A Stock Management problem

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Context of the consulting project

BVA is a company that repair automatic gearboxes from cars. In their activity it is a crucial company's life issue to be able to manage properly the amount of gearbox components they have in stocks. The problem can be stated as follows: when a set of n gearboxes (of one kind) arrive at BVA, mechanics open the gearboxes (sequentially), check all components, replace the broken ones, rebuild the gearboxes and send them for selling on the second hand market. For the process to go well, mechaniscs must have directly available any needed component. That would be of course simpler to order an important quantity of each component nevertheless, there are hundreds of different components and this is not financially feasible to buy and stock them. On the other hand, if a component is missing, the whole line of repair will be stop until the delivery of the specifically-required component. The only solution for BVA is to lower it stocks of gearbox components as much as possible while ensuring the immediate availability of any component. Therefore they need to be able to predict the number of broken components in a set of gearboxes. To achieve this you have at your disposal a little of historical data of failures. After talking with the manager he indicates to you that despite that you can also benefit from precious advises from mechanics which years of experience and expertise represent highly valuable source of information.

Nature of the data

There are many kind of gearboxes, each of them being built from hundreds of components. These gearboxes were in different brand of cars of different ages. The first simplifying step is to consider only one kind of gearbox component. The table hereafter represents the historical data available for one component and the characteristic of a novel set of gearboxes that will be repaired.

Table 1: Data for a single component

age	nb_comp_obs	nb_comp_fail	nb_comp_new
0	10	0	9
1	15	0	5
2	25	2	11
3	30	3	4
4	20	10	5

Your role:

The company would like a decision tool in order to optimize the number of components to order such that they could control the cost of their stocks while preventing the risks of missing a required component.

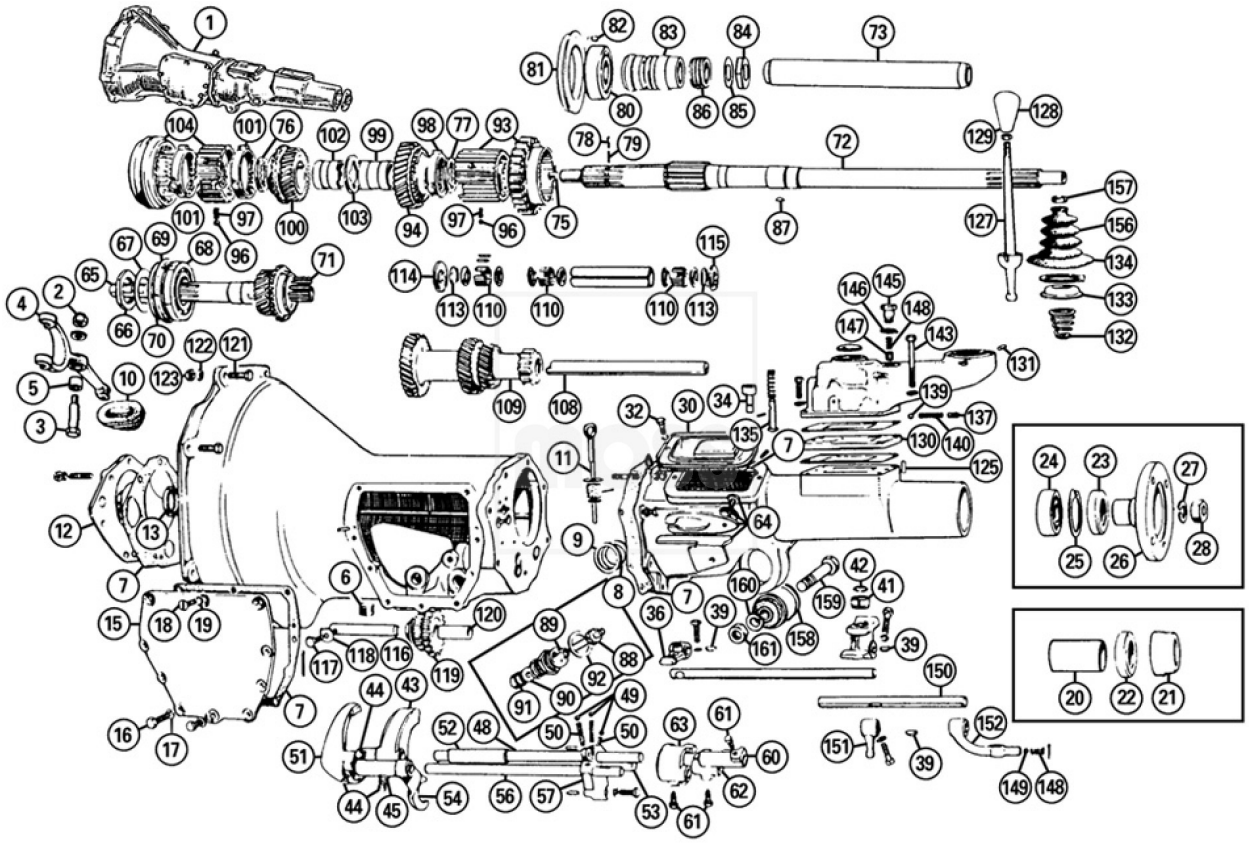

Figure 1: A gearbox