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Action Regulation Theory as a Tool for Qualitative Analysis

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Abstract

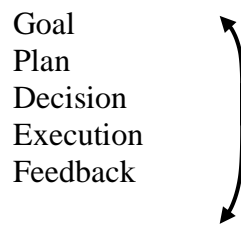
This paper presents a method of qualitative analysis which has become quite popular in Europe, and in Scandinavia in particular, but has received little attention in Australia and Asia. Action Regulation Theory (ART) provides an analytical framework capable of providing organisational analysis at the micro level. The framework considers individual job design and work process issues

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Introduction

Action Regulation Theory (ART) upholds the constraints of sociotechnical systems (STS) fit where it looks at joint optimisation of technical and social systems, but adds to the STS concept by taking a new approach to organisational analysis by interrogating individual actions to look for work hindrances. Work hindrances are systemic flaws which impede the regular progress of activity. ART comprises two concepts – actions are goal-oriented, and actions are regulated through a hierarchical structure – therefore a worker who performs an action is firstly led through a cyclic process of:



These cycles are also enveloped in a sequential-hierarchical system which regulate human actions on different levels, depending on the type of mental resources the task requires.

There are three levels of regulation – the *routine* level where actions are regulated more or less unconsciously and automatically – the *active knowledge* level, where actions are regulated in a conscious manner according to established rules or algorithms, and – the *creativity level*, where problems are solved or alternative options are considered. The level that the worker selects is correlated to the work task and to the level of their knowledge and experience, and according to their intended end-state. This means that different workers will enlist different levels of regulation (Waldenstrom, Josephson, Persson and Theorell 1998).

ART assumes humans are active and goal-oriented, and that they interact with their environment, being able to both change their plans according to the environment, and change the environment according to their plans, *this is a fundamental requirement, so that work hindrances can be attributed to the system, and not to the human*. With this in mind work tasks are executed according to the goals of the individual, and to the enacted level of regulation. Disturbances in this process are likely to arrive from work hindrances, due to systemic flaws in the social and technical design of the organisation, resulting in stress factors.

In their study Greiner, Ragland, Krause, Syme and Fisher (1997) found four stress factors, these were: *barriers* – the extent to which the work performance is impeded or interrupted because of work obstacles; *time pressures* – the measure of how fast the worker has to work to complete the assigned task under average work conditions, without barriers; *monotonous working conditions* – conditions which demand continuous visual attention, in combination with repetitive movements or information processing for at least 30 consecutive minutes; and *time binding* – the amount that worker autonomy is modified due to considerations over time and scheduling, regardless of time pressures.

The ability of ART to assess organisations for these hindrances and stress factors makes it a useful tool to objectively analyse sociotechnical work designs within and across organisations.

ART addresses organisational analysis from a perspective which treats the organisation as a system. A system is a complex arrangement of components which relate, directly or indirectly, in a stable or semi-stable causal network (Burrell and Morgan 1979). The two important elements within this arrangement are control and structure. *Control* requires the change of energy in one activity at one level in order to achieve meaningful activity at a higher level. To achieve this level of interference requires routes of communication which link activities and levels together. Humans are an implicit component in all social and work organisations, they link into the system through knowledge, providing a medium of interaction between the tool and the material being transformed, forming complex human activity systems. *Structure* comprises those elements within the human activity system which are either permanent or which will change slowly or occasionally. As such, structure, in terms of organisation, includes hierarchy, reporting structure, rules and procedures, task design, lines of communication, and physical layout (Bond 2000).

The systems view of organisational design can be metaphorically referred as organic or organistic as the system, in a macro sense, is reminiscent of its biological counterpart, both of which comprise systems and subsystems which symbiotically interrelate. However, for the organisation, in an organic design structure, the human element is the natural systemic flaw. As Haberstroh states, humans exhibit “low channel capacity, lack of reliability, and poor computational ability”, but on the other hand humans have some desirable characteristics “The strong points of a human element are its large memory capacity, its large repertory of responses, its flexibility in relating these responses to information inputs, and its ability to react creatively when the unexpected is encountered” (Haberstroh 1965, 1176). The challenge therefore is to design the organisational system so that it tolerates human weaknesses, while harnessing human strengths. The following theories of structuration detail some of the various attempts proposed by notable systems theorists in their endeavours to solve this dilemma.

