Using an algorithmic approach for grouping roles and sub-units

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We can conceptualize organization design as *grouping or clustering*

Roles in an engineering project

1

Anderson
Performs analyses for Edwards

2

Brown
Helps Craig develop documentation

3

Craig
Documents the technical requirements and explains them to Brown and Downey

4

Downey
Helps Brown in developing documentation

5

Edwards
Communicates the requirements and results of the analyses to Craig. In addition, he initiaties and follows up the analyses that Foster and Anderson are doing.

6

Foster
Assists Anderson in the analysis work.

Question: If the firm has a rule that says that each team should have maximum 3 members, who should be placed on the same team?

Grouping occurs at multiple levels

Sub-unit level

1

Department A
Performs data processing for Department E

2

Department B
Delivers documentation to Department C

3

Department C
Captures technical requirements and hand them over to Department B and D

4

Department D
Provides guidance and resources to Department B in order to develop documentation

5

Department E
Informs Department C of the requirements and the results of the analyses. In addition, follows up the analyses that Department F and A are performing

6

Department F
Assists Department A in performing analyses

Question: If the firm has a rule that says that each business unit should consist of a maximum of 3 departmants, which departments should be placed in the same business unit?

The Design Structure Matrix (DSM) can be used to document interdependences

1 **Anderson**
Performs analyses for Edwards

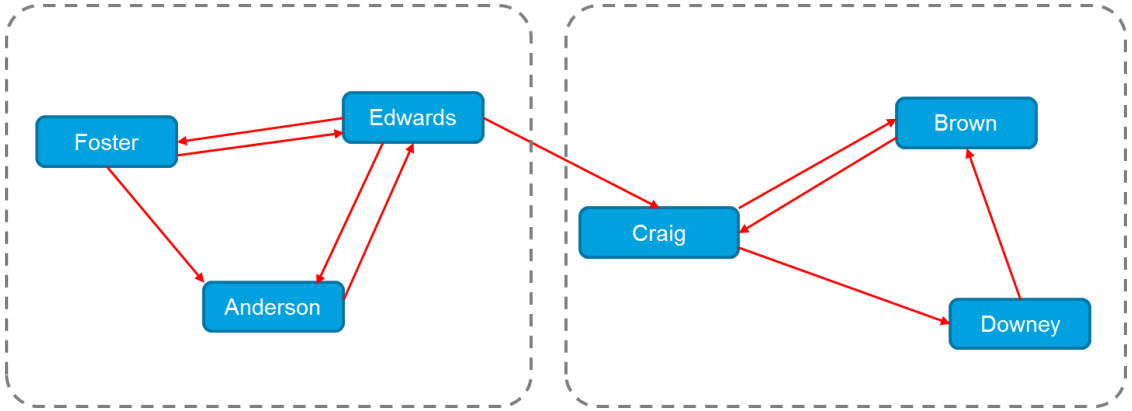
2 **Brown**
Helps Craig develop documentation

3 **Craig**
Documents the technical requirements and explain them to Brown and Downey

4 **Downey**
Helps Brown in developing documentation

5 **Edwards**
Communicates the requirements and results of the analyses to Craig. In addition, he initiaties and follow up the analyses that Foster and Anderson are doing.

6 **Foster**
Assists Anderson in the analysis work.



