**Cost matrix structure**

4flow’s software are optimizing logistics mostly for manufactoring companies that need larger parts delivered for production. The fleet of vehicles are being delivered by different logistic carriers. Meaning they have different price structures. In some cases they give a price quota that is as simple as a fixed cost per vehicle. Other times it can be a bit more complicated and the fixed cost can change depending on how far the vehicle is travelling. This gives you in the end a sort of one dimentional cost table where the fix cost changes based on the total distance:

|  |  |  |  |
| --- | --- | --- | --- |
| Total km B | B<100 | B<200 | B>200 |
| Fixed cost pr vehicle Cfix | Cfix = 2000 | Cfix = 3000 | Cfix = 4000 |

The example above sometimes changes to a variable cost per km aswell where instead of paying a fixed price, it is rather multiplied in the end with the total km the vehicle has driven.

The carrier could also have different costs based on the maximum weight being transported. In the simplest matter the carrier would have a price per km that depends on the total weight being transported, much like the km example above:

|  |  |
| --- | --- |
| Maximum weight on vehicle L | Cost per km Ckm |
| L < 10 T | Ckm = 20 |
| L < 20 T | Ckm = 40 |
| L > 20 T | Ckm = 60 |

Another carrier might not care so much about the distance because the weight is so small that he will take the load just as an extra package, similar to a postal delivery, and the distance wont matter. The carrier might actually pick up several other things on its way and only do the load as an extra mission.

|  |  |  |  |
| --- | --- | --- | --- |
| Total km B | B<100 | B<200 | B>200 |
| Cost per Kilo L<0,5T | Ckg = 2 | Ckg = 3 | Ckg = 4 |

Or that it varies in weight interval, no matter how far.

|  |  |
| --- | --- |
| Maximum weight on vehicle L | Cost per Kilogram Ckg |
| L < 10 T | Ckg = 2 |
| L < 20 T | Ckg = 3 |
| L < 30 T | Ckg = 4 |

Some Carriers also combine fixed with variable costs, and might calculate in per km/kg ie. Both numbers multiplied with a factor:

|  |  |
| --- | --- |
| Maximum weight on vehicle L | Cost per Kilogram or Kilometer Ckg/km + fixed costs Cfix |
| L < 10 T | Ckg/km = 2, Cfix = 200 |
| L < 20 T | Ckm/kg = 3 |
| L < 30 T | Ckm/kg = 4 |

**The worst case:**

The worst case scenario could be that a carrier decides to combine one or several (or all) of the above cost structures. Meaning that the cost structure might end up looking something like the following (by 4flow usually the same type of C is used per line (or per weight interval):

|  |  |  |  |
| --- | --- | --- | --- |
| Maximum weight L\Total distance B | B < 100 km | B < 200 km | B > 200 km |
| L < 10 T | Ckg = 2 | Ckg = 3 | Ckg = 4 |
| L < 20 T | Ckm/kg = 1 | Ckm/kg = 2 | Ckm/kg = 3 |
| L > 20 T | Cfix = 8000 | Cfix = 10000 | Cfix = 12000 |

This might happen when a spedition says if your package is LTL then we only charge per kg. And if your load is FTL we have a fixed price. Finally if its inbetween a certain weight we charge per km or km/kg etc.

The more complex the rarer this will be the case in praxis but it can happen. We also can have a different type of cost structure for different type of vehicles (ie. Heterogeneous fleet). Mega truck is more expensive than a 7 tonn truck. Some trucks can also not take certain deliveries cus of stop restrictions or the truck itsself cannot transport certain objects cooling restrictions etc.

Another input from Lars: If we can also take into account stop costs that would be great.

Clearify in this part if the paper

Make it clear that we do the optimization.