

## **The Ambivalence of Network Visibility in an Organizational Context**

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### **Abstract:**

We argue that technical features which make aspects of computer network visible can have ambivalent effects for the users. On the one hand they support cooperation among the users, whereas on the other hand these features can be applied to control the users extensively. To examine this ambivalence we present the results of an empirical field study on the usage of networks' visibility. Based on these findings we develop organizational and technical proposals for the application and design of features of visibility which could partly resolve this ambivalence.

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### **1. Introduction**

Because of the frequent changes of organizational environments, organizations are confronted with increasing demands for flexibility. Without flexibility in the action of work, without process concentration, i. e. without dynamic flow of work, organizations cannot exist any more. These demands on flexibility concern production, service sector and public administrations in the same way.

One possibility to meet with new challenges is the increased use of features of network visibility. Malsch (1991) assumes that networked computer systems play an important role in supporting the flexibility of the organization, increasing the visibility of the organizational set-up and work flow, and thus improving the coordination among the users. To make full use of these advantages of computer networks

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Malsch proposes an increased application of network visibility to increase the flow of information between cooperating users [1]. On the other hand Gurbaxani/Whang (1991) and Clement (1992) expect an intensification of users' surveillance by the use of network visibility. They report on cases where the management applied such features for monitoring individuals or organizational units extensively [2, 3]. Clement argues that increased use of networks leads to new forms of workplace surveillance and extends the range of the affected users into areas which were previously free of close supervision [3]. These contradictory perceptions of applications and prospects of features of network visibility highlight the ambivalence of their potential effects.

In the present work, we describe the ambivalent consequences of features of visibility more in detail and discuss some empirical results of a field study. Finally we want to develop organizational and technical proposals for design and application of features of network visibility which could partly resolve this ambivalence.

## **2. Network Visibility and its Ambivalent Effects**

The increased use of computer networks leads to more electronically stored data about aspects of users' cooperation and communication. These data are made accessible by features of visibility. Visibility contains all features of a network which disclose either the functions of a system or their use. We distinguish three types of visibility. *Visibility of content* discloses the content of messages transmitted via a network. As these data are inserted by users for purpose of communication and cooperation among themselves, in general, they will be weakly structured. Visibility of content has to be distinguished from recipients' ordinary usage of network functions to take note of transmitted messages. The activator of this feature is not identical with the recipient chosen by the sender. Thus, he uses ill-fitted specifications of access rights, special functions or supplementary know-how to enter and to enlarge the telecommunicative channel between sender and recipient. These data have a strong personal reference as the activator in general knows whose messages become visible.

*Visibility of use* automatically record data about the use of specific functions by single users and make these data accessible to the activator. As these data are created within the system they are highly structured. These data have a strong personal reference as the usage of a function of a network can in general be assigned to a specific user.

*Visibility of function* allows the activator to explore and perceive certain functions of a system. Thus, these features make the implementation of a system visible from an end user's perspective. These features have personal reference if the functions explored by them belong to aspects of the system, which have been tailored by single users or by a group of users according to their particular necessities.

Since a network connects individuals with diverging and even conflicting interests [4], the activation of visibility may lead to conflicts between the activator and the affected users. Such conflicts can be caused by a different perception of network visibility and its effects. On the one hand they can be useful for task handling because they make cooperation easier; on the other hand, functions of visibility can be used for surveillance.

To exploit the advantages of network visibility, Malsch (1991) asks for a reciprocal design of these features. This "symmetry of visibility" means that cooperating individuals and organizational subunits have reciprocal options of visibility. He assumes that only in the case of symmetrical visibility can these features cause an improvement of cooperation and flexibility [1].

We assume that unbalanced visibility is used less for cooperation (i. e. self-determined cooperation) than for surveillance. Surveillance takes place if there are possibilities to impose negative sanctions or to cause disadvantages to colleagues or to subordinates.