	A	B	C	D	E	F
A	A				X	X
B		B	X	X		
C		X	C		X	
D			X	D		
E	X				E	X
F					X	F

In practice, it is difficult to obtain valid information about interdependencies

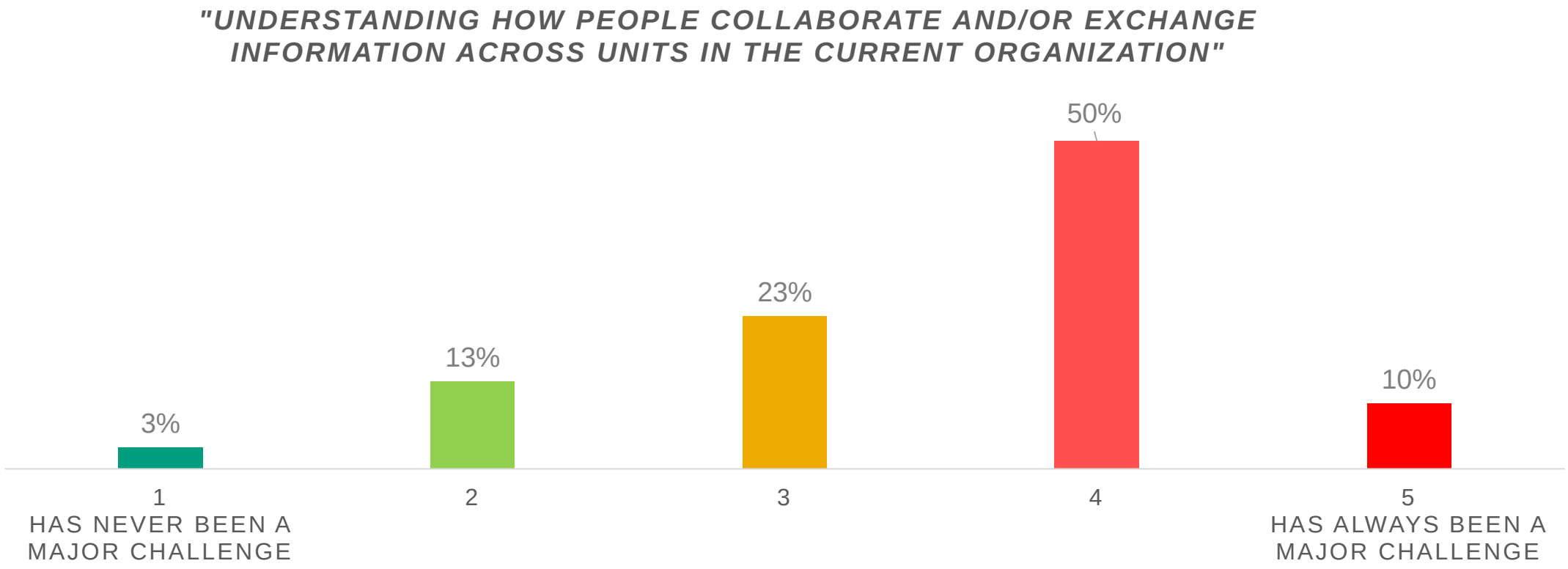
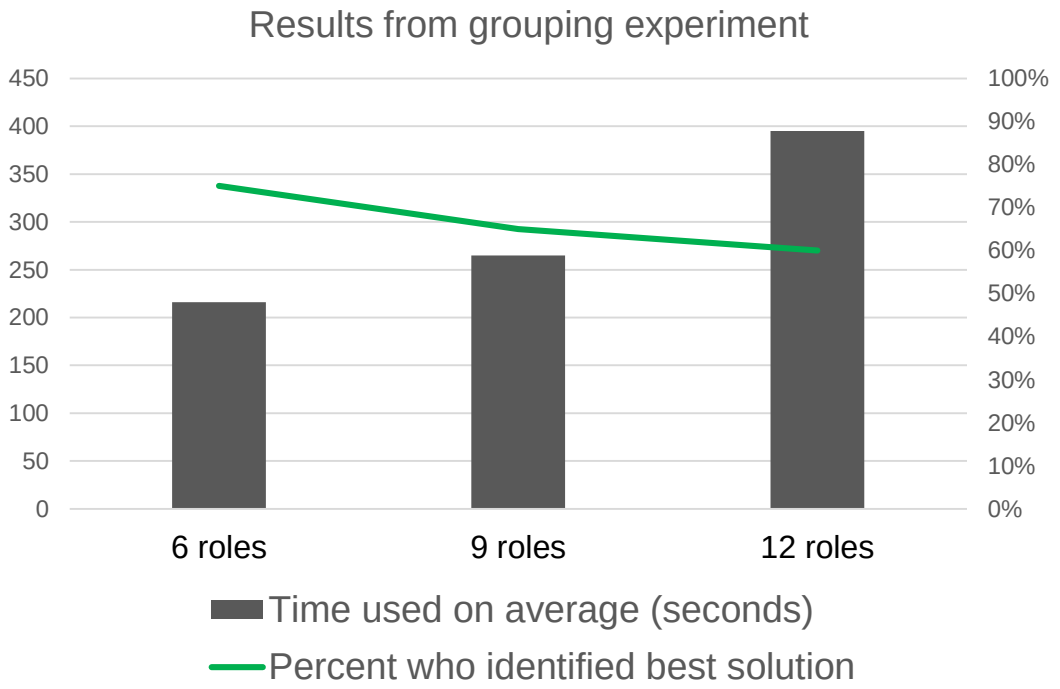


