potential intermediate concepts

In both cases, multiple intermediate concepts emerged in the research process, some of them were left out, and some of them remained. The notion of intermediary object operated in both cases as a central intermediate concept. In the BIM case, the intermediary object became the focus of the whole paper in Episode 3, when it was empirically grounded and used as a central concept in relation to indexicality and spatiality. This required that the notion of 'virtual materiality' was used as an additional concept. In the case of wooden boat building, the intermediary object appeared in the Episode 5 first on theoretical level, and was empirically grounded in the process of finalization of the thesis, when it was connected to the notion of the object of activity through the analytical framework of the lines of history. There were other intermediate concepts during the development of conceptual framework, such as 'power of the object', 'drivenness', but they were dropped as the refinement of theoretical ideas and analysis advanced.

Constant change of theory – constant change of intermediate concepts

Clarification of general theory and performance of analysis was happening in both cases side by side. These modifications naturally called for new intermediate concepts. In the BIM case the focus was first on understanding BIM as a multifunctional instrumentality in Episode 1, and the notion of intermediary object gave conceptual means of clarifying the role of BIM models as tangible means of collaboration in the construction project in Episode 3. In the wooden boat building the general theoretical framework changed from 'subjectness' to 'object of activity', then 'skilled performance' and then back to 'object of activity'. As

already mentioned above, intermediate concepts also then changed, as research process was advancing. Similarly, some analytical concept also evolved: a vague idea of historical analysis (Scribner, 1985; Engeström, 1999) from Episode 1 then re-emerged in Episode 5 to reinforce the analytical notion of the 'line of history'.

Pragmatic and practical factors have significance

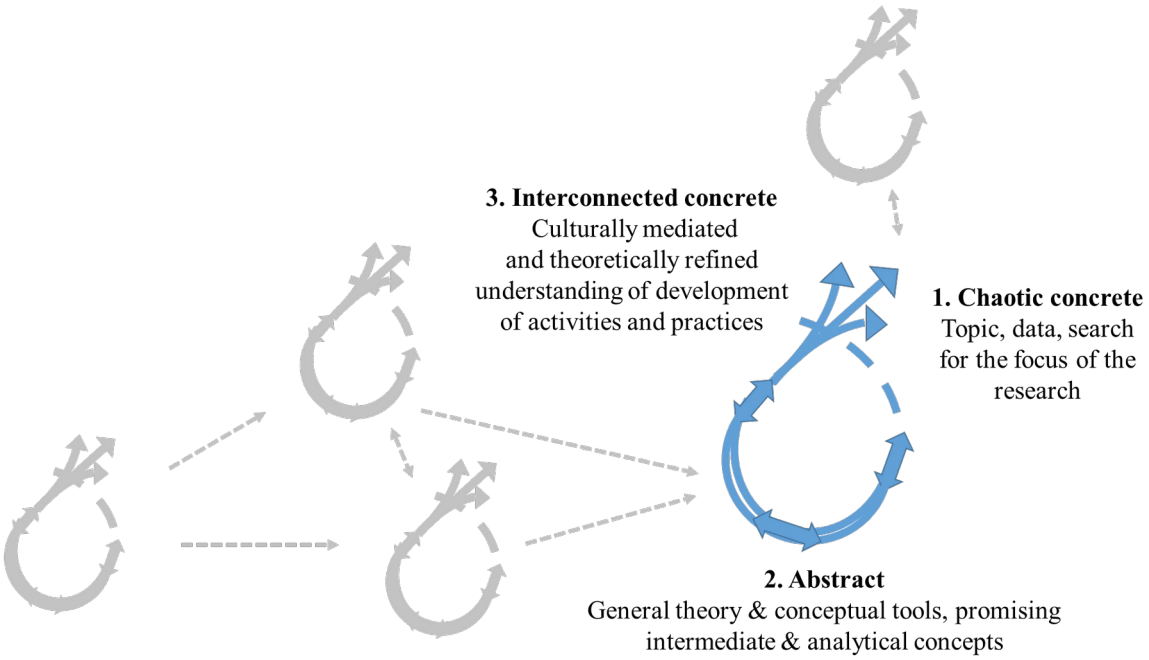
In the process of construction of conceptual framework several practical factors had significance, and they affect not only how research is done, but what is being researched. In the BIM case, for example, the long review process not only changed the initial focus of the article in Episode 3, but it also meant that in the meantime the same data was used when appeared an opportunity to write a paper to a special issue and a handbook article (Episode 4). In the wooden boat building case, the research plan from Episode 1 had to fit and support the project research and data. Presentation from Episode 3 had to focus only on Finnish case, as Russian interviews were not transcribed and translated. The key intermediate concept – 'intermediary object' – emerged from a simple comment in Episode 5.

