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Post pandemic strategic planning of food catering production and distribution networks: A regional case study

Beatrice Guidani[a*], Riccardo Accorsi[a,b], Riccardo Manzini[a], Michele Ronzoni[a]

[a]*Department of Industrial Engineering, Alma Mater Studiorum - University of Bologna, Viale del Risorgimento, 2, Bologna, 40136, Italy*
[b]*CIRI AgroAlimentare, Alma Mater Studiorum – University of Bologna, Via Quinto Bucci, 336, Cesena, Italy*

Abstract

Due to the Covid19 outbreak, the food catering industry faces disruption of demand traits and great uncertainty about the future development of market segmentation. The need for a re-design of production and logistic networks faces the lack of knowledge about cost drivers, rendering the application of mathematical optimization models challenging. In this paper, a cost components analysis is carried out to quantify each cost item's impact on the full meal cost. Cost analysis aims to formalize the relationship between meal cost and parameters such as productivity, meal conservation regime, customer typology, portioning method, and customer-plant distance. The cost parameters are adjusted through empirically driven correction factors to include operational and management complexities that would otherwise be neglected. The obtained parameters feed a total cost minimization model for a productive and distributive catering network. The location-allocation model chooses the production capacity to activate in each production plant for every meal-type and achieves the customer-production plant pairing. The framework is applied in an Italian regional case study to compare the BAU scenario to two different To-Be scenarios. The As-Is scenario considers four different production facilities serving the pre-pandemic demand of 2019, while the To-Be scenarios are based upon a demand forecast enforcing a more resilient network. The analysis shows how re-designing production and distribution networks enables meeting uncertain demand while keeping FMCs under control within a regional environment.

Keywords: Food Supply Chain; Catering Industry; Cost Optimization; Pandemic Impact; Location-Allocation;

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* Corresponding Author mail: beatrice.guidani2@unibo.it

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1. Introduction

The catering industry produces and distributes meals to end-consumers every day. Meals are provided through two main service models (Accorsi et al., 2019). In the cook-serve service, catering chefs and operators produce meals in the client's kitchen. With the deferred service, meals are cooked in Centralized industrial Kitchens (CeKi) and distributed to the clients using insulated packaging containers. The latter model provides ready-to-eat meals to schools, hospitals, and company cafeterias. The complexities of deferred catering networks can be traced back to the capillarity of the delivery points and the high number of local and national ingredients suppliers. CeKis represent the network's pivot point for food collection and distribution and are strong manpower-based facilities. The pandemic outbreak and the associated lockdowns highly affected the schools' in-presence attendance and many companies adopted smart working (Antczak and Horzela, 2021). The population increased the consumption of at-home meals (Sgroi and Modica, 2022; Cavallo et Al., 2020). As a result, canteens' demand suddenly collapsed, stressing unprepared catering production and distribution networks (Domingo et al., 2020; Marchesi and Mclaughlin, 2022). To survive the present and future demand disruptions, catering companies cannot rely only on short-term cost-cutting decisions, and resilient long-term profitable strategies must be defined instead (Sel et al., 2017).

The Full Meal Cost (FMC) is the share of the total cost incurred by the company allocated to a single meal. Labeling meals with specific cost drivers enables catering network management (Houba et al., 2000), but the implicit complexity and interdependences of such drivers make modeling the FMC challenging. For example, catering production is organized in job shop systems, and the allocation of costs and resources to each recipe is far to be straightforward (Tufano et al., 2019).

The main features characterizing a *meal category* and its cost are the client typology, the packaging system, and the conservation system. Clients' typologies include schools, companies, or hospitals and require different tasks and rules. For example, meals intended for children must comply with more stringent protocols on ingredients' origin and cooking processes. Meals' packages can be multi-portion, requiring a portioning activity at the client cafeteria, or single-portion, if every meal is separately sealed. Hospitals usually require portions in trays stacked into roll containers. The conservation technology maintains the meal at a safe temperature until consumption. Cook-and-Warm (C&W) and Cook-and-Chill (C&C) are the most adopted technologies.

C&W maintains meals above 65°C after production to avoid pathogens proliferation. After production, meals leave the kitchen into insulated containers and must reach the consumer within one hour. C&C meals are cooked and blast-chilled at 0-3°C before the internal temperature drops below 65°C. Chilling extends food shelf life (to days or even a couple of weeks) because low temperatures reduce the rate of microbial and biochemical reactions (Fellows, 2022). Meals are then delivered in refrigerated trucks and warmed at the consumption point or warmed at the CeKi and distributed as in C&W above 65°C. Although consumers prefer C&W (Meijer et al., 2021), C&C technology is growing in the catering sector because of the safety and quality improvement it conveys (Brown, 2008). Moreover, C&C technology improves operational flexibility as chilled meals enable make-to-stock reducing the impact of uncertain demand. Thus, the capital costs for chill-blaster and climate chambers and operational costs from power consumption may pay off in terms of flexibility and production-demand decoupling.