Therefore, most of the employees have a negative perception of surveillance. For the employees, surveillance points out that the superiors (or the colleagues) lack confidence in their work as well as in their behavior. Surveillance causes "individual uncertainty" and makes the employees nervous [5]. It is associated with higher stress levels [6]. It can reduce the willingness for cooperation. But there is a great need for their willingness; without it organizations cannot work flexibly and efficiently [7].

Surveillance can cause the above-mentioned consequences regardless of whether control actually takes place or not. The possibilities for surveillance only have the effects as a hidden intimidation [7] and include the possibility to control the behaviour as well [5], [8].

Furthermore, we have to consider the impact of network visibility on the subject of surveillance, i. e. whether it concerns the work process or the results. Functions of visibility reinforce the possibilities to control the work process. This means that not only the output will be checked but also the working method, the flow of work and the behaviour of the employees [9].

To investigate how features of visibility are seen by users, we integrated this topic in a broader field study on software-ergonomical problems of networked systems. We wanted to know in what manner users are affected by visibility, whether they are afraid of negative sanctions or disadvantages and whether they prefer more functions of visibility or a special kind.

### **3. Results of an Empirical Field Study**

We interviewed 31 users of networks of whom 19 worked in a German municipal authority and 12 were office workers in a German transport service company. For the interviews we used semi-structured questionnaires. The answers were clustered and analysed in a quantitative as well as in a qualitative way.

First we asked the users about their experience being passively observed at work. Later they were asked about their attitudes about observing colleagues. We were mainly interested in the effects of network visibilities of use and content. We asked the users to enumerate all features of these visibilities by which they are passively affected. Concerning visibility of use, in our fields of study the users mentioned for example: existence of telefax-journals, and accounting lists for telephone calls, checks of the telephone status, recording of log-ins into certain programs, notification whether e-mail has been read by the recipients, and checks of the status of office procedures.

They experienced visibility of content by the disclosure of their input into shared data bases, the accessibility of files in a networked server, disclosure of e-mail messages and operators' adding into an existing telephone call.

Comparing the statements of different users of the same system, we found that the mentioned list of features of visibility was incomplete for almost all of the users. This result can be explained by a lack of qualification or awareness of the users concerning these features.

Our next questions concerned the feelings of the affected users towards these features of visibility. Four out of 29 users were disturbed by the level of visibility which they subjectively perceived. The majority of these users had been affected by visibility of content in a medium which was confidentially used by them. Two of them found the operator added into their telephone call, another one mentioned that the administrator of a local area network could read her personal letters stored on a file server. This result seems to indicate that personal experience with affection by features of visibility in sensitive fields increases the users' awareness and thus leads to a feeling of disturbance. On the other hand, lacking qualification concerning these features and habituations to the daily reality, as it was expressed by some interviewees, could explain the answers of the majority of the users.

As the vast majority of all users had stated that they are not always aware of the activation of a feature of visibility affecting them, we asked the group of users who felt disturbed whether they would prefer a technical implementation in a way that they would be informed about each activation of visibility as soon as it is affecting data with personal reference to them. Three out of four users who were already disturbed by features of visibility preferred such an implementation. They argued that these type of visibility of use would make the usage of visibility obvious, and thus, the affected users could either protect themselves or they could make it a topic of discussion. On the other hand, one of the users feared negative effects of this realization because of mutual surveillance among users.

The group of users who were not yet disturbed by the subjectively perceived level of affection were asked about their feelings if increasing usage of features of visibility would finally lead to a complete disclosure of the performance at their networked work place. A majority of 13 out of 21 users answering this question stated that such a level of visibility would be disturbing to them. The other eight users would accept even increasing levels of visibility.

On the basis of their answers we can distinguish three categories of acceptance of increasing visibility of use. Half of this group of users stated that increasing visibility of use would be helpful to disclose their workload and merits to others which do not notice it appropriately right now. This group of users obviously accepts *progressively* higher levels of visibility. Statements like: "One could prove what has been done." or: "I can justify my workload to anybody." characterized their attitude. Another group of two users would *submissively* accept an increase of network visibility were it is judged necessary in their organization.

