

ACTIVITY THEORY MODEL

Application in the Automotive Industry

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Abstract: Activity Theory is a set of basic principles that constitute a general conceptual system, rather than a highly predictive theory and constitutes an adequate research tool in order to generate organizational activity changes. This paper intends to show the activity theory model and to present a real case of its application in a real organization and how the model has achieved company's reorganization.

1 INTRODUCTION

MIK S.Coop.¹ applies the activity theory in many of its projects to analyse and redefine the way companies are working in any of its processes. This paper intends to show the activity theory model and to present a real case of its application in a real organization.

2 THE ACTIVITY THEORY MODEL

2.1 The Basic Principles of Activity Theory

Activity Theory is a set of basic principles that constitute a general conceptual system, rather than a highly predictive theory and constitutes an adequate research tool in order to generate organizational activity changes. The basic principles of Activity Theory include the hierarchical structure of activity, object-orientedness, internalization/externalization, tool mediation, and development.

2.2 Hierarchical Structure of Activity

In Activity Theory the unit of analysis is an activity directed at an object which motivates activity, giving it a specific direction. Activities are composed of goal-directed actions that must be undertaken to fulfil the object. Actions are conscious, and different actions may be undertaken to meet the same goal. Actions are implemented through automatic operations. Operations do not have their own goals; rather they provide an adjustment of actions to current situations. Activity Theory holds that the constituents of activity are not fixed, but can dynamically change as conditions change.

2.3 Object-orientedness

The principle of "object-orientedness" (not to be confused with object-oriented programming) states that human beings live in a reality that is objective in a broad sense: the things that constitute this reality have not only the properties that are considered objective according to natural sciences but socially/culturally defined properties as well.

2.4 Internalization/ Externalization

Activity Theory differentiates between internal and external activities. It emphasizes that internal

¹ MIK S.Coop. is the management research centre of the MCC industrial group (Mondragon Corporación Cooperativa). www.mik.es

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activities cannot be understood if they are analyzed separately from external activities, because they transform into each other. Internalization is the transformation of external activities into internal ones. Internalization provides a means for people to try potential interactions with reality without performing actual manipulation with real objects (mental simulations, imaginings, considering alternative plans, etc.). Externalization transforms internal activities into external ones. Externalization is often necessary when an internalized action needs to be “repaired,” or scaled. It is also important when a collaboration between several people requires their activities to be performed externally in order to be coordinated.

2.5 Mediation

Activity Theory emphasizes that human activity is mediated by tools in a broad sense. Tools are created and transformed during the development of the activity itself and carry with them a particular culture - historical remains from their development. So, the use of tools is an accumulation and transmission of social knowledge. Tool use influences the nature of external behavior and also the mental functioning of individuals.

2.6 Development

In Activity Theory development is not only an object of study, it is also a general research methodology. The basic research method in Activity Theory is not traditional laboratory experiments but the formative experiment which combines active participation with monitoring of the developmental changes of the study participants. Ethnographic methods that track the history and development of a practice have also become important in recent work.

2.7 Integration of the Principles

These basic principles of Activity Theory should be considered as an integrated system, because they are associated with various aspects of the whole activity. A systematic application of any of these principles makes it eventually necessary to engage all the other ones.

3 ACTIVITY THEORY MODEL

In the model (see Figure 1), the **subject** refers to the individual or sub-group whose agency is chosen as

the point of view in the analysis. The **object** refers to the ‘raw material’ or ‘problem space’ at which the activity is directed and which is molded and transformed into **outcomes** with the help of physical and symbolic, external and internal mediating **instruments**, including both tools and signs. The **community** comprises multiple individuals and/or sub-groups who share the same general object and who construct themselves as distinct from other communities. The **division of labor** refers to both the horizontal division of tasks between the members of the community and to the vertical division of power and status. Finally the **rules** refer to the explicit and implicit regulations, norms and conventions that constrain actions and interactions within the activity system.

Different subjects, due to their different histories and positions in the division of labor, construct the object and the other components of the activity in different, partially overlapping and partially conflicting ways.

There is constant construction and renegotiation within the activity system. Coordination between different versions of the object must be achieved to ensure continuous operation. Tasks are reassigned and redivided, rules are bent and reinterpreted.

