24 TWO TIMES FOUR INTEGRATIVE LEVELS OF ANALYSIS: A FRAMEWORK

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Abstract

Walsham (2000) urged Information Systems researchers to truly cover all levels of analysis from the individual to the societal in their research agenda. In this paper, we accept his challenge by proposing a research framework of four integrative levels of analysis: individual, group/activity, organizational, and societal. Each level is divided into two viewpoints: intra (single case) and inter (multiple cases, relational, comparative). In addition, the temporal/historical dimension should be applied on all levels and viewpoints. We argue that although all of the levels and viewpoints of the "2 x 4 + history" framework cannot be thoroughly covered in any single study, researchers should always identify their specific research scope and context on all four levels, allowing other researchers to assess the peculiarity or wider applicability of the study. All of the levels and viewpoints are relevant to practical IS development in certain situations.

The original version of this chapter was revised: The copyright line was incorrect. This has been corrected. The Erratum to this chapter is available at DOI: 10.1007/978-0-387-35489-7_33

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1. INTRODUCTION

In the IFIP WG 8.2 Working Conference on the Social and Organizational Perspective on Research and Practice in Information Technology, in Aalborg, Denmark, Geoff Walsham pointed out that although globalization has become a fashionable term, most information systems (IS) research disregards societal issues and assumes that the results achieved in the context of the Western/ Northern countries are universal. Walsham urged IS researchers to truly cover all levels of analysis from the individual to the societal in their research agenda, and "to study *particular* individuals, groups, organizations, or societies in detail, and in context" (Walsham 2000).

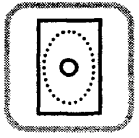
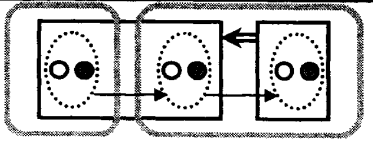
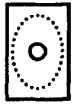
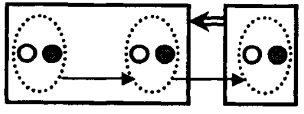
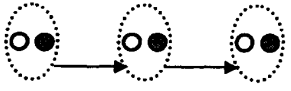
In this paper, we accept Walsham's challenge. The objective of the paper is to operationalize his levels of analysis one step further toward applicability in particular studies. While Walsham reviewed IS research on five levels of analysis—individual, group, organization, interorganization, and society—we propose a research framework of four integrative levels of analysis with two viewpoints—within and between units of analysis—on each level, together with a temporal dimension in all the "2 x 4 cells." In section 2, we introduce the concept of integrative levels and develop the research framework of four levels with two viewpoints. In section 3, we discuss the implications of the framework to IS research and development.

2. THE "2 x 4 + HISTORY" FRAMEWORK

The concept of integrative levels has been used in comparative psychology to describe the interplay between the categories of molecules, cells, tissues, organs, physiological systems, and organisms (Tobach 1999). An individual organism, e.g., a person, is the integration of the intraorganismic levels. Each level requires its own methods of study, but the levels are interconnected; for instance, a threat at the individual level causes a reaction simultaneously on the psychological, physiological, and biochemical levels. In this paper, we make an attempt to apply the principle of integrative levels to phenomena studied by IS research.

We propose that in IS research, four integrative levels of analysis are important: the individual, group/activity, organizational, and societal levels (Table 1). We briefly discuss the unit of analysis and the required reference theories on each level, and provide examples of possible research topics applying the intra- and inter-viewpoints on each level. References to literature on generally well-known theories are omitted.

Table 1. The 2 x 4 Integrative Levels of Analysis

Level of analysis	Intra-viewpoint: the unit of analysis as such	Inter-viewpoint: relations or comparison between units of analysis (an example)	Theories, frameworks, names (examples)
Societal	 Country/culture	 Trans-national service chain	Sociology, political economy, cross-cultural studies, Castells, IT for Development
Organizational	 Organization	 Business between organizations	Organizational theories, economics, resource-based theory, MIS, BPR
Group/activity	 Activity	 Service chain between activities	Work research, activity theory, actor network theory, Engeström, CSCW
Individual	 Person	 Men/women, doctors/nurses, etc.	Social psychology, gender studies, behaviorism, Kolb, HCI

2.1 Individual Level

Within unit of analysis: The unit of analysis on the individual level is, naturally, a *person*. Intra-individual research in IS deals with the processes and structures of the human mind in relation to the use of IT, for instance, job satisfaction among the users of a specific kind of information systems. Human-computer interaction (HCI) research belongs by default to this category. Such research will need the support of psychological theories and research methods.

