

Social Organization Analysis: A Tutorial

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Abstract

Far less attention has been paid to social organization analysis than to other stages of cognitive work analysis. In this tutorial I seek to correct this neglect by detailing the analysis for a first-of-a-kind system, the most general and most challenging case. I intend that the description I present in this tutorial will serve as a guide to social organization analysis for diverse social organization design problems.

Social organization analysis results in a description of the organizational structures and communication processes that support collaboration between peers and coordination across hierarchical levels within an organization. The aim is to develop an organizational structure composed of a loose federation of work teams that are coordinated via lean connectivity. The work teams will be modular, having all essential resources and capabilities or development and delivery of the desired work product. Where essential for development and delivery of the desired work product, those modular work teams will be highly cohesive and intensely collaborative as supported by dense connectivity.

In other words, stable, self-contained work modules or work teams will be developed to engage in the most intensive cognitive transactions required for development of work products and these work modules or work teams will be teams assembled into a coordinated and productive work system by reliance on minimally intensive cognitive transactions.

Introduction

Social organization analysis is a stage within the larger framework of cognitive work analysis. Social organization refers to the way in which work is distributed, coordinated and managed. Social organisation analysis identifies how work can be shared between workers, how it can be distributed temporally and spatially, and how it can be supported and guided by management through the different hierarchical levels of an enterprise. The word *social* as used here refers to the social processes of cooperation and collaboration as supported by communication while the word *organisation* as used here refers to the structures and distributions of workers and managers.

As shown in Figure 1, cognitive work analysis is a multistage framework. It is normal to start with work domain analysis and then to proceed to work organisation analysis. In many applications of cognitive work analysis (see Lintern, 2012), there is no requirement to execute the analyses of individual and group cognition in a particular order. In this tutorial, I will explain the concepts within the context of analysis and design for a first-of-a-kind system. This type of analysis and design problem is best accomplished by proceeding through the analysis of individual cognition in advance of the analysis of group cognition.

To outline the method of social organization analysis, I develop a fictional, schematic illustration in which the scope of work covers the analysis and design of an entity I designate as the *operational work unit* (enclosed by the red boundary in Figure 2). Within this operational work unit, teams of workers execute a suite of work tasks with the assistance of appropriate technological support. For the purpose of this tutorial, I assume that the previous stages of cognitive work analysis have identified the essential work tasks and the cognitive demands associated with those work tasks. Additionally, the work organization analysis will have identified work situations. I have chosen to set this tutorial illustration within the work situation of *normal operations*.

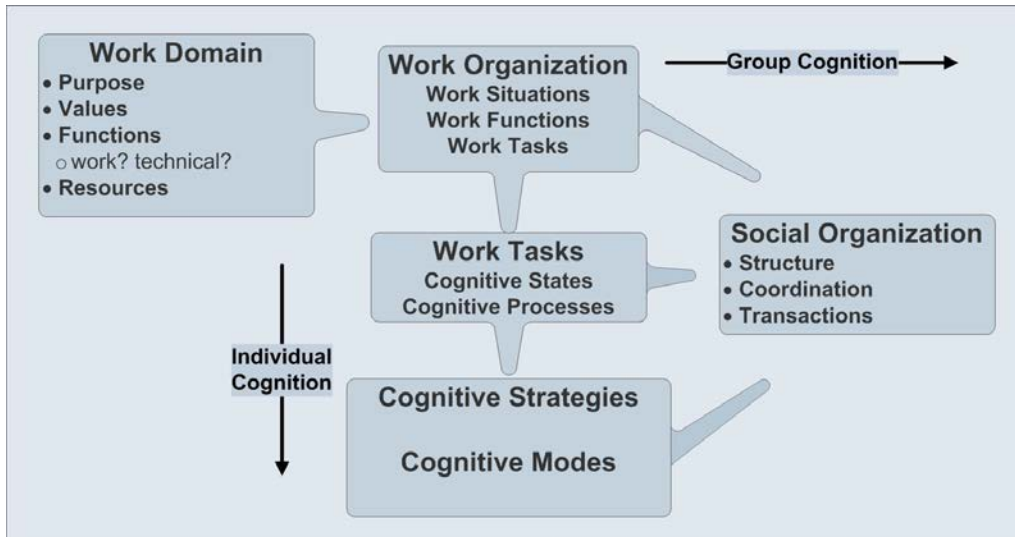


Figure 1: Cognitive work analysis is a multistage framework in which later stages draw on products from earlier stages