On the other hand, there is a group of two users which would accept a higher level of visibility *resignatively*. These users worked in a department where a culture of disclosure of personal matters already prevailed before introduction of networks. As desks and cupboards even with personal belongings were repeatedly checked, these users do not care any more about any levels of network visibility. Statements like: "Everything is already recorded." or: "Everything is already controlled." characterized this attitude. Though this group of users initially did not agree on the degree of

visibility, they finally gave up their resistance as they felt that there was no other way to continue working in their organization than changing their personal attitude.

With the increased use of networks, the phenomenon of resignative acceptance of visibility might become more important and may lead to a creeping change of the users' values. To avoid such a development we believe that the degree of network visibility should become a subject of participative design among the users affected.

We became interested in whether the attitude towards features of visibility depended on the hierarchical position of the users. We found that among assistants the feeling of disturbance was more widely spread and clearly expressed than on higher levels of the hierarchy. For instance, one of the assistants whose work consisted mainly of typing and manipulating documents on a networked computer stated that she would be outraged if speed or content of her work could be monitored.

Asked more in detail about their feelings of being affected passively by features of visibility, assistants showed higher personal attachment. They mentioned the feeling of surveillance and control more frequently than office employees or departmental managers. Furthermore, assistants more frequently expect sanctions as a result of this surveillance than office employees. Though in our case studies the number of interviewees in the group of the assistants was small, these results may hint to the fact that on lower hierarchical levels the personal impact of features of visibility is stronger than on higher levels.

The fear of being surveilled and sanctioned seems to be higher at the bottom of the hierarchy. This could be explained by the fact that in the case of routine jobs, features of visibility allow greater surveillance on their efficiency. In contrast, several higher level workers explicitly stated that visibility cannot disclose anything about the quality of their labour. They did not see the danger that network visibility could lead to a monitoring of their general behaviour at the workplace. Though their efficiency of labour will not be disclosed, according to Clement (1992) this type of less structured visibility can restrict the users' freedom of action as well [3].

Furthermore, we asked about the possibility of actively observing other users. We were mainly interested in usage of features of visibility of content and of use. None of the interviewees felt personally disturbed about the active use of these functions. Several of them mentioned that they need to activate these functions to do their jobs. Compared to the fact that four out of 29 users were disturbed when they were passively affected by these features, the differences in the level of disturbance may indicate conflicting interests between the roles of the activator and the affected users concerning these features.

Asked whether they think that passively affected users could be disturbed by the use of these functions, four out of 25 users agreed with this assumption, six of 25 of them were uncertain about it. Statements like "I don't know." or "I don't think so. They never mentioned anything about it." characterize this attitude. 15 of 25 users did not think that other users could be disturbed. The large number of the users who were unsecure seems to indicate that usage of features of visibility was not widely discussed within the investigated organizations.

Thus, cooperative learning among different users concerning the application of system functions as a wide spread mechanism for mutual qualification does not work in the field of features of visibility since there are often conflicting interests among the users. For example, an interviewee who worked as an administrator in a local area network stated explicitly that he doesn't talk about certain features of visibility

to his colleagues because he wants to avoid disturbances. In another case, the administrator of a networked application explicitly refused to explain features of visibility to other users. He argued that there is not any necessity for an explanation to other users because he would not abuse these features.

The already stated discrepancy between the functions of visibility mentioned by the passively affected users and the actually existing ones, therefore, can be explained as a lack of qualification. Thus, the treatment of features of visibility as a taboo topic among users can partly explain the low level of passively affected users' disturbance. To overcome this lack of qualification, both technical functions which support the visibility of features of network visibility, and an integration of these features into concepts of users' qualification, are required.

Summing up the results, we found that a vast majority of users were either disturbed by the already reached level of visibility or they would feel disturbed by a further increase in the level of visibility. As features of visibility can play an important role in the coordination of work, we asked the users about problems coordinating their work with others. A large number of the interviewees (17 of 31) mentioned problems coordinating their work with colleagues. Because of these problems, nine of them referred to a lack of visibility concerning the content or status of documents or procedures in which they were involved working. Therefore, several of the interviewees asked explicitly for an increase of features of visibility to facilitate cooperation. For instance, workers of the municipal authority's construction supervising department complained about the fact that they have a lack of visibility of use after finishing their task in an office procedure. They often neither know whether certain permits applied for by residents are already granted nor which colleague is right now responsible for it. Thus, it is difficult for them to answer resident's inquiries about the outcome of their application.