Methodological Cycle

The development of the conceptual framework was a constant movement between different elements of the research process: theories, data, methodologies, researchers, and practical elements. This movement cannot be depicted with one AAC cycle going through the whole research process, but as a network of multiple cycles (Figure 2).

Figure 2

A network of methodological cycles



Ideal-typical model of main elements in a research process applying the AAC method.

Each episode can be conceived as its own partial or complete 'methodological cycle' of AAC, with constant movement between the chaotic concrete, abstract and interconnected concrete. In each episode, some notions were changed, abandoned, modified, and also revived from the previous episodes. The previous methodological cycles, and sometimes also parallel versions, gave elements for a new cycle. Sometimes, some theoretical ideas were first abandoned, or seen as only a relatively small part of the analysis, but in later episodes taken as a central building block of the analysis. The movement in the cycle sometimes focused on the chaotic concrete around the data and the search for the focus of the research, and sometimes on the search for promising theoretical notions (abstract), heading towards a more fine-grained understanding of the case in relation to practices (interconnected concrete).

The methodological procedures in each episode can be described as either partially or completely following a cycle, in which the movement from the chaotic concrete through the abstract to the interconnected concrete happens through engagement with the data, practices or activity in question, and with theoretical conceptualizations. The temporal order in the research process does not necessarily follow the order of the elements in the cycle. The

development of the framework often happens simultaneously. In both cases presented, the researchers simultaneously developed theoretical ideas, started collecting data, and familiarized themselves with the studied activity, including its history and background.

Discussion

Scientific texts and basic methodological literature often present the process of constructing a conceptual and methodological framework as one process or cycle leading to a specific final product. The idea of a research process constituted by smaller cycles with constant interaction between theory and data is not, however, novel (see Engle et al., 2007; Engeström, 2016).

The ideal-typical design of an activity-theoretical study (Figure 1) suggested by Engeström (2016) depicts a general research study design with intermediate theoretical concepts. This is a well-working model of the whole research process on a general level, but does not bring forth midway or preparatory cycles, which in hindsight can be seen to give rise to the final product. Our manuscript archaeology showed how finding these kinds of intermediate concepts and adapting them into the conceptual framework can take a long time. It often takes several rounds of experimentation with different kinds of theoretical combinations. The search for fertile and apt intermediate concepts is not merely 'vertical' movement from general theory to intermediate concepts, or from data to intermediate concepts, but also 'horizontal' movement across different theoretical approaches.

The combination of different approaches in the conceptual framework of a study should not, however, happen in an eclectic manner in contrast to orthodoxy (Yanchar & Williams, 2006). The dialectical approach to constructing theories implies a combination of elements of orthodoxy (with a solid basic framework) and eclecticism (adaptive integration of intermediate concepts), and the reformulation of theoretical concepts based on their

differences and complementarities (Ilyenkov, 1975). Theoretical development requires a creative dialogue between concepts and theoretical approaches.

The framework of the progressive refinement of hypotheses (Engle et al., 2007) pays more attention to the transitional phases in research processes, focusing on the constant formulation of a new hypothesis. In our analysis, the research process constituted episodes with their own cycles, in which a specific research problem is worked on in connection with the results from other cycles. The episodes in the research processes were relatively independent elements, and resulted in 'final' tangible products of their own, such as a conference presentation, a short paper or a draft. The development of a conceptual framework consisted of several, more or less complete methodological cycles, which further developed the understanding of a case but often also changed the research focus. It was a kind of evolutionary process in which some elements developed in previous or parallel episodes were realized to be central in a slightly modified form in the later phases of the research. Some elements which were anecdotal at first, later became crucial.

The movement from the chaotic concrete to the abstract and to the interconnected concrete in specific cycles did not follow any strict order. Ascending from the abstract to the concrete and back in the cases appeared as a constant movement with multiple iterations between them, not as simply ascending from the sensory concrete to the theoretically abstract and then to the mentally concrete and practice. It is not possible to say what the actual starting point of this kind of process is. In some of the cycles in our cases, the movement was primarily between the different theoretical abstractions. This movement could be seen as *theoretical operationalization* – understanding a certain aspect (relevant for the research aim and for understanding the specific case or data) of one theoretical concept through another theoretical concept. In the case of wooden boat building, the concept of the object of activity was theoretically operationalized by the use of the intermediary object concept. In the case of

BIM, the concept of the intermediary object was theoretically operationalized in relation to the notion of the object of activity and later also in relation to virtual materiality.