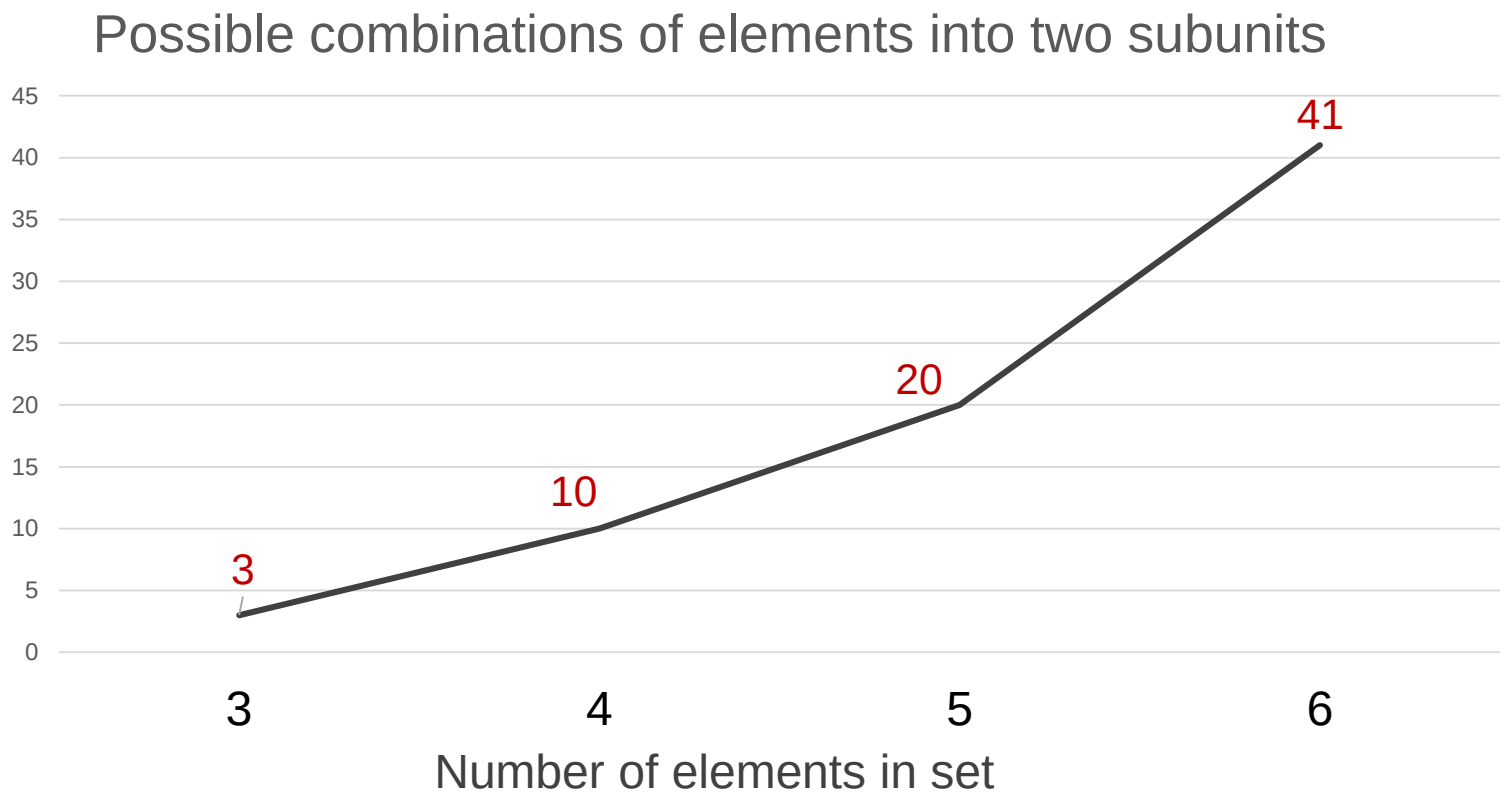
Figure 1: Result from survey among organization design practitioners (N = 176)

…and grouping gets progressively more difficult with higher complexity



- The graph is based on an experiment with 173 students, where they were asked to group/cluster 6, 9 and 12 interdependent roles into teams.
- In a real project, there are usually not six to twelve but dozens or hundreds of elements that one needs to take into consideration

The number of possible combinations of elements increases rapidly with size



The number of ways to select a subunit of k members from a unit of n members is given by the binomial coefficient

$$\frac{{}^{n}P_{k}}{k!} = \frac{n!}{(n-k)! \cdot k!} = \binom{n}{k}$$

Since the number of members in the subunit is arbitrary we must sum for all k to get the numbers in the graph

But since the remaining (n-k) members can be organized Into more than one subunit, the total number of possible combinations is even larger than given here

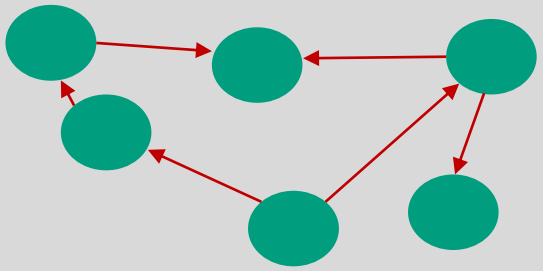
The Re:config tool addresses three key functional requirements

Support collection of data from the organization

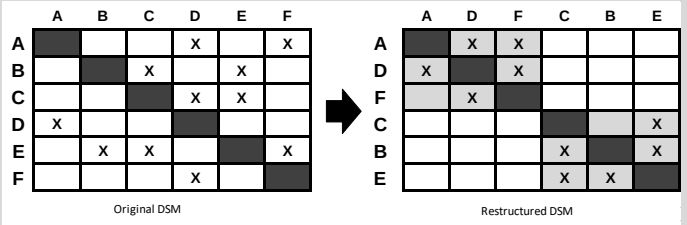
«How often are you in touch with John Smith?»