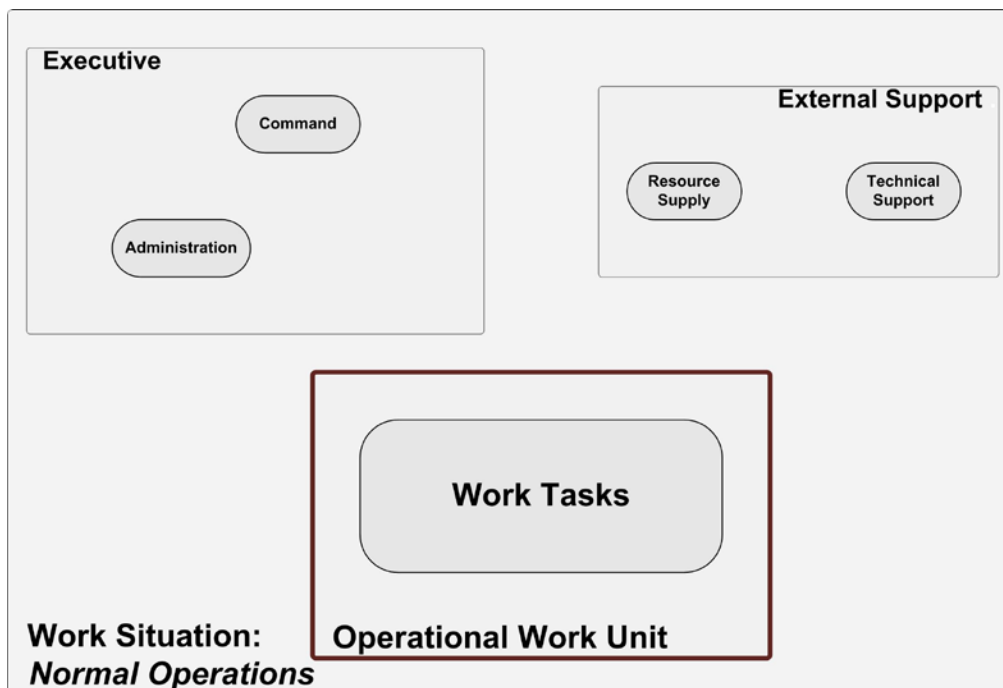


Figure 2: The method of social organization analysis is illustrated in this tutorial with reference to an operational work unit set within the larger context of a system that includes an executive and an external support unit

As suggested in Figure 2, the operational work unit sits within a more extensive system that includes an executive unit and a support unit. I have configured the example of Figure 2 specifically to illustrate how the analysis deals with the dense connectivity required for intensive cognitive work within the operational work unit and with the lean connectivity for support of sparse transactions between the three units. Both the executive and the external support units could be articulated in more detail as would be necessary for an extensive analysis of the whole system but for tutorial purposes I have chosen to illustrate the analysis with a generic and schematic organizational structure. For example, the executive of Figure 2 could contain several hierarchical levels of a command structure.

As well as redesign of the operational work unit, the scope of work (for this tutorial) includes redesign of the interfaces between the operational work unit and the executive and support units but does not include the redesign of those units.

Social Organization Analysis in Brief

Social organization analysis is concerned firstly with organizational structure and distribution of work. Organizational structures will necessarily be based on needs for authority, oversight, strategic guidance and reporting, and on the size of the organization. Vertical communication links will be needed to provide the connectivity that is essential for manager-worker coordination. For large enterprises, structures will be designed at several levels of scale, for example at the scale of the whole organization, at the scale of individual business units within the organization, and at the scale of work teams. It is unlikely that a particular organizational structure will work for all business units or all teams.

Social organization analysis is also concerned with organization and allocation of work tasks. Work teams must be structured to accommodate the nature of the work. In addition, the work that is undertaken must be coordinated through interactions

between workers; the lateral connectivity that supports essential collaboration (and sometimes, competition) between peers. The work teams will also interact with the management hierarchy through vertical connectivity that supports the transmission of instructions, guidance and requests. Finally, there will be requirements for information access and product transfers within the work unit and across its boundaries.

The supporting coordination processes, both lateral and vertical, are primarily communication events of various types. Social organization analysis identifies the generic properties of the communication events that maintain social organization within a work domain as a means of stimulating ideas for social-organizational design.

