# Sizing & Allocation in Labour Market: business strategies and multivariate analysis

Andrea Marletta

## 1. Introduction

In Labour Market, the issue of Sizing and Allocation is a largely discussed problem (Mariani, 2002). In this study, this topic has been considered from a statistical point of view. Indeed, the choice to increase or decrease the number of employees after a change in the marketing strategy needs a very accurate analysis. If, for example, a company decides to launch a new product on the market, it could be necessary to recruit new resources. The proposed statistical approach aims to give some hints about how many (Sizing) and where (Allocation) these resources have to be placed. This process is based on the features of the existing market and the territorial geography. Statistically speaking, multivariate analysis techniques have been presented as exploratory tools. In the application, a Principal Component Analysis has been used to investigate the business environment after some qualitative interviews to the board of the company. In a second step, some different scenarios have been proposed to determine the exact number of new resources using a data hybridization technique including internal and external sources. Finally, the allocation of the new hired on the Italian territory has been achieved thanks to the construction of a territorial potential index.

## 2. Methodological tools

This study is the result of a collaboration of the Bicocca Applied Statistics Center (B-ASC) and a private company requesting a new rule based on a statistical indicator for reorganize their employees after the introduction in the market of a new product. The Bicocca Applied Statistics Center (B-ASC) aims to promote the application of statistical methodologies within private companies and public organisations. The Center's main objective is to represent a point of reference for companies wishing to develop a statistical approach to decision-making processes, using quantitative methods and integrated information processing systems.

In particular, this collaboration aims to offer different scenarios for representatives' activity, representing the most appropriate models to satisfy both the company's needs and its competitiveness within the reference market. The term "scenario" is here intended as a possible reallocation of the workforce following a change in the marketing strategy. To reach this purpose, some internal business data will be compared to Open Data, considering the type of subject of interest, the market dynamics and the prescriptive potential.

This project has been divided into four phases: firstly, a qualitative analysis has been provided through semi-structured individual interviews with company managers involved in the strategic and operational management of the markets; secondly, a structured database has been built through data collection and hybridisation of open data and business internal data; successively, a sizing model has been developed through the synthesis of indicators and weightings; finally, the measure of the actual and potential effort in terms of promotional pressure, indices of territorial potential may be applied to define the placement of the new resources in contiguous and/or nested areas.

Andrea Marletta, University of Milano-Bicocca, Italy, andrea.marletta@unimib.it, 0000-0002-4050-5316

From a methodological point of view, multivariate analysis techniques has been proposed as possible tools in order to achieve the company's purposes. Using data from the qualitative analysis based on individual interviews, a Principal Component Analysis has been applied considering the frequency distribution of the terms present in the textual corpus (Jolliffe, 2002). After the construction of the structured dataset, a Principal Component Analysis on some internal and external indicators has been used to synthesize the potential of a specific geographic area. Finally, the results from these two approaches are used to propose some different solutions for sizing and allocation of possible new resources in the company.

## 3. Principal results

The qualitative analysis based on individual interviews produced some evidences about the vision of the manager board of the involved company. Among the main results, some considerations of the managers have been extracted: "The effort required from the company appears blurred between the global and local vision. It is important to be able to integrate local needs with global strategies. The arrival of new products may be an opportunity for change. In view of a new product launch, the interviewees agree on rethinking the presence on the territory. This may happen in two ways, by acting on the mix of products on offer or on the sales force. A meeting point must be found between the company's revenue and the working efficiency of the employees."

Different scenarios have been proposed as an alternative to the current situation to contemplate a new product's launch addressing a new target. Some managers underlined the "short blanket dilemma": to add a new product, something else should be removed. Otherwise, it is necessary to make an investment. Defining a new structure may help to be more efficient and to manage new products launch in the future. Optimal segmentation and targeting are crucial. Some external barriers should be considered, e.g. regional restrictions.

All the interviews have been analysed to achieve the key concepts and obtain a multi-perspective vision of the company. Firstly, the term frequency has been considered to build a dictionary as a Text Mining technique. From a detailed analysis of the interviews, the main concepts have been extracted. The term frequency allows to obtain a quantitative variable, and for supporting the conceptual analysis, a PCA has been applied on these data. From the PCA, two components explaining the $74\%$ of the variance have been extracted.



Figure 1: Cartesian plane after PCA qualitative analysis, 2019, Italy

The first component on the horizontal axis represents the continuum between a strategical or a tactical vision. The second component on the vertical axis represents the continuum between an internal or external vision. Using this technique, each term could be associated to one quarter

122

of the cartesian plane. In figure 1, it is reported the cartesian plane with some key concepts for each quarter. These concepts are the results of the set of words analysed, unfortunately for privacy reasons, it was not possible give more information about respondents and terms used.