The following sections will introduce theories of structuration, as a precursor to the main discussion on ART, and its application to qualitative analysis from a practical standpoint.

Structuration Theory

It is the work of Anthony Giddens which places an explicit bond between structure and control in social organisation. His objective in developing structuration theory is to “show that social collectives demonstrate persistent characteristics or features and that such structural characteristics seem to shape and facilitate practice” (Bond 2000). Structuration Theory provides an “ontological framework for the study of human social activities, that is, recurrent social practices and their transformations” (Giddens 1984). One of the principal aims of structuration theory is to resolve the debates between interpretivism, which places the emphasis on the way human agents and their interpretations create the social world, and functionalism, which places emphasis on

the pre-existent, given nature of the objects and structures of social systems. Giddens saw structural properties as virtual rules and resources that govern and enable social interactions and practices, where practices are skilful processes, methods or techniques preformed by human agents (Bond 2000; Lyytinen and Ngwenyama 1992).

Giddens' structuration theory comprises three main concepts: social structure, structuration and human agents. A *social structure* consists of "rules and resources, recursively implicated in the reproduction of social system" (Giddens 1984). Structuration theory distinguishes between system and structure. A system is defined by its observable patterns of behaviour and conventions, while a structure is bound by the unobservable rules and resources which are used to generate the system (Poole, Seibold and McPhee 1986). Within this context, rules are techniques or procedures, formal or informal, explicit or implicit, which guide human behaviour and social interaction. Such rules include codes of communication and norms of behaviour. Resources include capacities to affect material objects and means, as well as nonmaterial capacities to harness the activities of other human beings (Lyytinen and Ngwenyama 1992). As rules and resources are not observable social structures they do not exist in a physical sense, instead they emerge as instances of social action and impressions of past activity (Hettinga 1998).

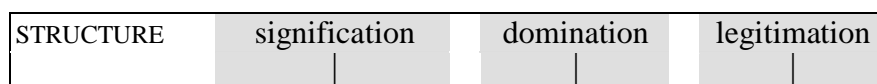
Giddens' explains that social structures are a duality – they are both "the medium and outcome of the contingently accomplished activities of situated actors" (Giddens 1984), the rules and resources established by society act as the medium of action and interaction, while at the same time existing as the outcome of action and interaction in a self-perpetuating manner. This relationship is critical to the idea of *structuration* (Giddens 1984). Thus actions and practices become knowledge, this knowledge forges guidelines and rules which provides for the reproduction of the original actions and practices. The rules are assimilated by new agents until they eventually become mutually held tacit knowledge.

The third key element of structuration theory is the concept of human agent. Human agents, or actors, act with deliberate and discursive consciousness, in that they will behave according to practical, prescribed and contextual arrangements or patterns of behaviour.

Social structures can be analysed from three dimensions (Hettinga 1998):

- Signification: the constitution of meaning
- Domination: relations of power
- Legitimation: moral order

These three dimensions of social structure form the three fundamental elements of social interaction. Figure 1 compares the three dimensions against their poles of the duality: structure and interaction, these poles are in turn mediated by a modality. This mediation is the drawing upon knowledge (implicit and explicit) and resources (material and nonmaterial) when producing and reproducing structures.



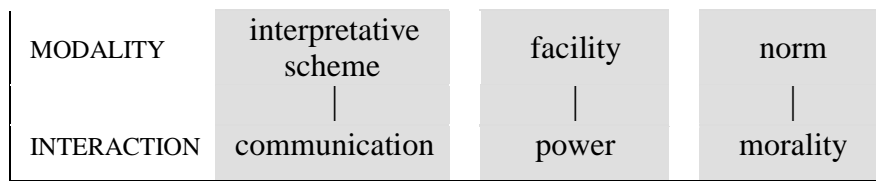


Figure 1. The three dimensions of structuration (Hettinga 1998).

The first dimension can be explained as being an interpretive scheme which mediates the production and reproduction of meaning via a mechanism of interpretation by applying variations of significance to the artefacts of communication. The second dimension looks at the facilities human agents will draw upon in their allocation and control over resources both human and material. The final dimension discusses the norms and standards or morality and their influence in the structures of legitimation. Figure 2 illustrates this process of structuration.