There is also incessant movement between the nodes of the activity. What initially appears as object may soon be transformed into an outcome, then turned into an instrument, and perhaps later into a rule (Engeström, 1996). For instance, an unusual medical case first appears as a problem, is transformed into a successful diagnosis and treatment, the account of which is used instrumentally as a prototype or model for other similar cases, and is gradually sedimented and petrified into a rule requiring certain procedures in all cases that fit the category. On the other hand, rules may be questioned, reinterpreted and turned into new tools and objects.

4 ACTIVITY THEORY APPLICATION IN THE AUTOMOTIVE INDUSTRY

This section intends to present a real case of activity theory application in a real organization.

The organization designs and manufactures tooling and machinery for the iron and aluminium foundry industry, mainly for the automotive sector.

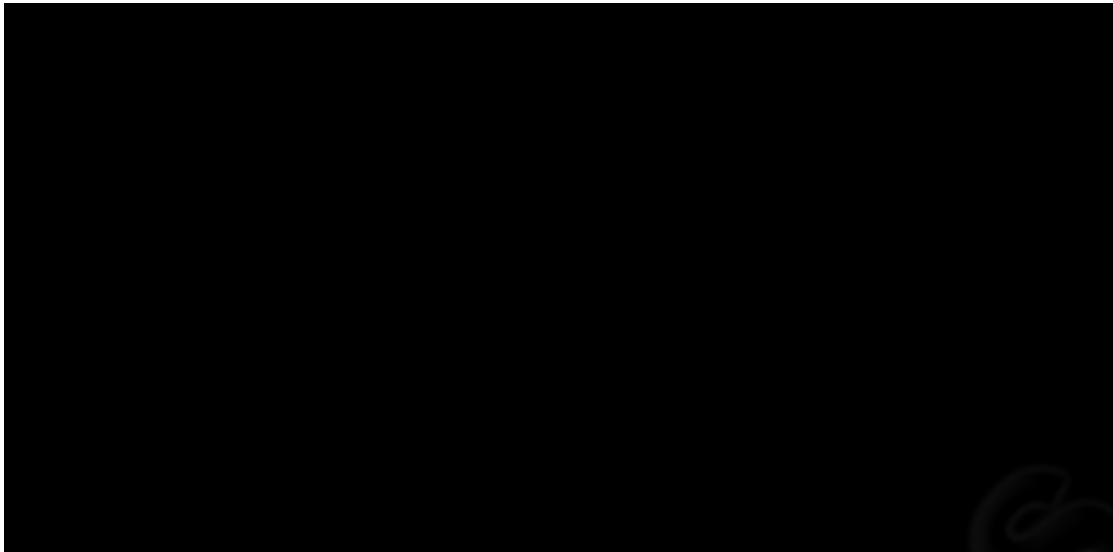


Figure 1: Activity Theory model.

It works with customer teams in order to get a full management of the project from order to production providing the best possible personalized attention to its customers.

4.1 Project Phases

In consonance with organizations board of director's view we decided to analyze and work in three specific processes without losing the connectivity with the whole organizational structure:

- Demand generation process
- Offer petition and negotiation process.
- Order / delivery process

The work carried out for each process followed the same activities: data gathering, data analysis, tensions identification and its analysis using the Activity Theory. In this paper we are going to focus on the Order / delivery process, and as we will see later on we will concentrate in a particular identified tension.

4.2 Diagnosis: Data Gathering

In order to gather quantitative and qualitative specific information, we accomplished face to face interviews with different crucial people taking part on the process.

4.3 Data Analysis

During the course of our study, we employed a variety of analysis models and methods although we

were basically focused on the application of Engeström's activity theory model.

Engeström's model was used in the analysis and communication of findings. Each transcribed interview was reviewed in detail. Annotations were made on the transcriptions to classify discussions of each activity system element and relationship among those elements.

Often, interviewees focused on tension between or within elements. Considering the analysis of tensions that were identified by the interviewees and observed in system analysis, we found that activity system tensions provide rich insights into system dynamics and opportunities for the evolution of the managing procedures.

4.4 Tensions between Activity System Elements

Three main tensions between and within activity system elements were identified in the Order/delivery process:

- Workload balance during the process
- Deadlines' fulfilment
- Mistakes in process

All the tensions were analysed according to the Activity Theory model. We are going to show application development for the first one, workload balance, which affects mainly to the technical office.