In another tutorial (Lintern, 2012), I explain the role of work domain analysis in mapping out the resources, capabilities and constraints of the work domain and explain the role of work organisation analysis in laying out the organization of work tasks. I also explain the role of work task analysis in identifying the cognitive states that will be activated during execution of a work task and the cognitive processes that will generate the state transitions. Subsequently, cognitive strategies analysis can be used to identify a range of generic methods for executing some of the cognitive processes, and cognitive modes analysis can be used to identify the style in which cognitive processes are executed.

The ensemble of work tasks as identified in work organization analysis constitutes the work that is to be undertaken. By reference to work situations and cognitive content, the first job of social organisation analysis is to assemble these diverse work tasks into modular constellations (as depicted in Figure 3) where modules are loosely coupled but work tasks within them are tightly coupled. The aim is to group work tasks that require similar types of cognitive expertise and that contribute to an identifiable work product into separate modules.

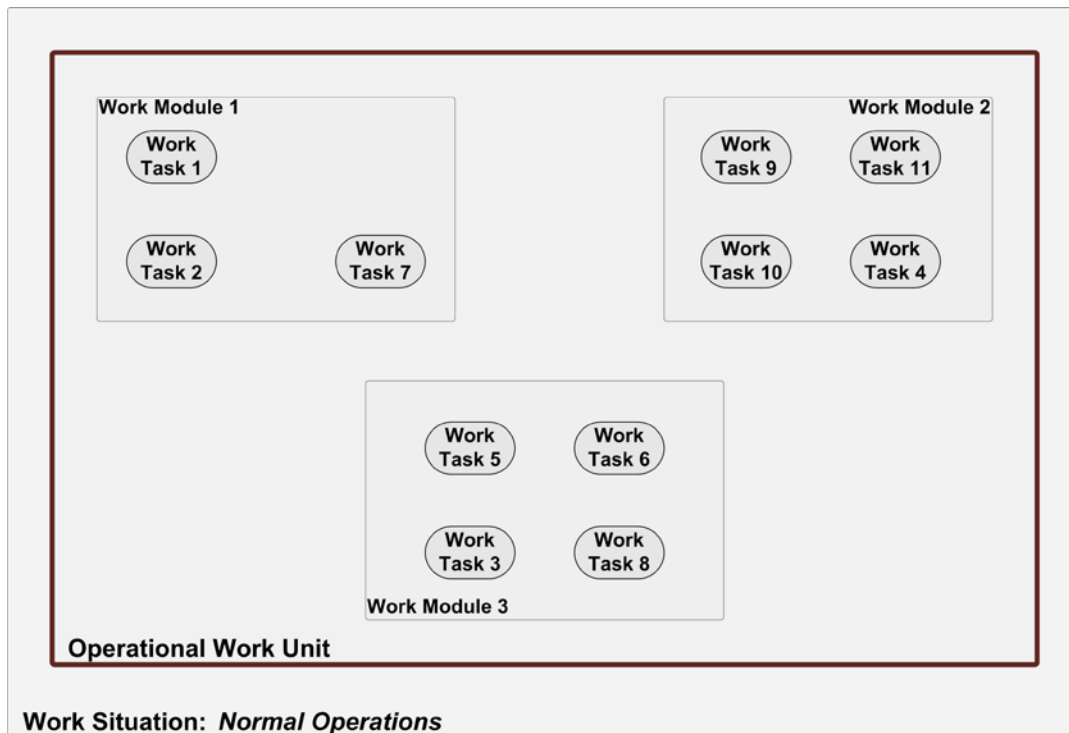


Figure 3: A hypothesis for modular organization of an ensemble of work tasks within an operational work unit and within a particular work situation

Each module should be designed to include the essential human competencies and the essential technical and information resources required for the work tasks that comprise the module. The integrated results of the work task, cognitive strategies and cognitive modes analyses will inform the design of technological, procedural and training supports for each of the work tasks that make up these work modules and will guide decisions about essential levels of worker skill and essential types of expertise needed for execution of the work tasks given the cognitive supports that will be provided.

In that allocation of work to modules is not definitive but rather, is typically based on educated judgement, the structure thus developed should be viewed as a hypothesis that will be evaluated in a scenario-simulation once these work modules are integrated into a coherent work system. That will require development of communication, team and organizational structures as informed by the social organisation analysis.