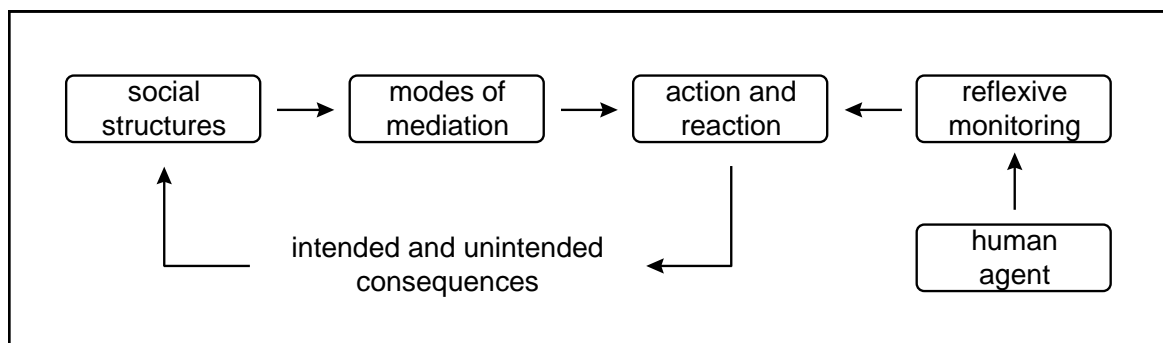


Figure 2. The process of structuration (Hettinga 1998).

Adaptive Structuration Theory

Based on the Structuration Theory forwarded by Giddens, Adaptive Structuration Theory is a modified model advanced by DeSanctis and Poole (1994). This variation is more appropriate for the study of humans when coupled with technology, and aims at attaining a better understanding of how to implement technologies in a human-social context by providing a model “that describes the interplay between advanced information technologies, social structures, and human interaction” (DeSanctis and Poole 1994).

Adaptive structuration theory uses a different definition of *structure* to that proposed by Giddens’ model. In this case a structure comprises two parts – structural features and the spirit of these features. Similar to the first two dimensions of the structuration theory, signification and domination, the *structural features* of adaptive structuration theory are the specific rules, resources or capabilities which bring meaning and control to social interaction (DeSanctis and Poole 1994). *Spirit* refers to the intention to which these features are used, this can be compared to Giddens’ third dimension – legitimation, as “it supplies a normative frame with regard to behaviours that are

appropriate in the context of the features” (Hettinga 1998). As with structuration theory, *structuration* is the process of production and reproduction of social structures, however Adaptive Structuration Theory allows for the modifying effect of technology which will contain its own rules and resources, this process is referred to as *appropriation* (Poole and DeSanctis 1990). Therefore social structure is neither determined by the social group, nor by technology, but is an amalgam of the two. Appropriation processes will occur at three different levels according to the degree of interaction between the social system and the technology (Poole and DeSanctis 1990). At the lowest level, the micro-level, appropriation occurs as a result of interaction between the individual and their unique uses of the technology. At the next level, global appropriation occurs as a result of group adoption and incorporation of the system. At the highest level social norms are formed which will apply to many groups and organisations (Hettinga 1998). Figure 3 provides an illustration of the concepts of Adaptive Structuration Theory.