Between units of analysis: Inter-individual research deals with *relations between individuals* or with *comparison between sets of individuals*. An example of the former type is a study on the informal IT support networks in organizations. In the last row of Table 1, we depict the basic research setting of the latter type: studies in which individuals are grouped according to sex, education, occupation, or the like, and differences between the groups are searched for. Examples of research topics in the inter-individual cell of the matrix include the impact of job requirements on male vs. female IS professionals, user interface adaptation according to Kolb's personality types, and the attitudes of nurses vs. doctors on hospital information systems.

2.2 Group or Activity Level

Within unit of analysis: The unit of analysis on the group level is a group of people who are *related to each other in a systemic way*, not just as a set of individuals sharing a common characteristic as in the inter-individual viewpoint. In other fields of investigation, a family or a kinship group, for instance, might be such systemic groups, but in IS the group level typically refers to a work setting. We subscribe to the view that a *work activity* is the collective systemic entity that deserves the role of the unit of analysis in group-level IS research (Kuutti 1991). A plethora of other theoretical frameworks operate on this level as well, e.g., actor network theory. Most practical IS development and computer-supported cooperative work (CSCW) research operate on the intra-activity level; the objective is to facilitate a work activity by improved information-technological means.

Intra-activity research requires a theoretical understanding of the inner structures and processes of an activity. Figure 1 depicts our "visual checklist" of the relevant elements of an activity. The model is based on activity theory (Engeström 1987; Engeström and Miettinen 1999; Hedegaard et al. 1999) and described in more detail elsewhere (Korpela et al. 2000a, 2001a). For the purposes of this paper, it suffices to point out that the model combines individual, collective, technological, and process aspects in a systemic way. The framework thus links the units of analysis of the individual and group/activity levels in the

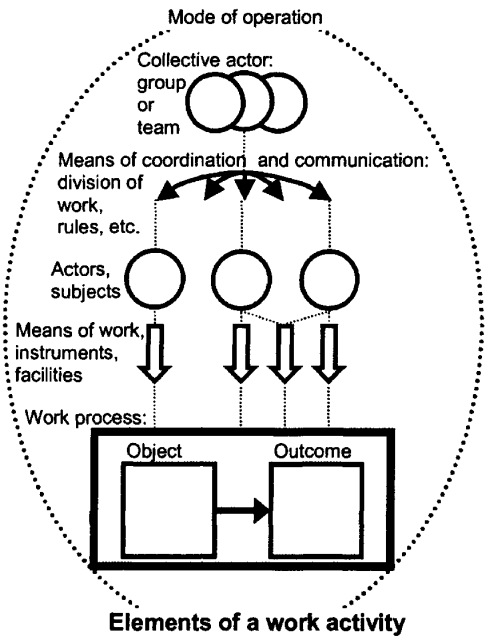


Figure 1. The Inner Structure of a Work Activity as a Systemic Entity

way required by the principle of integrative levels. The units of the two levels interact with each other and the analysis can switch back and forth between these levels.

Between units of analysis: Analogously to inter-individual research, inter-activity research deals with *relations between activities* or with *comparison between sets of activities*. The example in the second-last row of Table 1 depicts a service chain between activities. In general, the outcome of an activity is typically used within another activity, either as an object, means, or actors (Engeström 1987; Korpela et al. 2000a, 2001b). By analyzing the producing activities for each element of a given work activity and identifying the activities served by its outcome, one can systematically survey the relations between entire networks of activities. Examples of research topics in the inter-activity cell of the matrix include the interaction between IS development and IS research, or the use of the Internet to support managed healthcare.

It should be noticed that the levels of analysis can be combined. For instance, we can study gender-based differences between actors across a chain of activities, as depicted by the white and gray circles in the second-last row of Table 1.

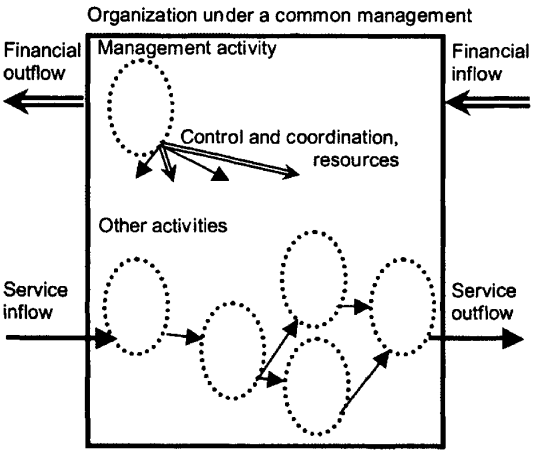


Figure 2. The Inner Structure of an Organization in Terms of Activities

2.3 Organizational Level

Within unit of analysis: The unit of analysis on the organizational level is, not surprisingly, an *organization*. Contrary to some other researchers in the activity-theoretical tradition, we believe that an organization cannot be fully understood as "just a big activity," i.e., we believe that the organizational level of analysis is needed as an independent level (Korpela 1994). Extending the activity-theoretical approach, however, we can define an organization as a group of activities controlled and coordinated by a shared management activity (Figure 2; Korpela et al. 2000a). Again, this framework provides a linkage between the units of analysis of the group/activity level and organizational level (cf. Grønbæk et al. 1993).

