Emilia-Romagna Region

Data Analytics Lab

Intelligent Digital Workspace in the Era of Smart Working

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Introduction

Following the introduction of innovation in working methods, which have had their greatest use with the management of the health emergency in recent years, it was found that agile work has brought advantages; with the nearing conclusion of the state of emergency, a model has been studied and defined that makes it possible to indicate the potential workplaces in which an employee can work, at least in smart-working, highlighting with a simulation what would be the savings in moving to terms of

- kilometres travelled,
- minutes spent,
- € spent on fuel,
- CO_2 emissions.

For the analysis, the employees of the Emilia-Romagna Region and the Regional Employment Agency in service as of 31/12/2021 resident or domiciled within the regional territory were considered, which are equal to 4,224; another fundamental data for the development of the analysis is the list of offices, obtained from the dAPPERtutto application, from which those no longer active or located outside the regional territory have been excluded, for a total of 137 offices to be considered in carrying out of the case study.

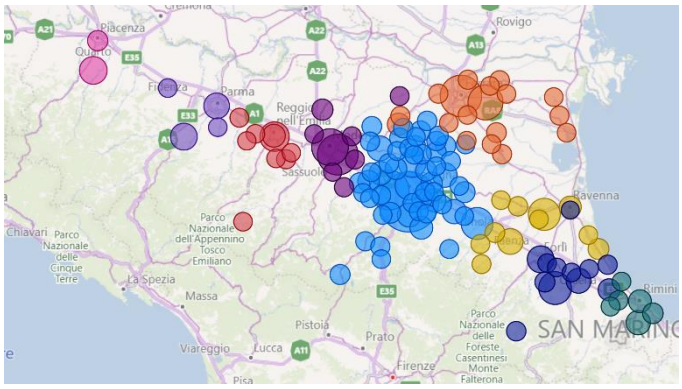
Following the collection of the above data, the geo-referencing activity and the calculation of the distances and travel duration of the route from the employee's residence or domicile to his/her place of work in the car was carried out.

Having obtained this information, it was possible to proceed with the implementation of a model, and the subsequent simulation of potential gains / savings obtainable with the application of the latter, explained in detail in the following paragraph.

Methodology

Employees who take at least 15 km and/or 15 minutes to reach the office assigned to them were considered as perimeter of the analysis. This filter involves a substantial cut on the number of employees on which the procedures for defining the model are carried out: of the 4,224 employees considered, 1,734 are more than 15 km or minutes away from their workplace.

By means of a clustering algorithm, based on the density of employee positions, it was possible to visualize which are the areas with the greatest need for offices and, possibly, in which to create new ones; later, to refine the logic of clustering, a parameter was inserted on the province of residence so that the clusters obtained with the algorithm are further subdivided according to the province of residence of the employees who are part of it. Additional clusters have been created, based on the province of residence or domicile, for the subjects considered by the algorithm as outliers to be able to reassign a closer office to them as well. With this procedure 120 clusters and 9 groups were obtained for the subjects identified as outliers.



To check the earnings in terms of travel, a simulation of reassignment of employees assigned to a cluster or identified as outliers to the offices closest to their residence or domicile was carried out; once the potential workplaces where to carry out the reassignment were identified, the distances and travel times to reach the reassigned workplace were calculated, these measures were compared with the fees to reach the workplace of belonging and, based on the data provided from POLA 2021-2023, it was simulated what the savings could be in terms of € spent on fuel and Kg of CO_2 emitted.

Overall results

Applying the methodology described in the previous paragraph, with the data available on the Emilia-Romagna Region and the Regional Employment Agency on the 1,734 employees considered for the re-assignment of the workplace, divided into 120 clusters and 9 groups of outliers, on average, each employee:

- before reassignment, travels about **41 km** and takes **37 minutes** each way to reach the primary workplace;
- after reassignment, travels about **8 km** and takes **11 minutes** each way to reach the reassigned workplace.

These results lead to the conclusion that each of the employees considered in the analysis in question *would save*, on average, per single travel, approximately:

- **32 Km** of travel distance,
- **26 minutes** of travel time.

These evaluations[1] led to simulations to verify what would be the achievable benefits over a working year, approximately 220 days, considering both the outward and return travels to and from the office, assuming that a percentage of the days' work must be carried out in the primary workplace, in terms of savings of:

- Km of travel,
- € spent on fuel,
- Kg of CO_2 emitted.

To carry out this simulation, as mentioned in the previous paragraph, the data provided by POLA 2021-2023 was used to create two fundamental parameters for the purposes of the simulation:

- Average expenditure by car € per Km
- g of CO_2 per Km emitted

whose values are respectively equal to € 0.40 per Km and 138 g per Km.

Starting from this information and assuming, in line with current regional regulations for ordinary smart-working, 51% of working days in the presence of the primary workplace, the model used for the study reports that, in one year, savings would be made[2]:

- **12.09 million** Km of travel,
- **€ 4.84 million** in fuel costs
- **1.67 million** Kg of CO_2 emitted

for an overall saving of **39.18%** on the 1,734 employees considered.

[1] View Table 1 in Appendix
[2] View Table 2 in Appendix

Applicability and developments

The model illustrated so far is reproducible and usable also for other authority and/or companies on condition of having useful data to be able to carry out geo-referencing; moreover it can also be expanded through the integration of data sources: initially the case study was developed using data from the Region, later the most recent data of the Authority were integrated together with those of the Regional Employment Agency, the results of which were previously reported in the report, and currently, an extension of the model illustrated above is being developed by integrating the information already available with ARPAE data.

Currently the calculations of distance and duration of the travels are based exclusively on the car; to improve the model estimates it would be necessary to know what the employee's preferred transport of commuting is to get to work.

Also having the data on the number of workstations available within the registry of the offices, it would be possible to plan interventions in the area more precisely.

Appendix

Table 1

	BEFORE	AFTER	SAVINGS
 Distance	40.41 Km	8.10 Km	-32.31 Km
 Duration	37.10 Minutes	11.32 Minutes	-26.18 Minutes

Table 2

PARAMETERS		YEARLY SAVINGS	
Perc. Days in the Office	51%	Km	-12.09 Mill
Average expenditure by car €/Km	€ 0.40	Fuel expense (€)	-4.84 Mill
g CO_2/Km	138 g	CO_2 Emissions (Kg)	-1.67 Mill
PERCENTAGE YEARLY SAVINGS			
-39.18%			