Social Organization Analysis Illustrated

Constraints and design options

In preparing for this analysis, it can be useful to lay out the organizational and work constraints in the manner illustrated in Figure 4 and to list the options for social organization design. An organisational constraint is one imposed by the hierarchical authority of the organization. Adherence to such constraints is required not necessarily for effective execution of the work but rather as a matter of policy. Work constraints are those inherent in the work and are imposed by the nature of the work.

Organizational Constraints	Work Constraints	Design Options
Statutory Regulation	Cognitive Demand	Division & Allocation of Work
Authority & Oversight	Amount, Load	Staffing & Role Allocation
Best Practice	Intensity	Team Structure
Geographic Distribution	Temporal Distribution	Collaboration Support
Organizational Structure	Interdependency	Information Access
		Execution Support

Figure 4: Organizational and work dimensions that constrain social organization design

The entries in Figure 4 indicate that a proposed design must take account of the organizational constraints (in this example, those of requirement to conform to statutory regulation, need for authority and oversight, requirement to conform to best practice, and the challenges imposed by geographic distribution and organizational structure). For example, the Chief Executive Officer or, in the military, the Area Commander, may specify the locations for work (i.e., geographic distribution) or the reporting and supervision requirements (i.e., authority and oversight).

The proposed design must take account of work constraints (in this example, its cognitive demand, the amount and intensity of work to be undertaken, the temporal span over which the work must be executed, and the interdependencies between various elements of the work). For example, the execution of some work activities may rely on concurrent or earlier completion of other work activities (i.e., interdependency) and may require certain modes of cognitive processing (i.e., cognitive demand).

Note that some of the column entries can change with the scope or intent of the design problem. For example, organizational structure is entered in Figure 4 as an organizational constraint but in a design problem of larger scope, it could become a design option. For this reason, the entries in Figure 4 should be considered as illustrative rather than definitive and as context specific rather than immutable.

Work modules, work units and staffing

Although one or more hypotheses about essential levels of worker skill and essential types of expertise needed for execution of the work tasks will have already been developed, a number of issues remain unresolved, among them for example, staffing, role allocation and team structure. Where the work demand exceeds what can be handled by one person, staffing numbers can be increased to the appropriate level. The nature of the work will suggest how the work might be distributed among workers and that may suggest an appropriate teaming structure. For example, it may be preferable to give different workers responsibility for different components of a work module or it may be preferable to have the different workers take care of complete jobs within that work module.

Figure 5 depicts how the work modules of Figure 3 might be reorganized into an operational work unit. The basic structure of this work unit should conform to the organisational constraints as shown in Figure 4. In this case, one role for the team leader is to satisfy the need for authority and oversight. Figure 5 indicates that the team leader will do that by fielding requests from the workforce and by offering guidance and reviewing the work products.

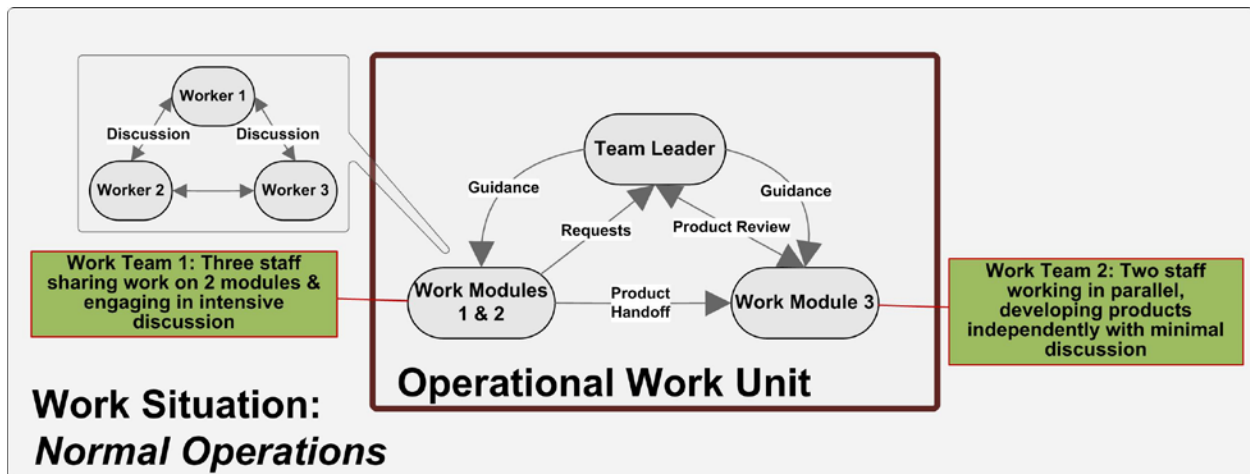


Figure 5: A hypothesis for team structure of a modular work organization within an operational work unit and within a particular work situation