These findings empirically support our assumptions about the ambivalent effects of features of visibility as they can encourage surveillance as well as cooperation. This ambivalence is often expressed by contradictory answers of interviewees. They opt as activators for a further increase of visibility whereas in the role of the passively affected user they express reservations toward an extended usage of these features.

Taking these ambivalent effects of features of visibility into consideration, we will develop organizational and technical proposals for the application and design of features of network visibility.

#### **4. Network Visibility in an Organizational Context**

To find out in which organizational context the features of visibility can be used appropriately, we will discuss the following structural characteristics of organizations: the division of labour and the mechanisms of cooperation. Both influence necessity and effects of network visibility.

Organizations divide the labour between their subunits. The resulting specialization of subunits can be handled according to either functions or objects [10]. Functional specialization leads to intense interdependencies between subunits as they are at least sequentially dependent on each other in the process of production. In this case the use of features of visibility may ease cooperation and can be properly applied. Most of the interviewees who asked for an increase of features of visibility were in

such a situation. The necessity for visibility is even increased in the case that the functional division of labour between individuals or subunits is flexible.

On the other hand visibility is less necessary among individuals or subunits which divide their labour according to objects. In this case their interdependence is restricted to common use of pooled resources. Therefore, features of visibility concerning the work process between such subunits should be in general abandoned. Exceptions might be acceptable in the case that individuals among whom an object-oriented division of labour prevails have to substitute each other temporarily. In our field study interviewees mentioned that absence caused by holidays and business trips makes occasion for temporary replacement of colleagues.

Division of labour within an organization requires mechanism to adjust the single subunits to organizational aims. Kieser/Kubicek distinguish four types of mechanism of coordination [10] :

- coordination by planning,
- coordination by programs,
- coordination by hierarchical decision-making,
- self-coordination by non-hierarchical communication.

Coordination by programs is based on the application of generalized rules which secure the adjustment between single subunits. Coordination by planning requires a scheduling of precise goals for subunits in advance with the help of routines or algorithms. Both of these mechanisms are applied to coordinate subunits prospectively. In order to improve these mechanisms, data derived from features of visibility do not need to have a personal reference unless these mechanisms are applied on the level of the lowest subunit. In this case the required data can be anticipated and it can be negotiated within the subunit whether a specific feature of visibility is needed to collect these data.

Under the conditions of quickly changing organizational environment, coordination by planning and programs is not sufficient. Therefore, these mechanisms have to be complemented by mechanisms which allow organizational reaction as an instant feedback to environmental disturbances.

The mechanisms of self-coordination and hierarchical decision-making allow feedback-coordination. They can be supported by data with personal reference. In the case of hierarchical decision making organizational subunits are coordinated by instructions given from a higher level of hierarchy. The superior might use features of network visibility to improve the information basis on which he makes decisions [11]. Seen from the perspective of the subordinated, the use of features of visibility poses the problem of surveillance because coordination by hierarchical decision making requires the option of the superior to sanction his subordinates. Our empirical results indicate that especially the lowest hierarchical rank is emotionally most touched and expects sanctioning as a result of network visibility most frequently. Under these circumstances the features of visibility will be seen as a mean of surveillance. Therefore, the passively affected users might either try to avoid the usage of networks as much as possible or they could try to manipulate the output of features of visibility. Thus, these features can threaten the performance of the whole organization.

By contrary, in an organization which emphasises self-coordination by non hierarchical communication the problem of surveillance will be decreased among workers of the same hierarchical position because those have less power to sanction each other. Thus, there should be less fear that personal data will be abused.

