Homework1_DavitOhanjanyan

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Reusing Trash by UBQ

For this homework, I chose an innovation, which is going to help with Reusing Trash by UBQ (time.com/collection/best-inventions-2023/6326972/ubq/). From the article of Times: "The company's system sorts, shreds and then melts trash down into fibers, cellulose, and sugars for conversion into small pellets that can be used to make new products."

Look-Alike Innovation

The look-alike innovation from the past I chose is GFL Environmental Inc. By their words: "GFL Environmental is offering services in solid waste management, liquid waste management, and soil remediation" (gflenv.com).

One of the reasons GFL Environmental Inc can be considered as a look-alike innovation for UBQ is that it is a relatively new company too. GFL Environmental Inc. was founded in 2007, and in 2011 it started to expend. In case of old companies – we don't know how they started or how the world felt about recycling at that time, but in this case – we know that it would be fairer because both companies are in the modern world.

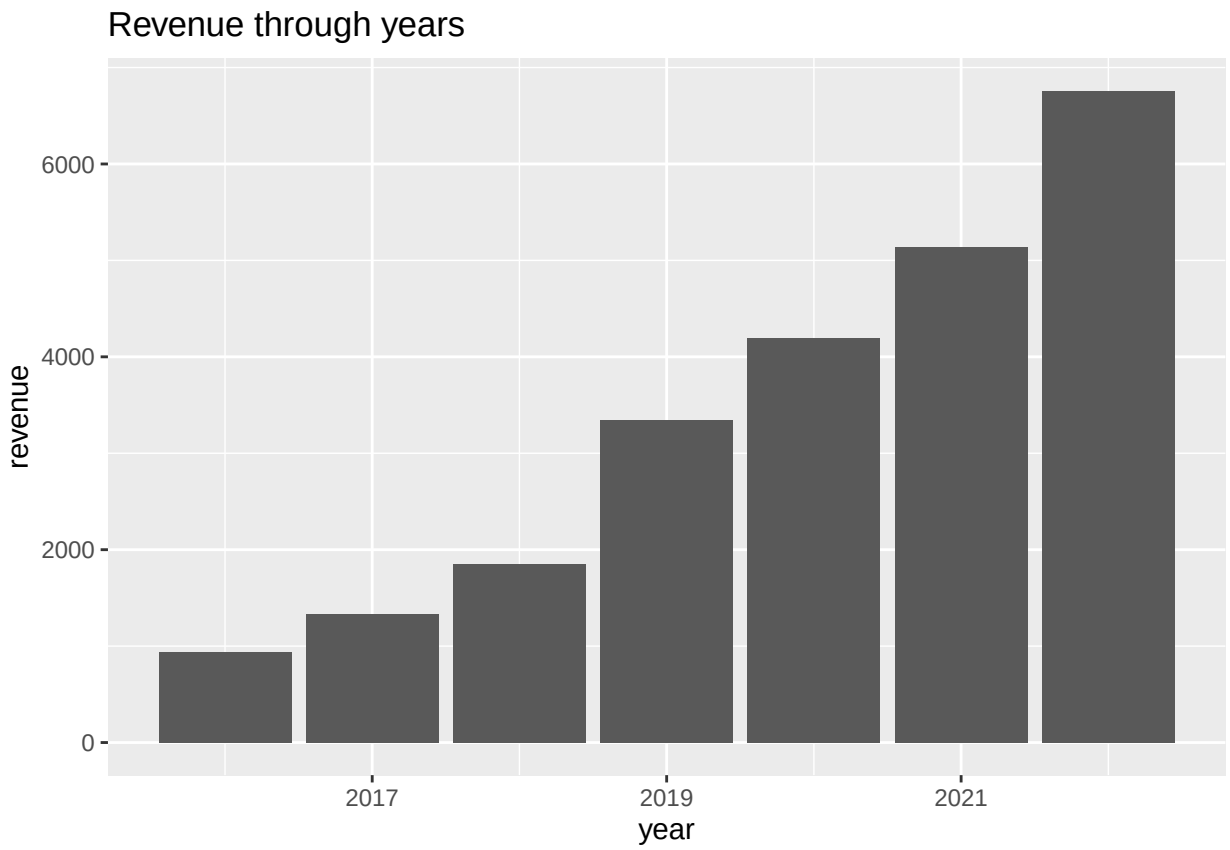
Another reason that these companies are look-alikes is that operate in the same sphere – recycling. The both companies are on the mission to reduce the trash in the world. The difference is GFL Environmental offers different waste management services, and UBQ only creates materials that are reusable and replace plastic. Nevertheless, both companies want to reduce the garbage – one with the help of recycling it, and the other – with making a substitute product.