Figure 5 further elaborates the hypothesis depicted in Figure 3 by suggesting staffing levels and the nature of the working relationship between staff within modules. For this illustration, I have assumed that the amount and intensity of the work undertaken in modules 1 and 2 are low enough for it can be executed comfortably by three workers with a similar skill set and level of expertise. These three work interactively, sharing elements of work tasks opportunistically. In contrast, the work of module 3 cannot be shared easily so that a single person must take responsibility for a complete work package as it is processed within the module. However, throughput is high enough to require two workers to cope with the work demand, each processing a complete work package with only minimal interaction.

Staffing Docket

The network diagram of Figure 5 should be viewed as a scratch pad that provides information for a formal product that will lay out staffing requirements in a matrix. The staffing docket shown in Figure 6 offers an appropriate form. It identifies the sub groups within the operational work unit and the proposed staffing assignments for each sub group. Separate columns are used to list the selection criteria for staffing

assignments. The selection criteria identified in Figure 6 are illustrative. The particular selection criteria and the manner in which they will be applied should be identified early in the social organization analysis.

Staffing Docket (Operational Work Unit)				
Operational Work Sub-Group	Selection Criteria	Education, Training, Qualifications	Seniority	Experience, Competency
	Staff Roles			
Team Leader	Team Leader			
Work Modules 1 & 2	Analyst 1 Analyst 2 Analyst 3			
Work Module 3	Planner 1 Planner 2			

Figure 6: A staffing docket showing proposed staffing assignments tabled against selection criteria

Transactions

Transactions are the human exchanges that transform disparate elements of a work system into a coordinated system. I prefer the term *transaction* to *communication* because some of the more significant exchanges are in the form of structured products such as plans or reports. While even those exchanges can fit within a broad definition of communication, the use of the term transaction emphasises that this is not just about communication in the narrow sense of normal conversation.

This part of the analysis identifies the transactions between human agents. The aim is to stimulate ideas about how to support transactions with technological, procedural or training innovations. Because the functions and practices of external units (in this

tutorial illustration, the executive and support units as shown in Figure 2) may constrain the options for transaction support, the analysis should distinguish those transactions that are internal to the design target (in this case, the operational work unit) from transactions with entities with which the design target must interact but that lie outside the design scope of the project.

The links (arrows) and their annotations as depicted in Figure 5 summarize the transaction patterns within the operational work unit. Figure 5 depicts the hypothesized transactions between the team leader and the two work teams (together with characterizations of the nature of the interactions). Additional within-team transactions are illustrated for the team that executes the work tasks for modules 1 and 2.

[Setting the work unit within the larger organization](#)

Figure 7 illustrates how the operational work unit depicted in Figure 5 might fit within a larger organization. As noted above, the operational work unit is the target of analysis and design. Redesign of the executive or of the external support is outside the scope of the design project but because redesign of the interfaces and transactions supports between the operational work unit and those outside its boundary is within scope, it is essential to identify the nature of those cross-boundary transactions.

The links (arrows) and their annotations as depicted in Figure 7 summarize the cross-boundary transaction patterns between the operational work unit and the other organizational units. These transaction links connect specific sub-groups in the operational work unit to specific sub-groups within the other organizational units. For some projects, it may be necessary to develop a more detailed representation that lays out transactions between individuals within those sub groups.