- ◯ Daily
- ◯ Every week
- ☑ Every month

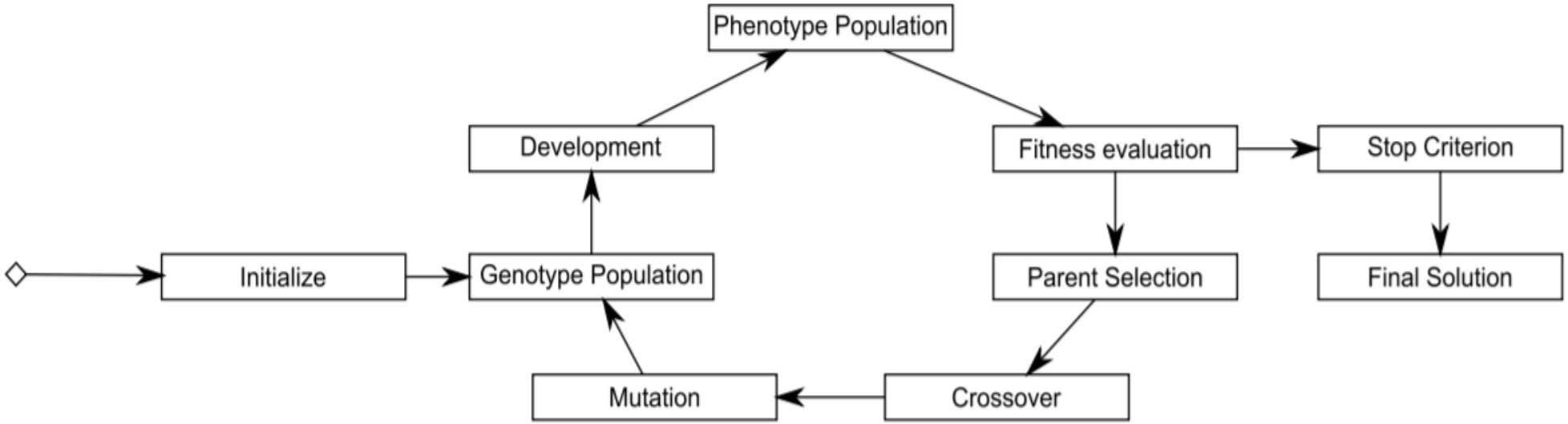
Visualize the data



Optimize the grouping (of roles, teams, departments, etc.)

