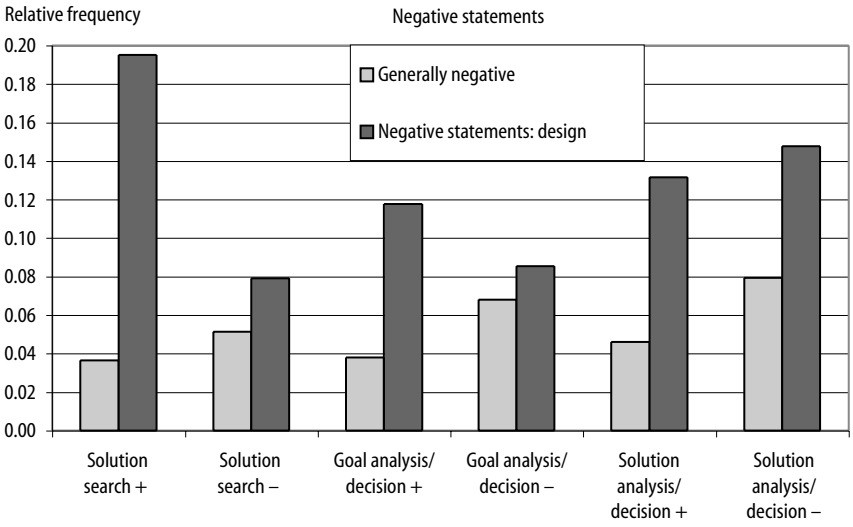

Figure 5.12 Relative frequency of negative statements in different types of critical situations.

successful and less successful critical situations. A generally negative statement bears no relation to a feature of the discussed design – for example: "This is all useless under these conditions." Contrary to these unspecified evaluations, a negative design-related statement is, for example: "The problem is that I cannot screw it tight to fix it."

Our research shows that crucial design aspects are discussed significantly more frequently in successful situations of solution search than in less successful ones. The most interesting finding is that the number of negative design-related statements in positive solution search situations (+) is very high, whereas the number of general rejections (negative items) is very low in these successful situations.

Contrary to the emphasis on content regarding negative statements, positive statements are mostly general and not design-related. (e.g., "Yes, that is no problem"). Figure 5.13 shows that in positive solution search situations (+), many more general positive statements and fewer design-specific positive arguments occur. An example of a design-specific positive statement is "Or perhaps a flathead-screw, one could weld it on, you are right." In negative solution search situations (–), we find only general positive statements and no design-related positive arguments.

A chi^2 test shows that all the reported differences are highly significant ($p < 0.01$).

How can we interpret these findings? The analysis above indicates, on the one hand, the importance of criticism on the basis of professional design knowledge, but, on the other hand, it points to the group climate as an additional ingredient in a successful, creative solution search: the amount of general positive statements in group communication that contributes to a positive climate balances the design-related negative arguments and makes them acceptable and useful.

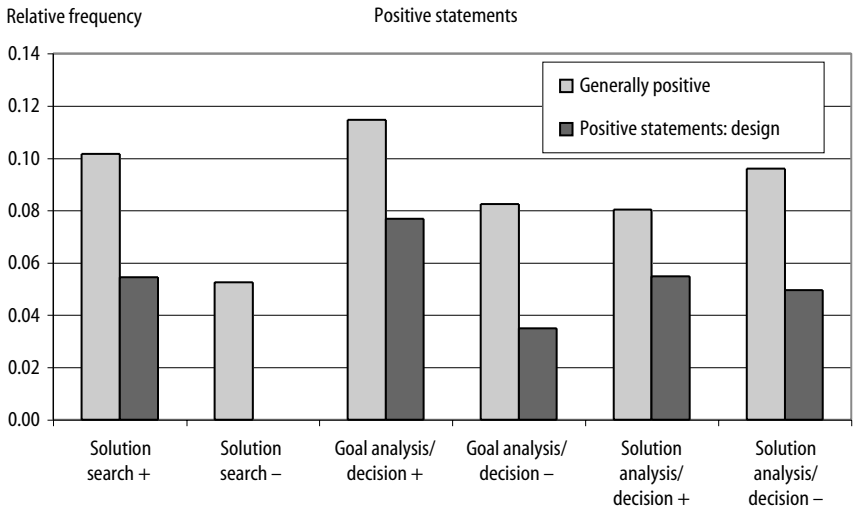

Figure 5.13 Relative frequency of positive statements in different types of critical situations.

What are the factors supporting communication in successful solution search situations?

To interpret the observations concerning design representations in critical situations, we must take into account the factors of the individual, the group, and the external conditions compiled in this study as described in section 2 of this chapter. Indeed, we find a good group climate to be a major influencing factor supporting communication in successful situations of solution search, as Figure 5.14 demonstrates. This figure is based on the analysis of 28 situations of successful solution search, in which factors influencing the quality of the solution search were identified. For every situation we made an annotated chart of the causal relations between influencing factors related to the task to individual prerequisites, to prerequisites of the group and to the external conditions, and parameters of the design process (cf. section 3.1). By summing up these single charts, we gain an insight into the mechanisms that have led to 28 situations of successful solution search. These mechanisms are diagrammed in Figure 5.14. The thickness of the arrows is proportional to the frequency (percentage) of the relations found in this type of critical situation. The thickness of the box frames is proportional to the frequency (percentage) of the factors identified in all critical situations of "successful solution search." An example of a successful solution search situation is given in the dialogue in Table 5.4.

The results obtained from the observation of 28 successful solution search situations reveal that the generation of ideas depends largely on the availability of information concerning the requirements and knowledge of possible solution principles. In 75% of all positive solution search situations, a good group climate was revealed as an important group prerequisite, and in most cases (54%) the good group climate triggered communication, which in itself was an important prerequisite of information availability. There are,