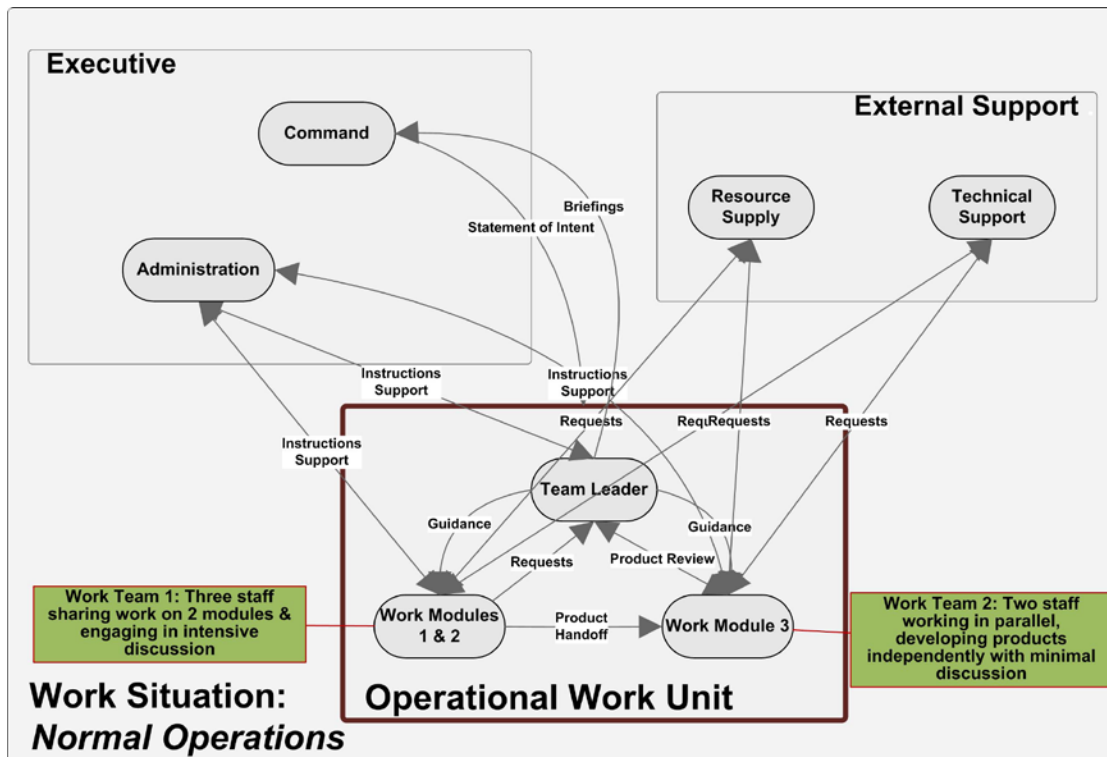


Figure 7: Elaboration of the hypothesis of Figure 5 to show how the transactions between the operational work unit and other units within the larger organization

Transactions docket

As with the staffing analysis, the network diagram of Figure 7 should be viewed as a scratch pad that provides information for a formal product that will lay out transaction requirements in a matrix. The transactions docket shown in Figure 8 offers an appropriate form. It identifies the reach of the transactions (their organisational distance) and the human agents involved in those transactions. Separate columns are used to characterize the transactions in terms of demand (its cognitive complexity), dimension (whether the agents are co-located or not and whether interactions are in real time or otherwise temporally displaced) and technological, procedural or training resources that might be used to support or enhance the transactions. The entries in Figure 8 are based on an illustrative but fictional narrative.

Transactions Docket (Operational Work Unit)					
Transaction Reach	Transaction Properties		Transaction Demands	Transaction Dimensions	Design Ideas
	Interacting Agents				
Internal	Team Ldr<->Op Staff		Guidance, Review, Update	Co-located, Synchronous	Shared Status Board, Work Boards & Notice Boards
	Team 1 <-> Team 2		Product Transfer	Co-located, Synchronous	Document Link
	Work-Team 1 (Internal)		Discussion, Problem Solving	Co-located, Synchronous	Shared Work Boards and Electronic Table
	Work-Team 2 (Internal)		Information Sharing	Co-located, Synchronous	Face to Face
Executive	Team Ldr->Command		Briefing, Discussion, Review of Command Guidance	Separated, Synchronous	Desktop Sharing Video Link Voice Link
	Team Ldr & Op Staff->Admin		Leave Requests, Pay, Travel Reports	Separated, Asynchronous	Text Link Document Link
Support	Work Teams->Supply		Supply Requests	Separated, Asynchronous	Text Link Document Link
	Work Teams->Tech		Problem Solving	Separated, Synchronous	Desktop Sharing, Voice Link, Document Link

Figure 8: A transactions docket showing agents associated with work tasks, and demand, dimensions and resources associated with transactions

Transaction reach

Transaction reach is a conceptual characterisation of the different types of organisational entities that interact with each other. The intent is to classify organisational interactions that could result in markedly different transaction demands and dimensions. In this tutorial illustration, I have differentiated the within-group interactions for the operational work group from the between-group interactions of members of the operational work group with members of the executive or of the external support.