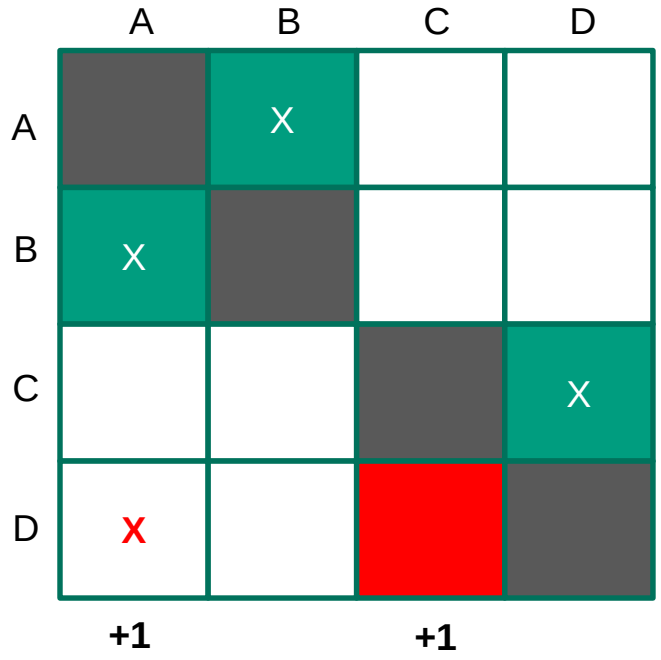


Re:config uses a genetic logarithm



Source: Soldal, 2012

The solutions are evaluated by means of a fitness function

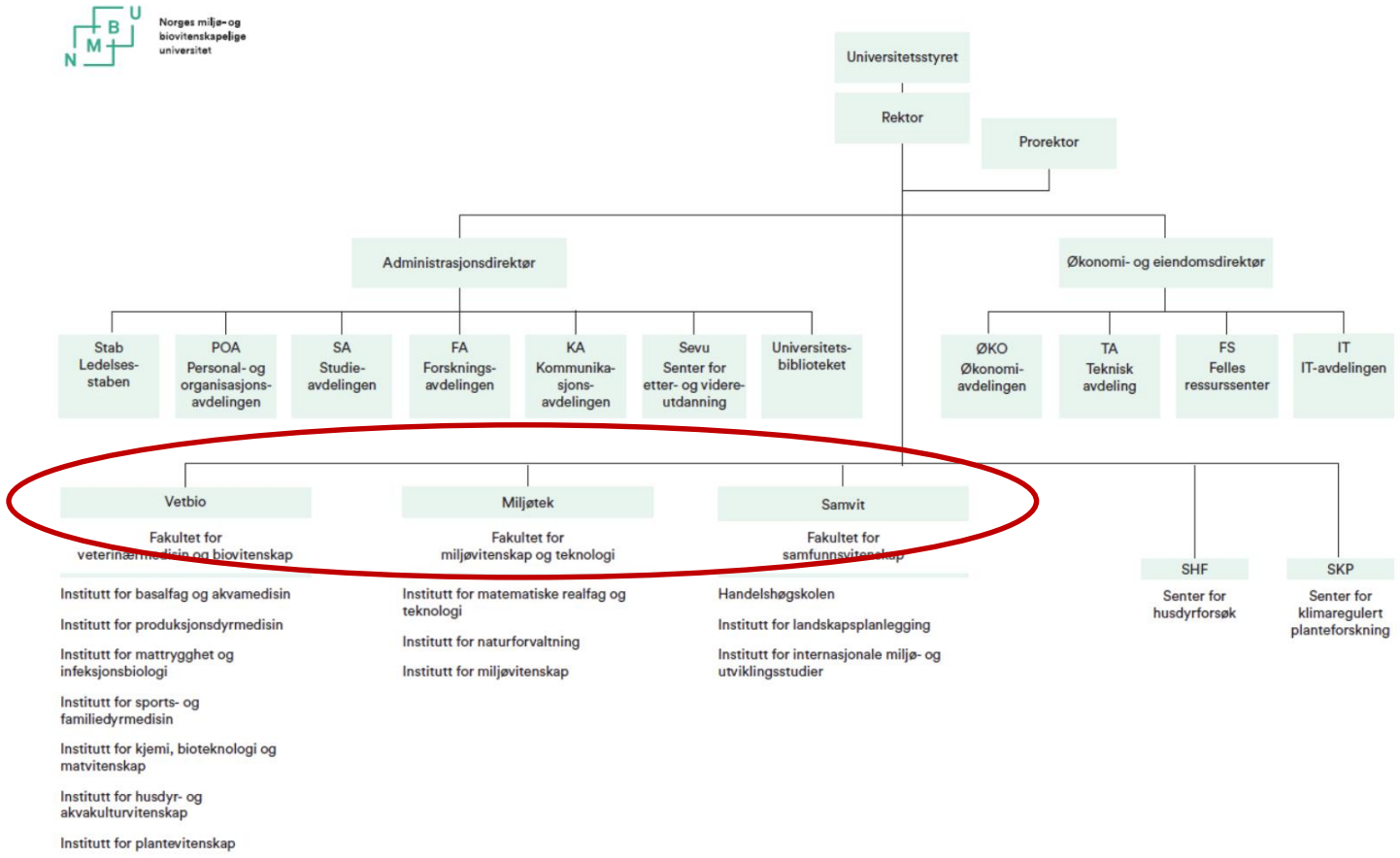


= 2 (worse than 1)

Penalty for not including the D-A interdependency within a cluster

Penalty for including C together with D even though they are not interdependent

We collected data at a Norwegian university



- 13 university departments, 2 research centres, 11 administrative units
- Three faculties (schools) – leading to three administrative layers
- Only 5200 students
- The university president wanted the organizational structure to be flatter

Questionnaire to collect data

You indicated that you had an interface toward the following unit:

Department of environmental science

1. How would you characterized this interface /the collaboration? *

It was primarily we who were reliant on input from this unit ▼

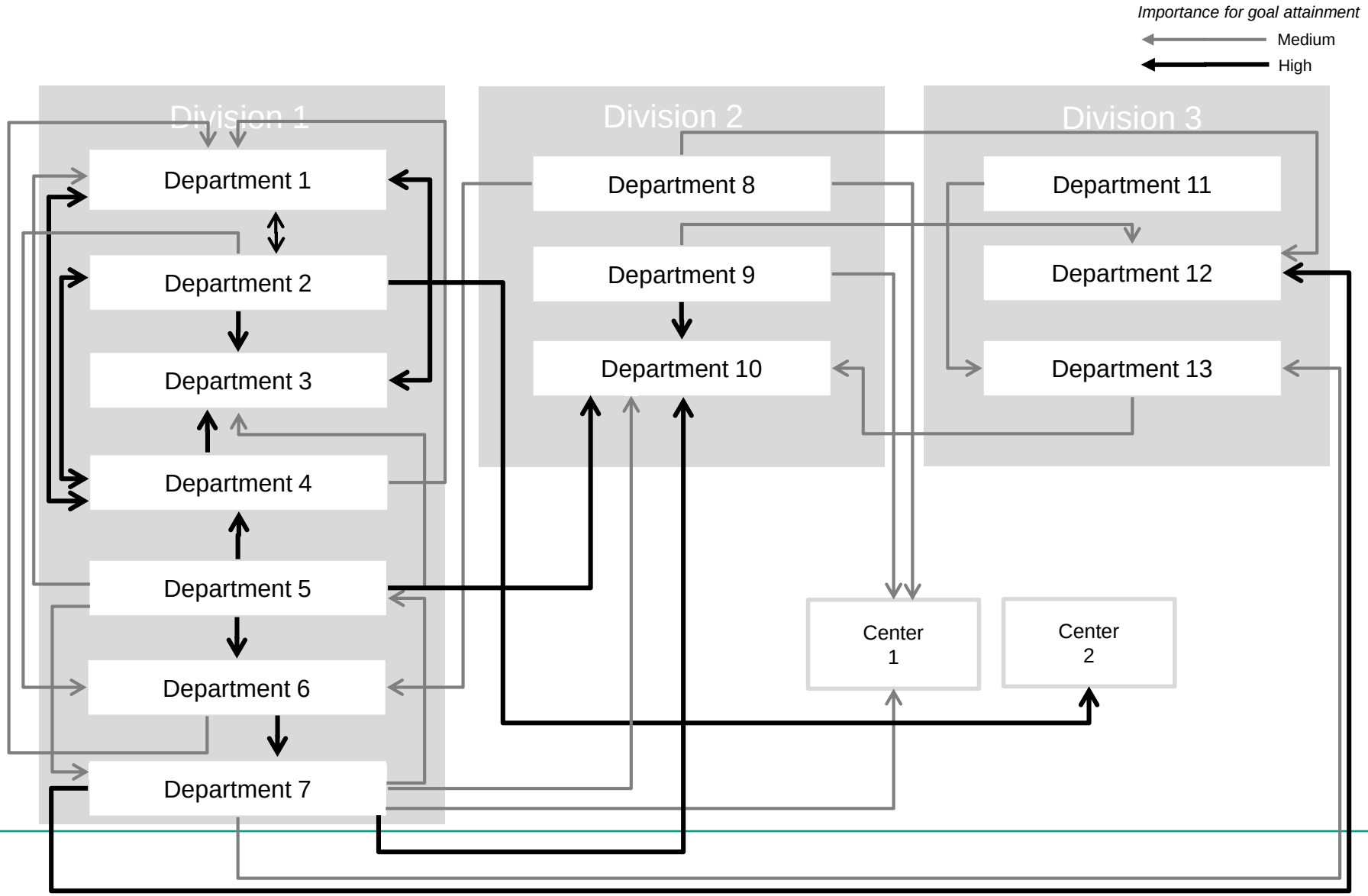
In relation to which activities or priorities do you coordinate, collaborate or exchange information? *

- ☐ Planning and delivery of study programs
- ☐ Research
- ☐ Administration
- ☐ Other