In general, organizational and business theories and frameworks are required on this level, e.g., the resource-based theory. A typical intra-organizational IS research topic might be the alignment between business strategy and IS. The organizational level is probably the most traditional level of IS and MIS research.

Between units of analysis: In particular, financial relations between organizations do not seem to easily bend into a pure activity framework. In a market setting, financial relations between organizations follow service relations between activities in the opposite direction ("payment for service," right-hand side of Figure 3), but financial and service chains are not necessarily identical (left-hand side of Figure 3). Inside an organization, management has the right to allocate the resources received from the outside among the activities, irrespective of which activity provided the external service that "earned" the income (Figure 2). The cooperation and network relationship theories also apply to the inter-organizational viewpoint, and electronic commerce is a prime example of an inter-organizational IS research topic.

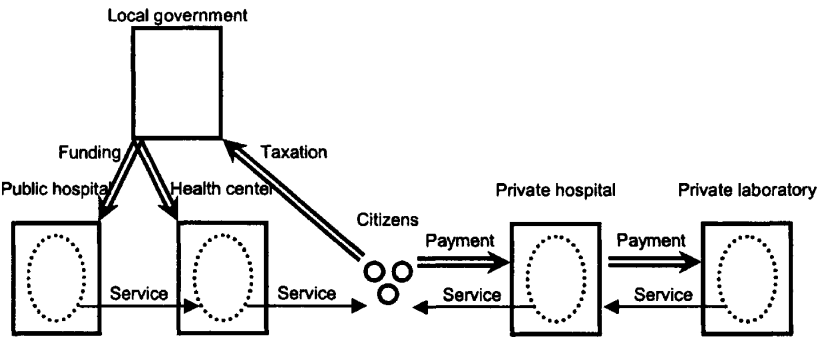


Figure 3. An Example of Inter-organizational Financial and Service Relations

2.4 Societal Level

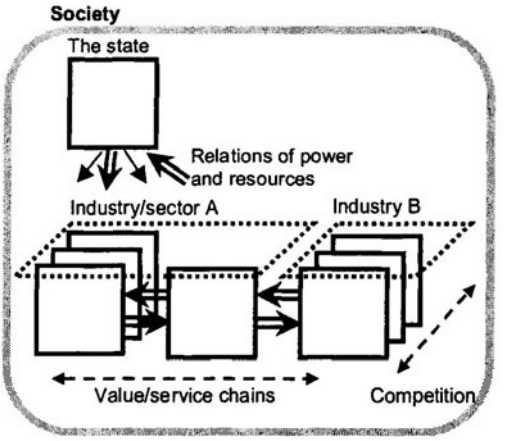


Figure 4. Elements of a Framework Linking Organizations with a Society

Within unit of analysis: The unit of analysis on the societal level is a *society*, which can be a political entity (country) or a cultural entity. Correspondingly, political science, sociology, cultural theories and so forth are needed in IS research on this level. The different meanings of the term society should be kept clear: cross-national research is not necessarily cross-cultural, and vice versa. Intra-societal IS research tries to find relations between an IS phenomenon and its societal context. A typical topic might be the development of the software industry in India. For such research, it would again be useful to have a framework that links consecutive levels—the organizational and societal levels—together. Figure 4 presents some elements that appear in scientific thought on these levels. A linkage to the intra-individual level will similarly bring in the concept of social classes. However, each IS researcher must find a consistent framework that will be applicable to his or her specific research problem.

Between units of analysis: Comparisons between countries or sets of countries belong to the inter-societal cell of the matrix. Figure 5 presents two concepts applicable to this level: a service or value chain that spans national or cultural borders, and a grouping of countries into industrialized and developing ones. As Walsham (2000) remarks, despite much talk about globalization, the inter-societal level is under-researched in the field of information systems.