Object: An efficient workload distribution in order-delivery process, principally in the designing.

Subject: Project manager, Technical manager and Designers

Instruments / artifacts: spreadsheet, project management programme

Division of labour:

- Project manager: he defines project's phases' deadlines (long-term planning).
- Technical manager: He is responsible for managing design activities that is to say, for defining short-term deadlines and its monitoring and for assigning designers to each specific activity.
- Designer: He develops product's design.

This division of labour is all right in theory, but in practice technical managers feel more comfortable designing than managing their department. They were designers before being Technical managers and in spite of having new responsibilities they haven't fully assumed them. If there are problems with the activities deadlines they rarely adopt the necessary measures to correct it. Therefore, Technical Office work usually arrives late to the following process phases (CAM, manufacturing, assembly).

Rules: This company is organized in customer teams, depending on technologies (iron, aluminium or injection). Each team's structure is formed by a project manager, a technical manager, designers, a quality manager, an assembly manager and assembly workers. Manufacturing is common for all the teams.

The main goal of this organization is to provide a personalized attention to customers but, on the other hand we loose flexibility. In practice we find a problem when there are significant work level differences among teams because they are specialised in their customers and they are not used to sharing their resources. This problem is even more critic in the technical office, which is usually the origin of the delivery delays. Technical managers don't like "lending" their designers to other teams.

In addition to work level balance problem there is a huge lack of standardization (different documents, different design programmes, etc.). Technical managers are focused on their own teams and they don't manage together their department. Meetings among technical managers don't even exist.

Community: Directly, all the departments which take part in the order – delivery process (project

managers, technical office, manufacturing, assembly).

Indirectly, the whole organization and its customers.

4.5 New Configuration of the Processes

Once all the analysis elements have been defined, and specially focused on the tensions identified during the activity, we organized interdisciplinary sessions in order to find some alternative activities with the objective of tension reduction.

Within each session there was an interesting dynamic between open-ended dialogue technique and the desire for reliable data. The influence of observation on the observed is a well known phenomenon. The mere act of watching may help subjects to increase their awareness of mediating instruments, rules and the activity system object. Clearly, the group became more aware of misalignments in their work methods or tools.

As we said, the briefing, especially the discussion of tension between the subjects and division of labour served as a catalyst for dialogue between de interdisciplinary group. This dialogue created a new depth of understanding among the whole process. Having a representative of each part of the process to discuss more deeply the meaning and implications of the process analysis contributed significantly to the appreciation of the whole group and permitted to arise some solutions or changes described in next lines.

Subject: Project manager, Technical manager, Designers and Technical Director (new figure).

Division of labour:

- Project manager: he defines project's phases' deadlines (long-term planning).
- Technical director: he manages the technical office (resources assignment, innovation, standardization, activities monitoring, etc.).
- Technical manager: He is responsible for the engineering and design activities of his projects.
- Designer: He develops product's design.

Rules: Technical office needed a new figure who really managed the department. In the new model developed technical managers continue working in customer teams but designers are not members of a customer team but of different projects. The technical Director is the person who assigns

designers to each project. He knows workloads and he can decide which project needs which designer. Moreover, designers will work with different customers / technologies and technical office will increase its flexibility.

Technical director will not only balance workloads but he will also assume the department standardization activities (documents, checklists, CAD programmes) and he will lead all innovation and improvement initiatives.

Instruments: an ERP will be implemented to improve the organization's management (to standardize processes, to avoid documents duplications, etc.)

5 CONCLUSIONS

Actions can not be analysed as if they were isolated activities. The Activity Theory defines and takes into account all the elements taking part in the activity, not only the subject and the outcome but also the object, the division of labour, the instruments, the community involved in the action and existing rules and culture.

Relations among the different elements defined are dynamic and can change if the ambient conditions change, so the moment's conditions determines each analysis results and if conditions change it will be necessary to make a new study.

The Activity Theory offers us a theoretical framework to study social practices. The greatest asset in an organization is its people, that is to say, its employees' knowledge, capabilities and acts. Consequently, Activity Theory provides an important potential to be applied in companies and contribute to analyse most of its problems.

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