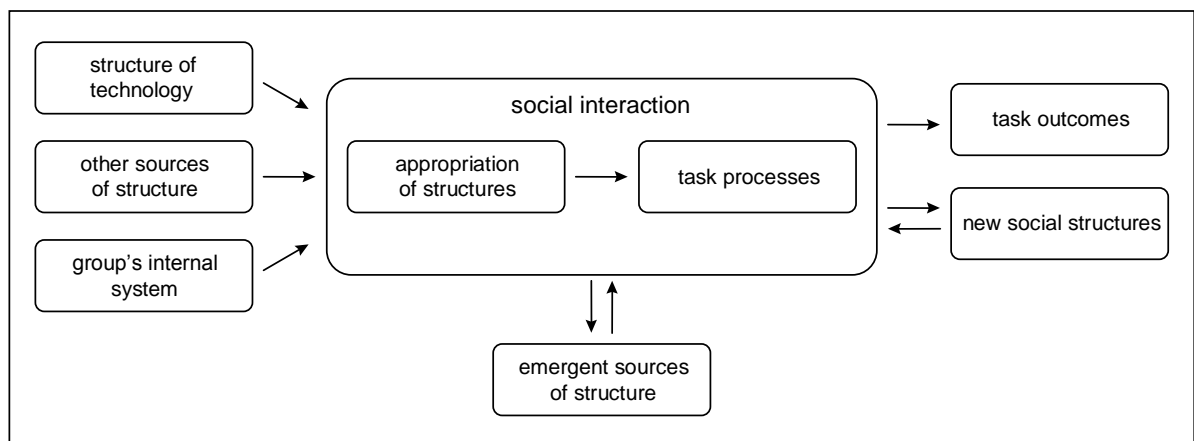


Figure 3. The major concepts of Adaptive Structuration Theory (Hettinga 1998).

The theories that have been discussed so far provide an introduction to organisations according to the premise that organisations are structured and function in a biological manner similar to organisms. As such organisations comprise parts or subsystems which interrelate and rely upon each other in order to maintain an existence relying on mutual complementarity for their survival. A further distinction of these theories is that they have been developed according to the open systems perspective where the whole organism as well as its parts must engage in an exchange of resources with its environment to avoid entropy.

... the open systems perspective stresses the reciprocal ties that bind and relate the organization with those elements that surround and penetrate it. The environment is perceived to be the ultimate source of materials, energy, and information, all of which are vital to the continuation of the system. Indeed, the environment is seen to be the source of order itself (Scott 1992 93).

This view of organisational structure emphasises the complex and variable nature of its component parts, leading to arduous lines of control and coordination. Parts are capable of semi-autonomous action and are multicephalous in that, as with many

heads, they are able to simultaneously manage multiple channels of communication, decision and action. Organisations are also morphostatic - capable of self-maintenance and stability, and morphogenic - capable of structural development and growth (Scott 1992).

The complex organization is more like a modern weapons system than like old-fashioned fixed fortifications, more like a mobile than a static sculpture, more like a computer than an adding machine. In short, the organization is a dynamic system. (Leavitt, Dill, and Eyring 1973 4)¹

Open systems theory takes a less conventional view of organisation, moving from a focus on structure towards a greater emphasis on process, this is illustrated by the move from early theories of structuration to more contemporary theories like sociotechnical systems and activity theory which see organisations as constructs of inputs, throughputs and outputs. As such organisational analysis must take a more detailed look at the internal functioning of organisations ensuring that components and subsystems foster a mutual complementarity.

Action Regulation Theory

¹ Leavitt ... in Scott, W. R. (1992). Organizations - Rational, Natural, and Open Systems. Englewood Cliffs, N.J., Prentice-Hall, Inc.

Action Regulation Theory is a cognitive theory which is well known in Germany and Scandinavia, but it is little known in English-speaking countries (Greiner, Krause, Ragland and Fisher 1998). It is based upon a conflux of Lewin's Field theories and the fundamental Activity Systems (AT) theories proposed by Leont'ev and Vygotski (Hacker 2003), however where AT looks at *activities*, which comprise sets of actions, ART focuses on *specific actions*. An action is described as goal-oriented behaviour (without a goal there is no cause for action), which is coupled with an inherent feedback cycle, which allows for the concept of action as a psuedo-iterative process. ART is concerned with the structure of goals and sub-goals, which are guided within a hierarchical framework of plans, monitoring, and feedback. These components of action are regarded as links between mental representations and the material and social environment. Thus ART can be seen as a part of Activity Theory (Frese and Zapf 1994; Morf and Weber 2000).

A practical analogy of action in this context could be a situation where on a film set