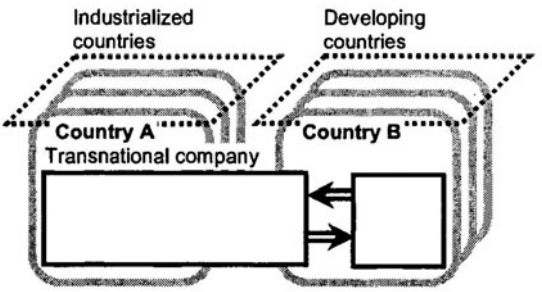


Figure 5. Examples of Inter-societal Relations

Theoretically, there is still a fifth level of analysis, the global level, where the unit of analysis is the planet Earth as a systemic entity. However, since there is currently no need for an inter-global viewpoint because of the lack of other known globes, the inter-societal level can serve as intra-global as well.

2.5 Temporal or Historical Dimension

On each level of analysis, a "snapshot" view of a given point of time can be complemented by a longitudinal view representing the history, temporal development or phases of the phenomenon under study. The theoretical frameworks on each level, however, remain consistent across the historical dimension. Figure 6 presents a schematic longitudinal setting for studying, for example, the interplay between political events and an IS activity in a given country for a given period.

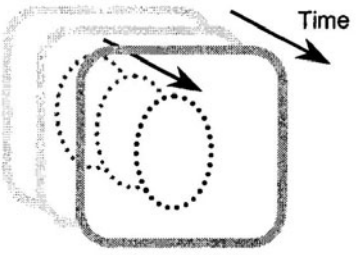


Figure 6. An Activity Within a Society Studied in Consecutive Phases

3. DISCUSSION: IMPLICATIONS TO INFORMATION SYSTEMS RESEARCH AND DEVELOPMENT

The framework we suggest is fairly rich and elaborated on the group/activity level. It is less clear-cut on the individual and organizational levels, and quite tentative on the societal level. More theoretical and empirical work is thus required to operationalize the linkage between information systems and societies.

But is such a complexity of levels and frameworks really needed? It is apparent that all the levels and viewpoints cannot be equally thoroughly covered in any single study—the emphasis must usually be on a single level or two consecutive levels at a time. However, we argue that researchers should always identify their specific research scope and context on all four levels to allow other researchers to assess the peculiarity or wider applicability of the study. That is, even if a study deals with intra-individual issues only, the researcher should report the activities, organizations, and societies in which the individuals are studied. If it appears that the study deals with individuals in office activities in academic organizations in an industrialized country, its relevance to individuals in farming activities in the informal sector in an impoverished country can be

explicitly discussed and assessed. If the specific contexts and scopes of a study are not made explicit, the transferability of the results remains obscure.

If a study applies an intra-viewpoint on any level, the validity of the results is increased if a discussion from the respective inter-viewpoint is included. For example, in an intra-individual study, it is advisable to discuss whether the results are equally applicable to men and women, literate and illiterate, or whatever the relevant inter-individual sets may be in the case. Similarly, if a study is conducted in one society only, like most studies are, the value of the study is increased if its applicability to other societies is discussed.

We have applied the intra-activity, inter-activity, inter-organizational, and intra-societal levels of analysis in a research project studying IS development in software companies in Nigeria (Korpela et al. 2000a, 2000b, 2001a, 2001b; Soriyan et al. 2001). The publications so far deal primarily with methodological issues, while empirical results and analyses are forthcoming.

Although the emphasis in this paper is on research, we believe that the levels and viewpoints also can be applied in practical IS development in certain situations. In any major IS development effort, a contextual analysis of the target activity, network, and organization is useful. Our experience suggests that the activity-theoretical framework makes sense and is practicable in ordinary IS analysis situations by non-experts (Korpela et al. 2000a). An inter-individual analysis, at least between men and women, is pertinent to guarantee that the benefits of an information system do not accumulate to one group and the disadvantages to the other. When developing organizational information systems that span countries and cultures, an inter-societal analysis would be highly relevant, but the analytical frameworks currently available may not be readily suited to IS practitioners.

4. CONCLUSION

The main contribution of this paper is to take Walsham's framework one step closer to practice by introducing the "2 x 4 + history" matrix of levels and viewpoints. We also suggested specific analytical frameworks in some of the cells of the matrix. In the intra- and inter-group cells, the activity framework is fairly elaborate. On the other levels, more sketchy and tentative frameworks were used, and the contribution of the paper is to urge researchers to present more elaborate and operational frameworks, particularly to the societal level. We argued that every IS study should identify its context and scope on all four levels, even if actual analysis is limited to one or two levels and viewpoints. The activity-level framework, in particular, is suited to practical IS development.

In comparison to other frameworks relating different levels of analysis and used in IS research, like the contextualist model by Pettigrew (1985) or the

organizational environment model by Ives et al. (1980), the activity-theoretical framework provides a more detailed, theoretically founded view of what a "context" or "environment" is and how it is related to "the internal."

5. ACKNOWLEDGMENTS

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