The fictional narrative indicates that all staff members within the operational work unit, when interacting with each other, engage in transactions that are similar in terms of demand and dimension. Other organisational units are included under transaction reach and they might be distinguished or combined as indicated by the similarities or

differences in the interactions those in the operational work unit have with sub groups within those external units.

Interacting agents

Interaction pairs are listed in the second column. Internally, the team leader interacts with his staff in all-hands meetings and sometimes with individuals and teams. The work teams interact with each other. The work requires interactions between individuals from each team but these interactions can involve different pairings at different times. If the narrative indicates that a particular staff member in one team is invariably designated to interact with someone in the other team, the entries in this column would be adjusted to reflect that.

The narrative indicates that the internal discussions for work-team 1 are more frequent and more intensive than those for work-team 2 and so these two teams are distinguished in this column.

Similarly, for the executive and support entries in the transaction-reach column, distinctions are made in defining interaction pairs when the demands and dimensions of the transactions are distinctively different.

Demands, dimensions, resources

The fictional narrative has the executive and support units separated from the operational work unit by large distances. Figure 7 indicates that the team leader and each of the work teams need to have means of communicating with both the executive and the support units. Given the separation demand, transactions will require some type of technological support to bridge the distance. The other dimension, synchronicity, will suggest important technological capabilities for those transactions. Could something like text chat or email be satisfactory or is voice communication in real time necessary? The transaction demands, whether they are perfunctory versus cognitively intensive, also have implications for the types of transaction support tools to

be provided. Should there be a video link? Should there be some type of shared, interactive workspace to support collaborative problem-solving or planning?

In contrast to the spatial separation between the operational work unit, the executive unit and the support unit, the interactions within the operational work unit are always co-located and synchronous. All-hands meetings are used to brief the staff on guidance and updates from the command sub group while individual meetings are used to review progress. Information transfer in these interactions might be facilitated by a shared status board, shared work boards, and notice boards.

The two teams have only minimal interaction in relation to their work. The members of work-team 1 transfer the results of their analyses to work-team 2 for further processing. This is always done by posting the product to the information system followed by a brief face-to-face (co-located and synchronous) discussion. This interaction requires an electronic means for transferring documents.

The members of work-team 1 are in continuous interaction as they develop their work products, backing each other up, asking each other for assistance and advice, and sharing efforts on different pieces of the work problem. They often become involved in collaborative problem-solving. The intensive and complicated nature of their interactions suggests that their work might be facilitated by shared work boards. A shared electronic table on which they can display resources and work with them may also be useful.

The members of work-team 2 operate more independently. Their interactions are typically confined to brief exchanges to share some noteworthy aspect of the work. It seems unlikely that their interactions would benefit appreciably from availability of a shared work board.

Evaluation via Scenario Simulation

The network diagrams included in this tutorial (Figure 3, Figure 5 and Figure 7) should not be viewed as design recommendations but rather should be treated as hypotheses.

They may be transformed into design recommendations by scenario-based evaluations that assess workflow, workload and productivity. In some cases, a number of possible network configurations might be developed, in which case there would be a need for comparative evaluations to identify the preferred design option.

Concluding discussion

Social organization analysis results in a description of the organizational structures and the coordinative work processes that support collaboration between peers within a team or work group as well as the coordinative processes between that work group and other hierarchical levels within an organization. The analysis uses products from the earlier stages of cognitive work analysis, most notably the modular work structure developed in work organization analysis to advance hypotheses about structures for work units, work teams, and transaction links.

The aim is to develop an organizational structure in which the most intensive cognitive transactions are undertaken within stable, self-contained work modules or work teams with these modules or teams assembled into a coordinated work system by reliance on minimally intensive cognitive transactions. In other words, the aim is to develop a loose federation of work teams or work units coordinated into a unified system by virtue of lean connectivity but with each team or unit unified by high internal cohesion and dense connectivity.

Vicente (1999) introduced social organization analysis as a distinctive stage within cognitive work analysis. His treatment was conceptual and brief. Since the publication of Vicente's book, far less attention has been paid to social organization analysis than to other stages of cognitive work analysis. In Lintern (2009), I offer a more tutorial treatment but it too is brief and is oriented to one particular type of problem. In this tutorial I have sought to lay out the analysis for the most general and most challenging case. It is my expectation that the description I present in this tutorial can serve as a guide to design of a social organization analysis for different types of design problems.

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