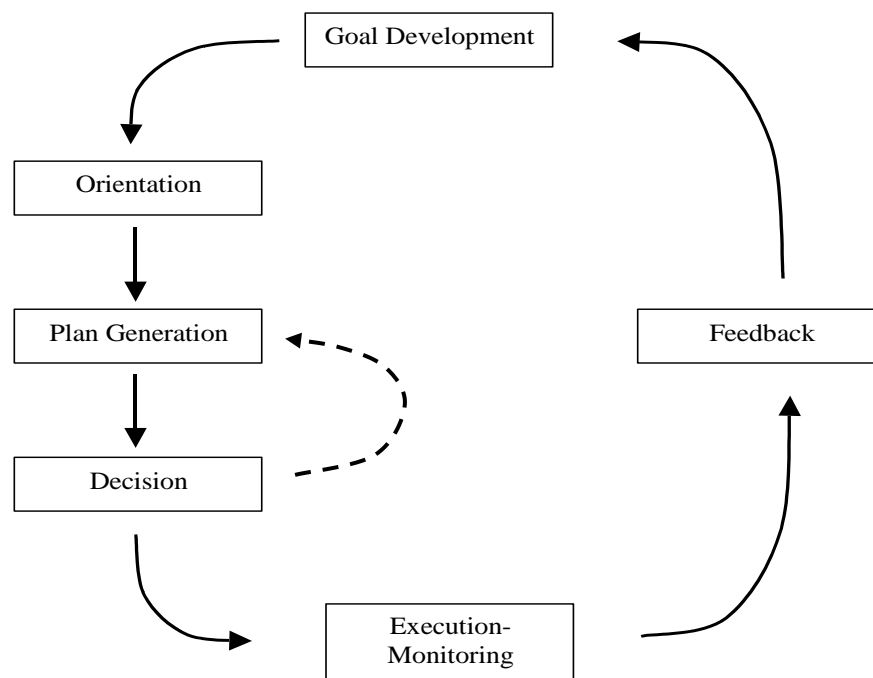


Figure 4. The Action Process.
Based on Frese and Zapf (1994)

the sound technician requires a clearer sound image, he would instruct the *boom operator* to move the microphone closer to the object for a clearer audio recording. Referring to figure 4, the boom operator will *develop the goal* (and decide amongst other competing goals) – **I want to move the microphone closer to the birds' nest**. Next she will *orient* herself by collecting information about the situation and capturing and analysing relevant signals leading to a probable prognosis – **The wind is blowing and the branch is moving**. The signals relate to acquired models and knowledge the grip has gained through experience and training. The analysis will then lead to *generation of plans*, while this is usually constructed before the action is

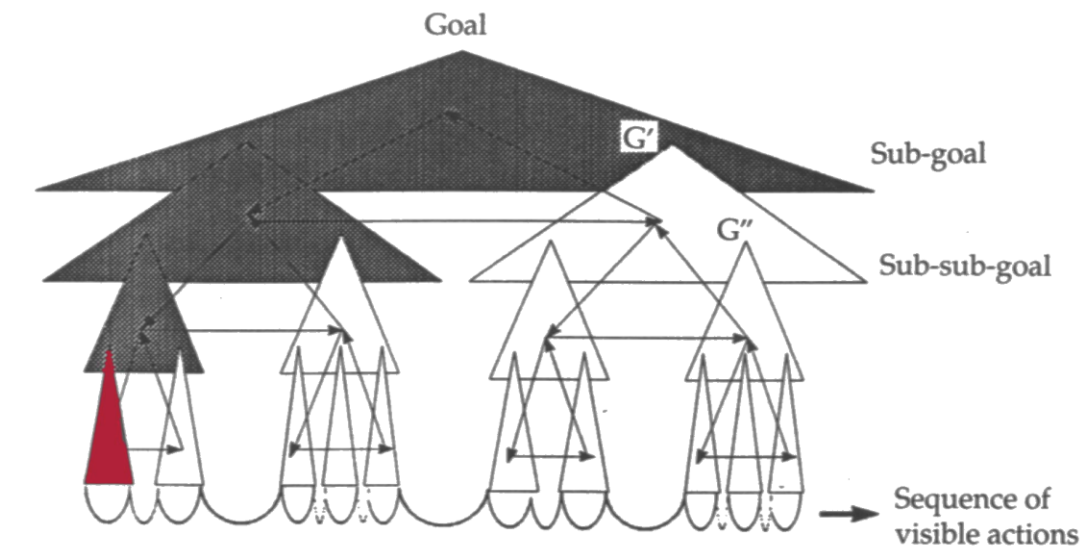
executed, it is not always comprehensively conceived, usually it is a simple sub-goal, with various levels of contingency – *I will rest the boom on the upper branch – if the branch is too flimsy I will support the weight by readjusting my balance.* *Decision* is usually a subconscious commitment to execute the plan. It may include an iterative process of Test-Operate-Test-Exit (TOTE), where the process between plan and decision are being continuously fine-tuned. *Execution and monitoring* is the point at which the subject interacts with the object, and both positions are altered. *The boom operator moves the microphone closer to the nest.* *Feedback* completes the action. It provides the subject with information regarding progress toward the goal, and can be extrinsic or intrinsic. *The sound technician receives an improved sound level and advises the boom operator that the position is good.*

In a nutshell an action is stimulated by a goal, which motivates the actor toward action, which consequently requires the anticipation of future conditions and results in a need for an action plan. The process is complete with feedback providing a basis for comparison and learning (Waldenstrom et al. 1998).

