Summary

Introduction
Many organizations, in the profit as well as the not-for-profit sector, strive for higher degrees of autonomy at the shop floor. As a result, they design team based organization structures, using various types of teams such as relatively autonomous teams, whole task groups, or self-directed teams.
Our experience within an organization with relatively autonomous teams learnt that these teams vary in their degree of autonomy even within one organization. Also, the implementation of the teams was a difficult process. These observations turn out to be common to many organizations; under comparable circumstances the degree of autonomy of teams varies and the implementation process appears to be troublesome.
Apparently, organizational theory does not provide sufficient direction for the design and implementation of self-directed teams. The Modern Sociotechnical Approach is one of the theories for designing and operating these types of teams. The Modern Sociotechnical Approach is well-known as a structural approach. If an organization is no longer capable to meet the demands of its environment, it needs to conduct an integrated (re)design of its organization structure. The Modern Sociotechnical Approach provides the principles and concepts for the integrated structural redesign.
The variation in autonomy of teams under similar conditions and the difficulties with the implementation of teams seem to related to the concept of control. The sociotechnical literature is relatively vague on the concepts of control and control structures. The literature provides some insights in issues of control within teams and the control of individual teams, but is seriously lacking in the outlining of control issues between teams or hierarchical control over teams. In other words, sociotechnical theory lacks insights between the parts and the whole. Systems Theory, however, can provide just those insights. Therefore, this study uses the Systems Theory as the foundation to analyze control issues in sociotechnical organizations. The purpose of this study is to gain insight in the application of Systems Theory and Control Theory in the areas of sociotechnical control issues and to develop tools for analysis and design of sociotechnical control structures.

Theoretical Analysis
The sociotechnical literature states that all teams at all hierarchical levels in the organization should have operational, tactical and strategic control. Focusing on one hierarchical level, all three types of control are interdependent. Strategic control refers to the function(s) of the system to be controlled, which means it focuses on the input and output of the system. Tactical control refers to the infrastructure of the system, provided the input and output of the system. And finally, operational control focuses on accomplishing the system functions, provided the input, output and infrastructure of the
system. Focusing on multiple hierarchical levels, we conclude that the organization has a choice regarding the level to which control is assigned, which we refer to as organizational choice. However, the nature of control is influenced by the level it has been assigned to. If control is assigned to a lower hierarchical level, it might exceed the lower level boundaries and result in strategic control. If, on the other hand, this control is assigned to the next higher hierarchical level it might not exceed the higher level boundaries, and result in tactical or operational control.

When organizations delegate control, which means that they assign control to lower hierarchical levels in the organization, they reduce control at higher levels to benefit lower levels. Theoretically, the influence of lower levels can extend beyond their own level. This phenomenon is referred to as bottom-up control; lower hierarchical levels influence control at higher levels.

Sociotechnical organizations and traditional (bureaucratic) organizations differ in two ways with regard to organizational choice. The sociotechnical organization focuses both on designing relatively autonomous teams and on designing control at the lowest possible hierarchical levels. As a result, sociotechnical organizations are likely to have more organizational choice than traditional organizations. Also, sociotechnical organizations naturally focus on utilizing organizational choice more to benefit the lower hierarchical levels. Therefore, lower hierarchical levels in sociotechnical organizations have more influence on higher levels than these levels have in traditional organizations. The explicitly built-in bottom-up control is referred to as emergent control.

Research Question

The sociotechnical organization structure distinguishes itself by relatively autonomous teams in terms of execution as well as control at all levels of the organization. This design implies that the internal coherence of the team’s accountabilities and authorities should be as high as possible, whereas the external coherence of team’s accountabilities and authorities should be as low as possible. The internal and external coherence of teams is referred to as structural autonomy.

Based on the theoretical analyses, we expect the sociotechnical organization structure to be the ultimate breeding ground for emergent control. This study focuses on testing this hypothesis in an actual sociotechnical organization.

This study’s empirical question is: *Is there a relationship between a team’s degree of structural autonomy and its degree of emergent control?*

Research Design

In order to bring about answers, this study measures, compares and analyses the structural autonomy of a number of teams and their degrees of emergent control. Unfortunately, there were no established assessment tools available to measure either a team’s structural autonomy or its emergent control. As a result, in this study we developed a measuring instrument. Consequently, this study incorporates elements of exploratory and testing research. Therefore we chose to use a case study, for this design provides the opportunity to do both.
We conducted a quantitative assessment and comparison of the structural autonomy of teams and their emergent control. The measuring instrument provided the opportunity to measure and rank the teams in terms of their degrees of structural autonomy and emergent control. The analysis of both rankings should provide insights into the relationship between structural control and emergent control. This study measures structural autonomy by assessing the internal and external coherence of task domains and authorities allocated to a team in three systems: the logistic system, the maintenance system, and the personnel system. Collectively, 26 indicators determine the degree of structural autonomy. Three indicators assess the degree of emergent control: bottom-up flow of ideas, influence on external task domains, and perceived independent behavior. Statistical analysis establishes whether or not a relationship exists between structural autonomy and emergent control.

Results
At the end of 1995 and the beginning of 1996, a case study was conducted at a manufacturer of electrical components belonging to a large Dutch Company. At the start of 1995, the manufacturer decided to redesign the production processes into focused product flows to which thirteen teams with expanded accountabilities and authorities were allocated.

This study did not find a relationship between a team’s structural autonomy and its emergent control. Surprisingly, the study did find that the variable “team age” is a critical variable determining the team’s degree of emergent control. The measuring instrument showed some opportunities for improvement.

Conclusions and interpretation
Both the conceptual definition of emergent control and empirical evidence provide insight in the impact of integrated sociotechnical design. We conclude that there is a cycle within which design and change alternate. On these grounds, we formulated a sociotechnical change model that connects the concepts of control, design, change, and learning. This model appears to concur with our findings of the impact of the variable team age, which shows a learning process. This model also supports other empirical evidence of sociotechnical change.

This sociotechnical change model still assumes a relationship between organization structure and emergent control. We consider it likely that there is a relationship, but that this study did not show this relationship due to methodological and/or theoretical issues. The methodological issues relate to the translation of the theoretical concepts into measurable variables and our particular empirical setting. The theoretical issues relate to structure as a theoretical concept and to the possible delay in the formalization of actual structures.

This study has not shown conclusive evidence of the relationship between structural autonomy and emergent control. However, it has shown that there is a link between the implementation of the sociotechnical organization model and the variable team age. In alignment with other authors that have shown the relationship between structure and the
functioning of teams, this study supports the finding that the sociotechnical change model provides a meaningful representation of sociotechnical change. The model shows sociotechnical change does not imply a one-off design and implementation process. Instead, sociotechnical change implies an ongoing discussion and change of the organization structure, as an integrated aspect of every day business. This explains why relatively autonomous teams in comparable circumstances can greatly vary in their degree of autonomy. It also helps to understand the reasons for the troublesome implementation processes associated with sociotechnical change. Not only does the organization face fundamental structural changes, it faces radical change processes as well.