After the qualitative analysis, in order to perform the sizing and allocation model, the final dataset containing quantitative indicators has been collected mixing internal and external sources. The internal sources are represented by data about sales of the products in the market and reports showing the daily activity of the employees. The external sources have been collected by using the healthcare data warehouse of National Institute of Statistics (Istat) named Health for All (Istat a, 2020) and the portal demo-istat for obtaining some demographic indexes in the Italian territory (Istat b, 2020).

The hybridization of these sources led to a structured dataset where each row represents an Italian geographical area. The used territorial classification is NUTS 1, NUTS 2 and NUTS 3. The variables for the definition of the potential have been divided into three categories: structural, market and promotional pressure. The first group is composed by some indicators about total, female and female 15-49 years population, birth rate, number of deliveries, physicians and total number of beds in specialized wards. In second group, some KPI about market sales have been reported. Finally, the third is about performance indexes of the employees.

In order to make assumptions about the capacity of a new team to determine the correct sizing, some hypothesis about the number of working days have been assumed. The potential portfolio has been computed only by considering the definition of the total number of physicians in portfolio and computing a number of visits for day. The final sizing model has been obtained through the potential portfolio, the number of physicians and the working days. The original workforce of the team was made of 112 employees. After the launch of a new product in the market, using the sizing model, the proposed new team is composed by 132 elements, with a differential of +20 employees[1].

Once the sizing phase is completed, the allocation phase allows to arrange the new resources in the Italian geographic area. The first allocation is about NUTS 1 and NUTS 2 units. An index of Territorial Potential (ITP) for Area and Region has been computed to detect under-estimated territories (Mariani, 2002). The ITP explains 79% of the variance using the first component of the ACP.

In table 1, for each Italian territory belonging to NUTS 1, it is possible to represent the allocation through the use of the ITP. The area with the biggest increase is South & Islands with a differential of 12 units. Similar results are available at NUTS 2 level.

| NUTS 1 | ITP | Actual Employees | Proposed Employees | Differential |
|---|---|---|---|---|
| North-West | 23% | 28 | 32 | +4 |
| North-East | 25% | 32 | 32 | 0 |
| Centre | 25% | 28 | 32 | +4 |
| South & Islands | 26% | 24 | 36 | +12 |
| Italy | 100% | 112 | 132 | +20 |

Table 1: Allocation of new hirings in the company for NUTS 1, 2019, Italy

In table 2, it is displayed the ITP for Italian regions. Lombardy is the region with the highest ITP, this means that in North-West area, a possible new hiring could regard this region.

---

[1]In order to respect a non-disclosure agreement between the B-ASC and the interested company, all quantitative results have been blinded and re-scaled.

| NUTS 2 | ITP |
|:---:|:---:|
| Lombardy | 18.1% |
| Lazio | 10.4% |
| ... | ... |
| ... | ... |
| Aosta Valley | 0.01% |
| Molise | 0.01% |
| Italy | 100.0% |

Table 2: ITP for NUTS 2 regions, 2019, Italy

Similar considerations could be hypothesized for NUTS 3 regions.

## 4. Conclusions

In this work, the problem of sizing and allocation has been considered at business level. In particular, starting from a real case, thanks to the application of some multivariate techniques, an exploratory approach has been proposed to determine the number of new hirings. This approach consists in a multi-steps procedure. Firstly, a preliminary analysis was based on some qualitative interviews to the top managers of the company. These interviews led a text mining analysis, in which through a PCA a dictionary based on frequency terms was obtained. This qualitative analysis allowed to visualize the possible strategies and the different visions proposed by the managers.

Starting from this qualitative analysis, a dataset was built after an hybridization of business and external sources to perform the sizing and allocation model. Each considered variable refers to an Italian geographical area. Similar analysis was performed at NUTS 1, 2 and 3 level. The sizing step was realized by considering the starting number of employees, the working days, the potential portfolio and the number of involved stakeholders. The allocation step was achieved through a PCA based on selected KPI about structural, market and promotional pressure. This PCA led to an Index of Territorial Potential (ITP). At level of NUTS 1, the South & Islands area has been detected as under-estimated, so the majority of new hirings could regard this area. At level of NUTS 2, Lombardy is the region with the highest ITP.

In conclusion, this approach could be considered as a valid alternative to solve the problem of sizing and allocation of new resources in Labour Market when a company chooses to launch a new product.

## References

Istat a. (2020). Health for All. https://www.istat.it/it/archivio/14562

Istat b. (2020). Geo-demo. http://demo.istat.it/

Jolliffe, I. T. (2002). *Principal Component Analysis, 2nd edn. Series: Springer Series in Statistics*, XXIX, 487. illus. Springer, NY, 28.

Mariani, P., (2002). *La statistica in azienda, contesti ed applicazioni*. Franco Angeli, Milano.