



# Sustainable enterprise interoperability from the Activity Domain Theory perspective

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## ABSTRACT

The investigation of sustainable enterprise interoperability requires an explicit position of what constitutes the enterprise. In particular, human aspects like agency, sense-making, interpretation, common understanding, etc., must be taken into account. To this end, the purpose of this contribution is to make an inquiry into interoperability from the perspective of the Activity Domain Theory (ADT). In this theory, the enterprise is considered as a constellation of *activity domains*. The activity domain is characterized by the *activity modalities* – objectivation, contextualization, spatialization, temporalization stabilization, transition – which represent human, innate predispositions for coordinating actions. Interoperability is focused to one particular modality: the transition between activity domains. An example from the telecom industry is used to illustrate the approach. Implications for various aspects of interoperability are discussed. In conclusion, it is argued that the ADT is an alternative framework for advancing the understanding of sustainable interoperability between enterprises and enterprise systems.

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## 1. Introduction

The traditional, vertical integration of enterprises, where a single enterprise controls the bulk part of the supply chain, is rapidly being complemented by close and volatile collaborations between independent organizations. In order to capture short-term business opportunities, there is a need to establish and maintain sustainable networks of enterprises that benefit all partners involved. Sustainability – the capacity to endure – implies, among other things, the discovery of new and lost enterprise capabilities in the network, and the adaption of knowledge, processes and interacting enterprise systems (ES) to the new circumstances. This trend brings forward an increased focus on enterprise interoperability. Whatever change impacts the network, it will inevitably affect interoperability. Thus, in order to achieve sustainability, it is imperative to understand the essence of interoperability.

Interoperability was originally defined as “the ability of two or more systems or components to exchange information and to use the information that has been exchanged” [1]. However, in the context of sustainability, this definition is clearly inadequate. The scope must be widened from a narrow focus on ESs to encompass the interoperating entities – the enterprises. A firm position must be taken on what constitutes the enterprise. Unless such a position

is defined, inquiries into interoperability will inevitably be based on a morass underpinning, which aggravates a cumulative knowledge build up and the elaboration of realistic approaches for intervening in practice.

The concept of ‘enterprise’ is closely related to ‘organization’, where ‘enterprise’ emphasizes the doing or undertaking aspects of the business, and ‘organization’ the more structural ones. However, there is no consensus in the literature about what constitutes an organization. A number of different Unit of Analysis (UoA) have been suggested, such as: “organization” [2], “individual act” [3], “dyad” [4], “organizational field” [5], “practice” [26], “organizational routines” [6], “transaction” [7], “activity” [8], “social actor” [9], “work teams” [10], and “work system” [11].

These different UoAs focus each on a particular aspect of the organization, leaving the core character of the organization in oblivion. Thus, in order to put interoperability inquiries on firm ground, a conceptualization of what constitutes the fundament of the organization is needed. Such a fundament is provided by Activity Domain Theory (ADT) [12].

The ADT grew over many years from two roots – a theoretical one in the Russian theory of activity [20] and a practical one in the Ericsson telecom practice, where the author spent most of his professional life.<sup>1</sup> A strong motivation for engaging in ADT is that most extant approaches tend to overlook human, biological

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<sup>1</sup> Ericsson is a well-known leading supplier of telecommunication equipments worldwide: <http://www.ericsson.com/>.

inherited prerequisites for acting. This is indeed remarkable, since every act must ultimately be grounded in our biological and cognitive human constitution; we cannot act outside our given prerequisites.

In order to address this issue, ADT is centered on the concept of *coordination*. Coordination is at the core of human reality; by necessity we need to coordinate our actions, both when acting alone and together with other people. Coordination has been studied extensively in the literature; however, mainly from an organizational point of view. For example, Grant claims that the “fundamental task of the organization is to coordinate the efforts of many specialists. Although widely addressed, organization theory lacks a rigorous integrated, well developed and widely agreed theory of coordination.” ([13], p. 113). Concerning a particular kind of ESs, the so-called Enterprise Resource Planning (ERP) systems, Kim, Lee, and Gosain state that “The problem of coordination is counted as one of the most important issues leading to failure of a number of ERP implementations” ([14] p. 159).