For the homework, I will use information about the revenue of GFL Environmental in last seven years:
2016: 934 M CAD$
2017: 1330 M CAD $
2018: 1853 M CAD $
2019: 3347 M CAD $
2020: 4196 M CAD $
2021: 5137 M CAD $
2022: 6761 M CAD $
Market Potential: 17890 M CAD$

Here we can see how our data looks like:

```
years <- c(2016, 2017, 2018, 2019, 2020, 2021, 2022)
revenue <- c(934, 1330, 1853, 3347, 4196, 5137, 6761)
data <- data.frame(year = years, revenue = revenue)
ggplot(data = data, aes(x = year, y = revenue)) +
```

```
  geom_bar(stat = 'identity') +
  ggtitle('Revenue through years')
```



Now we include the equations for the Bass Model.

```
t = 1:length(revenue)
bass_m = nls(revenue ~ m*(((p+q)^2/p)*exp(-(p+q)*t))/
               (1+(q/p)*exp(-(p+q)*t))^2,
             start=c(list(m=sum(revenue),p=0.02,q=0.4)))
```

Now we use the library diffusion to make predictions about p, q and m.

```
diff_m = diffusion(revenue)
p=round(diff_m$w,4)[1]
q=round(diff_m$w,4)[2]
m=round(diff_m$w,4)[3]
diff_m
```

```
## bass model
##
## Parameters:
##                                Estimate p-value
## p - Coefficient of innovation     0.0119      NA
## q - Coefficient of imitation      0.4558      NA
## m - Market potential          60022.7135      NA
```

```
##
## sigma: 209.9741
```

So, using the look-alike innovation, we can have an assumption about or innovation. That is: p = 0.0119, q = 0.4558, m = 60022. Now let's do predictions:

```
m <- 60022
p <- 0.0119
q <- 0.4558

bass_predictions <- function(t, m, p, q) {
  m * (((p + q)^2 / p) * exp(-(p + q) * t)) / ((1 + (q / p) * exp(-(p + q) * t))^2)
}

first_year <- 2024

num_years <- 5
predicted_adopters <- sapply(first_year:(first_year + num_years - 1),
                             function(year) bass_predictions(year - first_year, m, p, q))
print(predicted_adopters)
```

```
## [1]  714.2618 1106.3620 1684.7566 2499.9626 3570.2423
```

Now, we can use another approach, where market potential is 17890, as it is predicted for our look-alike product, and let's see what difference would it make.

```
m <- 17890
p <- 0.0119
q <- 0.4558

bass_predictions <- function(t, m, p, q) {
  m * (((p + q)^2 / p) * exp(-(p + q) * t)) / ((1 + (q / p) * exp(-(p + q) * t))^2)
}

first_year <- 2024

num_years <- 5
predicted_adopters <- sapply(first_year:(first_year + num_years - 1),
                             function(year) bass_predictions(year - first_year, m, p, q))
print(predicted_adopters)
```

```
## [1]  212.8910  329.7594  502.1541  745.1323 1064.1371
```

So, we can see that we got almost 3 times less predictions for our company!