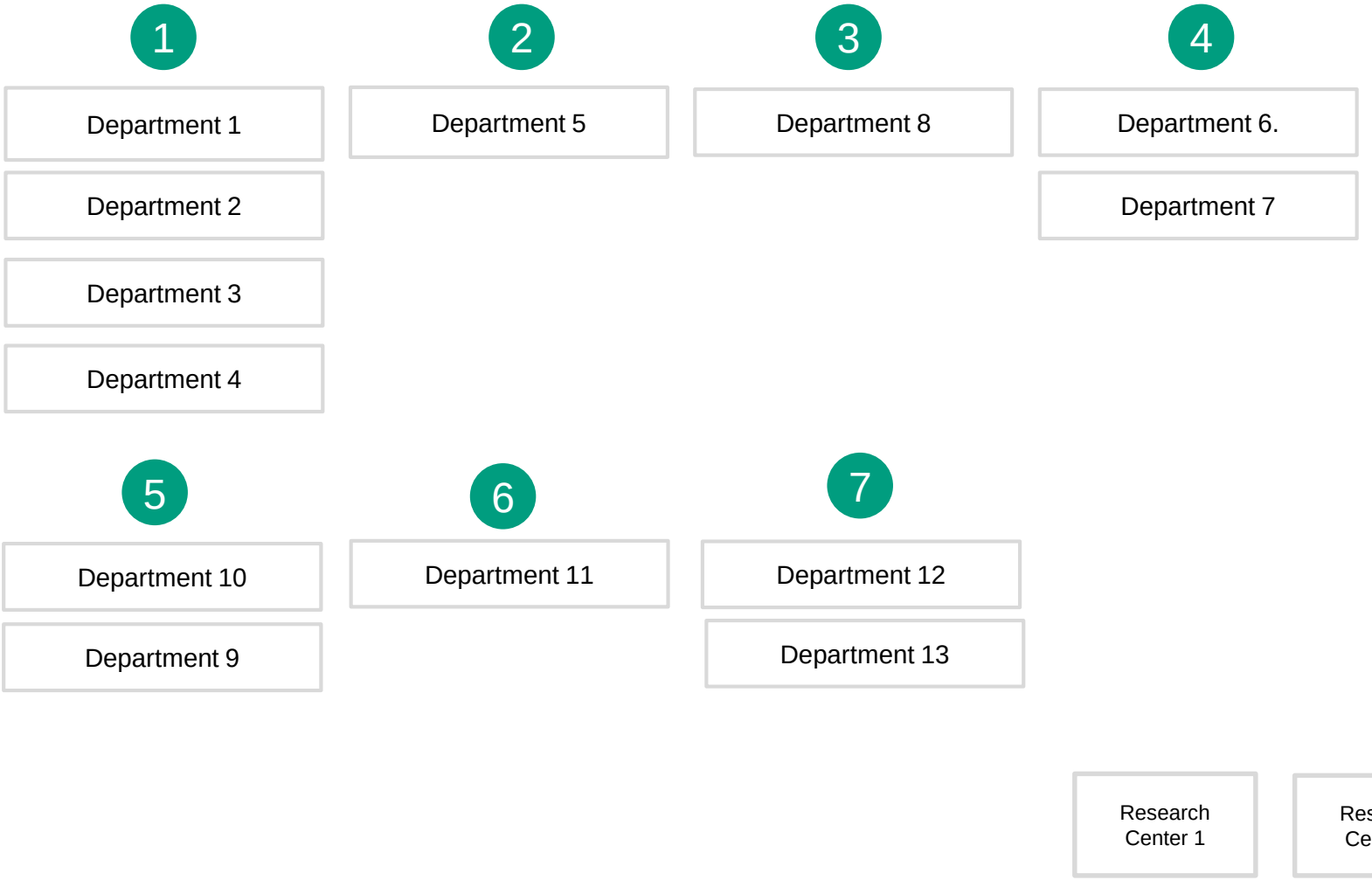
How important would you say that this relationship is for your unit's ability to reach strategic goals during this period? *

It has little effect on our ability to attain our goals	It has some effect on our ability to attain our goals	It is critical for our ability to attain our goals
○	○	○