In spite of the extensive amount of research, it is remarkably hard to pin down coordination. For example, Larsson [15] lists 19 definitions, and Malone and Crowston [16] identify eleven interpretations. Malone and Crowston also emphasize the multidisciplinary nature of coordination; the study of coordination must draw on organization theory, management science, computer science, economics, linguistics, and psychology ([16], p. 88). To further aggravate this situation, Nicolini concludes that there is a lack of knowledge about how coordination is actually carried out in practice:

In spite of the recent resurgence of interest in the study of coordination [17,18], we still know markedly little about the practice of coordination and, above all, the coordination of practices and knowings. ([19], p. 617)

In order to illustrate the approach to coordination suggested by ADT, we may consider a familiar activity – that of making a cup of coffee at breakfast. First, there is certainly a motive for doing so: enjoying a good taste, becoming alert, and so on. The activity is directed toward an object: the coffee that eventually will appear in the cup – an “objectless” activity is impossible” ([20], p. 55). By attending the object, motivated by some need, we contextualize the situation at hand – a ‘horizon of relevance’ is constructed that enables us to concentrate on what is appropriate for the task at hand, and disregard irrelevant aspects. In the coffee-making situation, this context probably includes the kitchen, the package of coffee, the coffee urn, etc., while other things like the uncut lawn outside the kitchen window and the weather are more or less irrelevant for the moment.

When a context has been perceived, there is a need to orient oneself in the situation: how are the relevant things related to each other? Where is the package of coffee? Where is the outlet for the cord to the coffee urn? If you have been making coffee in the same kitchen for a long time, this is probably not an issue; you know where to find the things you need and how these are located in relation to each other. However, if you come into quite a new kitchen, you have to make a conscious effort to orient yourself in that situation.

Next, you have to perform a sequence of actions in order to get the desired coffee: get hold of the coffee package, load the right amount of coffee into the coffee urn, switch on the power button, pour the coffee when it is ready, and the like. You have learnt this sequence, either by yourself through a process of trial and error, or, which is more likely, by someone showing you how. This lends a stabilizing character to the situation; you do not have to start all over again every morning by evaluating all possible ways of making good coffee.

During the entire activity you make use of certain means without which the activity could not be performed: coffee beans, the coffee urn, electricity outlets, the cord between the outlet and the coffee urn, cups, chairs to sit on, possibly a table to put the cup on, and the like. Not all properties of these means are interesting; only those that are relevant in the coffee-brewing situation.

Finally, after enjoying your well-earned cup of coffee, you may turn your attention to something else, like starting your trip to work, cleaning the house, washing your car or whatever. In doing so, you need to make turn your attention to another activity, where you will encounter the same characteristics as in the coffee-making activity; this time however, manifested in a different way according to the new situation.

In ADT, the fundamental conjecture is that the characteristic features described above are found in every socially organized human activity. Coordination is enabled by mastering the dimensions spanned by the *activity modalities* – *objectivation*, *contextualization*, *spatialization*, *temporalization*, *stabilization* and *transition*. These are integrated into a totality of the situation called the *activity domain*.

When applying this thinking to enterprises, it can be observed that an enterprise consists of many organized groups of people working on different objects for various reasons. For example, a marketing business unit sells the product, development develops it, and production produces it. Thus, an enterprise can be conceptualized as a constellation of activity domains, each providing a certain capability that the enterprise needs. Regardless of what kind of organizational unit is considered – two collaborating persons, a team, a group, a project, a business unit, the entire organization, collaborating organizations, and so on, – these may all be considered activity domains, each one structured by its specific manifestations of the activity modalities.

In order to carry out the work in an activity domain, different kinds of means such as ESs are needed. These systems provide information management capabilities, the relevance of which in a particular domain depends on its object and motive. For example, an ERP system is likely to be more relevant in domains that sell commodities from stock than in a domain that develops software functionality.

In this perspective, interoperability is seen as *interoperability between activity domains*. Stated differently, interoperability occurs between different contexts, indicating that the transition modality is in focus. The transition may affect such disparate things as agreeing on what a certain information entity means, deciding a sequence of information transfer, providing data base interaction facilities between ESs, securing stable Intranet services, and the like.

With this as a background, the paper is structured as follows. To begin with, the main features of the activity domain are outlined. Next, various aspects of interoperability are analyzed with the help of an example from Ericsson. This is followed by a discussion of the implications of the ADT approach toward interoperability. Since the contribution is a conceptual paper, no fully completed case is provided. However, the implications are derived from solid experiences learnt in the practice of developing complex telecommunication systems for an extremely demanding market, which makes it plausible that the approach is widely applicable. In conclusion, I claim that the proposed approach provides a firm ground for investigating sustainable interoperability and devising methods and means to manage it in practice.

## 2. The activity domain

In Fig. 1 the activity of performing a guitar concert is illustrated. The motive for engaging in this activity may be to amuse an audience, play for money, personal satisfaction, and the like. The

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