COMPANY REORGANIZATION

A company wants to reorganize its labour force. It currently has 3 different kind of employees; untrained, moderately trained and highly trained. Over the next 3 years, the company expects a necessary shift to more trained employees. How should the company reorganize to minimize cost? Or minimize the number of employees that have to be laid off?

Employee information

	Cost of lay-off	Available to be hired per year	Cost of hiring	*Retraining of employees*	Cost
Highly Trained	$700	500	$250	Untrained -> Moderately trained	$400
Moderately Trained	$500	800	$150	Moderately trained-> Highly trained	$500
Untrained	$350	1200	$100		

Estimated number of employees that are required.

	Current	Year 1	Year 2	Year 3
Highly Trained	800	1200	1500	2000
Moderately Trained	1500	1500	2000	2500
Untrained	2000	1600	1000	0

Number of employees that are trained, hired or laid off.

Number of employees trained

	Year 1	Year 2	Year 3	Cost
Untrained -> Moderately trained	0	0	0	$0
Moderately trained-> Highly trained	0	0	0	$0

Number of employees hired

	Year 1	Year 2	Year 3	Cost
Highly Trained	0	0	0	$0
Moderately Trained	0	0	0	$0
Untrained	0	0	0	$0

Number of employees laid off

	Year 1	Year 2	Year 3	Cost
Highly Trained	0	0	0	$0
Moderately Trained	0	0	0	$0

Untrained	0	0	0	$0

Total number of employees laid off: 0

Number of employees working

	Year 1	Year 2	Year 3
Highly Trained	800	800	800
Moderately Trained	1500	1500	1500
Untrained	2000	2000	2000

Total cost of reorganizing $0

Problem

A company has three different kinds of employees. These are highly trained, moderately trained and untrained workers. The company expects a shift towards more highly trained employees necessary over the next few years. It is possible to train people at a certain cost Laying people off also costs a certain amount. How should the company reorganize to save costs and/or have as few lay-offs as possible?

Solution

1) The variables are the number of people that are trained, hired and laid off. On worksheet HireFire these are given the names Trainees, Employees_hired, and Employees_laid_off.

2) The constraints can be divided into 2 parts.

First, there are the logical constraints, all of which are defined via the Assume Non-Negative option:

Trainees >= 0

Employees_hired >= 0

Employees_laid_off >= 0

Second, we have the training, laying off and hiring constraints. These do not use defined names, but are represented on the worksheet by the following cells:

C22 <= B17

C23 <= B16

C26 : C28 <= C9 : C11

C31 : C33 <= B15 : B17

C40 : E42 = C15 : E17

D22 <= C41

D23 <= C42

D26 : D28 <= C9 : C11

D31 : D33 <= C40 : C42

E22 <= D41

E23 <= D42

E26 : E28 <= C9 : C11

E31 : E33 <= D40 : D42

In general, these constraints reflect the movement of employees from being hired untrained to becoming moderately trained or highly trained.

3) The main objective is to minimize cost. This is defined on the worksheet as Total_cost.

Remarks

The model as presented here will find the method of organization that has the lowest cost. It can involve large lay-offs. It is even possible that there are alternate solutions that require fewer lay-offs! To check this, you can add the constraint Total_cost = Solution, where Solution is the amount previously found by the solver. Then change the objective to minimize lay-offs. This way you are sure to find the solution that is least expensive and involves the fewest layoffs. If the number of lay-offs is still unacceptable, you could solve the original problem again and this time include a constraint like total_laid_off = 0, or * 1000. When this problem is solved you can use the sensitivity analysis report to see how much an extra lay off would cost.