In some of the cycles, the focus was on the movement between the theoretical concepts and what can be identified as the chaotic concrete, or the data and the preliminary focus of the research. This movement can be called *methodological operationalization* – aligning theory and insights from data in the empirical analysis. In the cases analysed, a central methodological operationalization in the BIM case was different forms of indexicality, and in the wooden boat building case, four lines of history. Theoretical operationalization alone is often not sufficient: it also requires methodological operationalization.

In the analysed cases, the intermediary object, a concept stemming from the ANT tradition (Vinck & Jeantet, 1995) emerged as an intermediate concept connecting theory and data and helping to find the focus of the analyses. In the BIM case, it was about concretizing practices – to describe how the collaborative use of BIM models was organized, and how these models provided tangible means for collaboration. In the wooden boat building case, the intermediary object was used to concretize the notion of the object of activity and to depict the modifiable, concrete and dynamic nature of its instantiations. These operationalizations raise and stress the various 'dimensions' of the object, such as the historical, temporal, spatial, or situational dimensions (Engeström et al., 2003).

The AAC method appears to be a fruitful way to describe the construction of a conceptual framework especially when horizontal movements between research cycles is taking into account. Like any model, AAC is a simplification and an idealization of the actual process. The manuscript archaeology of the cases aimed to show the long history of development behind the conceptual framework. This focused but descriptive historical analysis has its limitations, although it helps trace the development of concepts in research processes.

Conclusion

The aim of this paper was to apply and elaborate the AAC method to describe a complex process of constructing a conceptual framework in two specific studies. The interpretations of the AAC method highlight that the process targets ascending to *practice* (Dafermos, 2018; Engeström, 2020; Miettinen, 2000). How is this central aspect of the AAC method taken into account in our interpretation? The interaction between theory and practice, concepts and data has always been a central question of the CHAT approach. The core of the approach, starting from the works of Vygotsky (1978), has been on developmental (Engeström, R., 2014) and interventionist methodologies (Sannino, 2011). For Ilyenkov (1982/2008), the final stage of the AAC method was transferring the concepts to practice, which is the ultimate criterion for objectivity in these concepts. In CHAT research this is often supported by developmental and interventionist methodology, in which the developed concepts are tested in practice (Engeström, 2020), for instance, the concept of physical mobility in elderly home care (Engeström et al., 2012).

Our cases were not interventionist research, which is more common in qualitative studies, so it is important to ask how and if a movement to practice can happen. One of the starting points of the research was ethnography and observations of real activities, aiming at understanding historical transformations in the construction industry and craft activities. The multiple methodological cycles of constructing a conceptual framework with constant movement from the abstract to the concrete created a more refined and concrete understanding of these practices. In this sense, the theoretical conceptualizations developed in this process more fully describe the phenomena and their relations (cf. Ilyenkov, 1982/2008; Davydov, 2008). Understanding activities and changes does not mean simply applying existing concepts to describe practices: it requires reconstruction and concretization of these concepts in the practices. Research conducted within interventionist methodologies (Sannino,

2011) aims to change activities. Research aiming at understanding the transformations of practices and activities using ethnographic methods needs constant movement between theory and practice, in order to produce concepts that concretely describe practices and provide potential means for change and further research (Gherardi, 2012). In this sense, the AAC method has the potential to provide general methodological guidelines for various forms of practice theory or practice research (Miettinen et al., 2012) more generally, not just for research influenced by CHAT.

In this paper, we have introduced a dual understanding of transmethodology. First, as creating complementarities between theories, concepts, methods and researchers. Second, as a complex outlook on methodology, including long-term interactions of theory and practice. As a result of our analysis, transmethodology can also be understood as constructing the conceptual framework of a study through multiple episodes or methodological cycles over a long period of time. We showed how the interaction between various elements – theories, concepts, data, methods, analyses, researchers – contributes to this process at different stages of the research process. Our analysis merely scratched the surface of this issue. It would be fruitful to analyse these kinds of long-term methodological processes in more detail, using different sorts of cases. These analyses provide the means to interpret how ideal-typical formulations of methodology are followed and reconstructed in practice. They enrich a picture of methodology 'in the wild'.

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