Discussing the chances for an increase usage of features of visibility, Malsch (1991) considers hierarchical equality between actively and passively affected users an important precondition [1]. We assume that the ambivalence of network visibility is best solved in organizations which are based on self-coordination. Supposing that organizations which stress self-coordination are more efficient in treating quickly changing environments [10], we expect that future development will lead to organizational structures which are based on semi-autonomous groupwork [12], [13], [14]. Such organizations will depend less on hierarchical coordination, and thus, they will ease an appropriate application of features of visibility. Therefore, it is worth looking more in detail at requirement for the design of features of visibility.

## **5. Requirements for the Design of Features of Visibility**

Considering our empirical results the lack of visibility of the features of visibility attracts attention. Though features of network visibility affect a multitude of users passively, these features are frequently implemented like single user systems' function. The activator can dispose of these features autonomously. He can explore these functions while the other users have not any technical support to investigate by which features of network visibility they can be potentially affected. Furthermore, the activator can decide how to accustom and when to activate these functions without notification or participation of the affected users.

By contrary, a symmetric application of these features in an organization which is based on self-coordination by non-hierarchical communication, has to make their design and usage a matter of negotiations between activators and affected users.

As a precondition for such a discourse, the design of features of visibility has to provide all potentially affected users with tools to explore these features. Furthermore, the empirical findings indicate that users who are affected by features of network visibility prefer an implementation where activations of these features get visible to them. Thus, in case that users accept that their usage of the network will be partly disclosed, they should have the chance to opt for a function which indicates this activation to them.

Beyond these requirements further mechanisms are indispensable to let affected users participate in decision making on the application of features of network visibility.

Negotiability can be applied as a metafunction which enables affected users to find consentaneous solutions on conflicts concerning the activation of features of visibility. In the moment an activator tries to use a feature of visibility an additional channel is built up to the affected users. Via this channel activator and affected users can negotiate whether and how the intended features should be used. As potential conflicts deal with the selection among a limited number of well defined features, the conversation among the users can be structured and technically supported with the help of predefined acts of conversation [15]. Negotiability offers forms to the users to classify their contribution into the acts of: proposition, agreement, disagreement and counterproposition. As an integral part of system features, negotiability can implement directly the outcome of users' negotiation. Thus, negotiability encourages participative decision making on the usage of features of visibility in the moment of their intended activation.

By contrary, group-oriented configurability [16] supports an a priori decision making about the questions:

- which specific features of visibility should be used within certain organizational subunit,
- who should have active access on specific features of visibility,
- who can be passively affected by certain activators' usage of specific features of visibility.

Offering these options to tailor systems according to changing requirements of the organizational context, group-oriented configurability can encourage a periodic process of participative adaptation of features of visibility.

Furthermore, features of visibility should offer different levels of abstraction of the data presented. Higher levels of abstraction reduces the personal reference of these data and thus, diminishes the danger of surveillance of individuals. For instance in a workgroup it might be necessary to know exactly which member of the group is concerned with a particular dossier, while, on the level of the organization as a whole, it might be sufficient to know which subunit is presently responsible for this dossier. In this way Kubicek/Höller (1991) have proposed to implement different levels of abstraction concerning visibility of use in a procedure monitoring system [14].

## 6. Conclusion

We have discussed the influence of certain aspects of the organizational set-up on the effects of network visibility. Though we believe that these aspects are not sufficient to predict all effects, their consideration can provide suggestions for the design of features of network visibility. Informal aspects of organizations can be best considered within a process of participative tailoring, which can be supported by the proposed technical requirements for design. Within this process one has to decide in which way specific features of visibility should be equipped with metafunctions which implement the design requirements.

This process of participative adaptation has to be iterated during the use of the system because it is impossible to anticipate the application of features of visibility. This is due to the complexity of the functionality of networks, which allow certain users to invent new features of visibility, and to dynamic adaptation of the other functions of a network, which may create new features of visibility as side effects. Organizational changes can require an adaptation of features of visibility as well.

We hope that these organizational and technical proposals may contribute to resolve the ambivalence of network visibility in a way which encourages cooperation among the users without increasing user surveillance.

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