While the above adequately describes the ‘action’ part of ART, ‘regulation’ comes from the structure of actions and possible alternatives. This is because the actions are structured in a hierarchical system. Figure 5 illustrates this process of regulation, taking into account the hierarchic-sequential manner of action regulation. Firstly a goal is set, then working down, sub-goals are devised leading to actions. Completion of a set of actions will satisfy a sub-sub-goal or a sub-goal, which will eventually achieve the major goal. A parallel can be made to going from higher levels (the intellectual level) to lower levels (the sensorimotor level) in the human muscular-nervous system.

The real value of ART is with its ability to measure stresses or errors in the work system. Assuming that individuals are active and goal oriented, and they dynamically engage with their environment. Any failure to achieve a goal, which is potentially unavoidable, is due to an error.² As human error is avoidable, errors analysed through ART are assumed to be systemic, and are due to misalignments within the sociotechnical system. Such sociotechnical flaws are known as work hindrances as they tend to disrupt stable activity in the average person resulting in stress factors. These stress factors are characteristics of the work task that hinders the regulation of mental processes because of poor technical or organizational design, such design flaws include barriers to work, excessive time constraints, boredom, technical problems, ergonomic problems, scarce or restricted resources, environmental factors, or organisational short-comings. Work characteristics such as these will impede the task at hand, and force workers to try and cope with the situation, and will induce fatigue and poor occupational health and efficiency.

² This definition of ‘error’ is contrary to many other paradigms, where an error may occur as a result of intolerance or through the violation of a rule



From "The Model of the Hierarchical-Sequential Organization of Action" by W. Volpert. In *Cognitive and Motivational Aspects of Action* (p. 39) by W. Hacker, W. Volpert, and M. Cranach (Eds.), 1982, Berlin: Hüthig Verlagsgemeinschaft GmbH. Copyright 1982 by Hüthig Verlagsgemeinschaft GmbH. Reprinted by permission.

Figure 5. The Hierarchic-Sequential Regulation of Action

ART as a Tool for Qualitative Analysis

ART aims at gaining simultaneous improvements in organisational efficiency and human performance (Hacker 2003). Taking the two concepts of action and regulation the theory works to measure and optimise organisational performance where thought and action – plus – planning and execution can be analysed in concert as one process (Oesterreich and Volpert 1986).

Through action, the theory allows the measurement and understanding of individuals' motivations and self-directed action towards goal completion. Through regulation the theory measures the various learning and cognitive behaviours of individuals in the approach to, and management of, work options. Together an implementation of ART will measure the efficiency of human-technical interaction in the workplace or organisation by monitoring and reducing work hindrances. This method of qualitative analysis achieves two beneficial outcomes. Firstly, it highlights areas of organisational and occupational design which have inherent flaws impeding the efficient flow of work. Secondly, it provides guidance for the enhancement of workplace design along the lines of a sociotechnical systems structure ensuring the mutual optimisation of technical and human systems in the workplace.

Conclusion

Action Regulation Theory provides a basis for measuring and optimising the human-technical interface in the workplace. Taking a systems perspective of organisation, the theory builds on the work of Lewin with his force-field analysis and the work of Vygotski with Activity Theory, as well as the various approaches to Sociotechnical

Systems Theory. ART is divided into two complementary approaches to analysis. Firstly, work processes are observed according to their capacity to allow human variation towards task action, and how this action assists or impedes workflow. Secondly, work processes are observed according to their ability to constrain or promote cognitive regulation and creativity, whether workers will learn and innovate their way to more constructive and efficient outputs.

Overall, ART measures work impediments called hindrances and aims, ultimately to reduce these. ART provides a systematic method for analysing organisations based on worker activity and work flow. It is a method which has been largely overlooked in non-European countries, but it is a method which may have merit in other parts of the world.

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