Map of interdependencies between departments



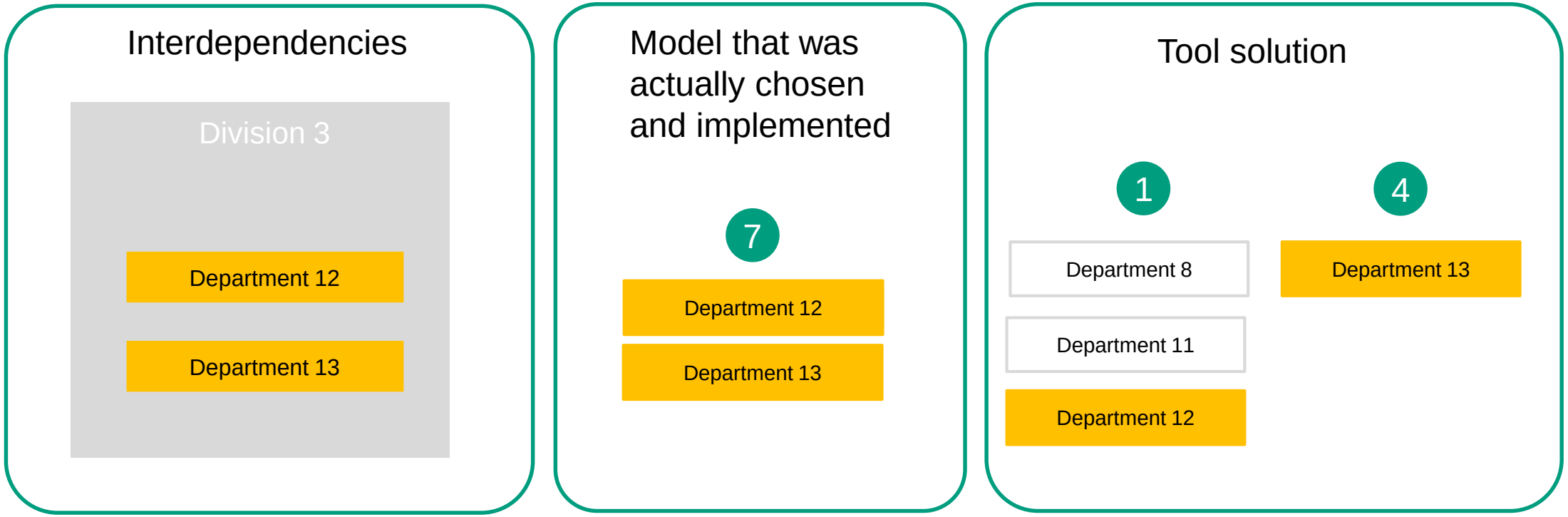
Model that was chosen and implemented



The tool identified the following grouping as the best one

1	2	3	4	5
Department 8	Department 1	Department 9	Department 13	Department 10
Department 11	Department 2			Department 5
Department 12	Department 3			Department 6.
	Department 4			Department 7
	Center 2			
				Center 1

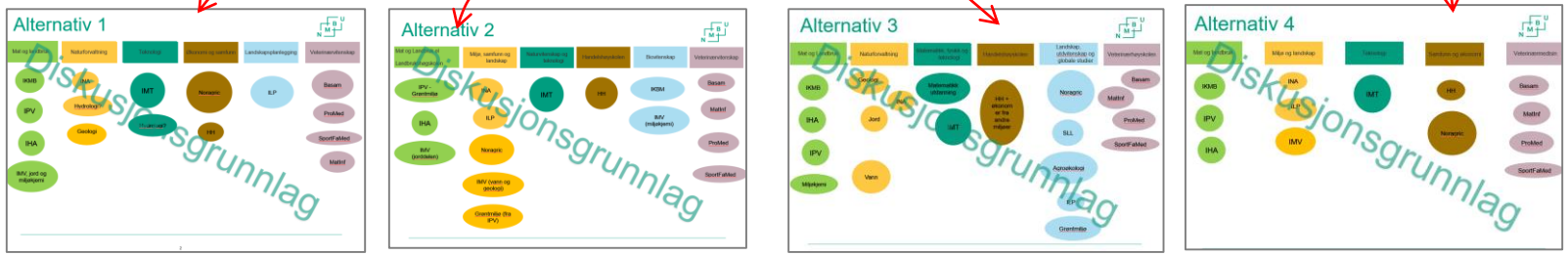
Detailed view of two departments



- There are no interdependencies between department 12 and 13
- …yet the two unrelated departments were merged

We also compared the tool solution to other options developed by a consulting firm

Alternatives developed by external consultants



	Forslag 1: Admin før	*Forslag 1: Admin etter*	*Forslag 2: Admin før*	*Forslag 2: Admin etter*	*Forslag 3: Admin før*	*Forslag 3: Admin etter*	*Forslag 4: Admin før*	*Forslag 4: Admin etter*	*Tilhørighet før 2016*	*Tilhørighet etter endringen i 2016*	*Verktøy-løsning iht undervisning*
Re:Config Score, straff inne & ute 1/3 & orginal DSM	243	300			259	310	275	266	218	322	142
Re:Config Score, straff inne 0.2 & ute 0.4 & orginal DSM	190	231			201	238	213	207	172	245	122
Re:Config Score, straff inne 0.1 & ute 0.6 & orginal DSM	132	162			137	165	147	143	118	169	82
Score diff	**111**	**138**	**0**	**0**	**122**	**145**	**128**	**123**	**100**	**153**	**60**

- The tool can be used to calculate the «fitness» of manually developed organizational models (e.g., alternatives proposed during a reorganization process)
- In this manner, they can be compared by using a quantitative indicator
- The model identified by the tool implied an organization with less than half of the coordination cost of the model that actually was implemented

Further work

- We are continuing to refine the genetic algorithm
- We are developing other metrics for measuring organizational design
- We are in discussion with consulting firms about testing the tool

Summary

- We have developed a tool for organizational grouping/clustering
- We have shown that the tool can be used to improve the design of a real organization
- The tool requires further validation, testing and refinement

References (links)

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