As C&C requires investments, the location of chilling capacity and the allocation of new C&C demand rely on the strategic decision-making of capacity location and network re-design. Optimization models represent useful tools to tackle the design of production and distribution networks like this. Modeling catering production and distribution networks entails consideration on delivery routes. Location-Routing Problem (LRP) may help, but it is inherently NP-hard and real-world instances are solved with heuristics and meta-heuristics multi-stage optimization models (Dai et al., 2019). Furthermore, the operational layer of the routing problem may clash with the long time horizon of strategic facilities' location. Some develop cascading models to address the routing after network design using different time horizons (Farahani et Al., 2013).

The strong seasonality of the catering industry represents indeed an obstacle to the LRP formulations (Balakrishnan et al., 1987). Meals demand varies greatly in the customers, quantities, and recipes over the year. Autumn records peak, while July and August reflect the closure of schools and employees' holidays. As a consequence, routes change significantly with customers and demand over the planning horizon. Moreover, the inherent complexity of the tight time-window limits the viability of LRP for regional catering network design. At least, not in this article.

In this paper, a Location-Allocation (LA) optimization model intended for the strategic re-design of a regional production and distribution network for food catering deferred system after demand shocks is proposed. The model investigates the economic feasibility of C&C technology introduction and the best configuration for C&C capacity location. The novel contribution lays in the tailored parametrization and modeling of the different cost contributions composing the FMC. Focus is paid to the logistic and distribution parameters', drawing the impact of logistics whilst not involving delivery routes. For this purpose, a logistics cost parameter affected by the client-CeKi distance and the costumers' geographic density is formulated.

The remainder of this paper is organized as follows. In the next Section, the optimization model will be presented and the parameters valorization will be discussed. Then, Section 3 will introduce a real-world case study and the model application results. In Section 4, the model and the results are discussed, and practical implications are proposed. Finally, the model limitations and future research directions are presented in Section 5.

2. Model design

In this Section, the MILP model is formulated to aid the strategic location of Ceki and production capacity while allocating the demand flows. The sets and subsets are introduced, then the parameters are depicted. The integer and continuous decisional variables are introduced, with the objective function and the constraints.

2.1. Sets and Subsets

Sets are defined to characterize the network entities, CeKis, and clients, and to represent the features affecting the meal cost contributions.

Sets

$k \in \mathcal{K}$,	set of existing or potential CeKis.
$j \in \mathcal{J}$,	set of clients.
$t \in \mathcal{T}$,	set of client types (school, company, or hospital).
$m \in \mathcal{M}$,	set of meal types, conservation technology-dependent (e.g., C&W and C&C).
$p \in \mathcal{P}$,	set of packaging types (e.g., multi-portion, single-portion, and tray).
$s \in \mathcal{S}$,	set of CeKi's sizes. The size refers to specific meal categories defined by the client type, the conservation technology, and the packaging solution. Each CeKi will open a number of sizes equal to the number of meal categories it serves.
$z \in \mathcal{Z}$,	set of geographical zones. A geographical zone represents a uniform area of the network in terms of serving practices, distance from the CeKi, and clients' density. The unitary logistic cost may be considered equal for every client inside a geographical zone.

Subsets

$d \in \mathcal{D} \subseteq \mathcal{J} \times \mathcal{T} \times \mathcal{M} \times \mathcal{P}$,	subset of meal categories (meal type $t \in \mathcal{T}$, packaging system $p \in \mathcal{P}$, and client type $t \in \mathcal{T}$) requested by client $j \in \mathcal{J}$.
$c \in \mathcal{C}_{zone} \subseteq \mathcal{K} \times \mathcal{J} \times \mathcal{Z}$,	represents the geographic zone $z \in \mathcal{Z}$ that client $j \in \mathcal{J}$ falls into for CeKi $k \in \mathcal{K}$.

2.2. Parameters

In this paragraph, the parameters are introduced and organized into three layers: demand, cost, and production. The valorization of the cost parameters is thoroughly outlined in the following

Demand Parameters

$\bar{d}_{jtmp}$,	average demand for a specific meal for each client. The demand is defined for each tuple $(j,t,m,p) \in \mathcal{D}$ [meals/year]
vd_{jtmp},	demand variance for each tuple $(j,t,m,p) \in \mathcal{D}$ [meals/year]^2
$D_{jtmp} \sim \mathcal{N}(\bar{d}_{jtmp}, vd_{jtmp})$,	demand for tuple $(j,t,m,p) \in \mathcal{D}$ [meals/year]

For each client, the yearly demand is evaluated through a normal distribution defined by a mean value and a variance. Such parameters are gathered for past and future scenarios by historical demand profiles (pre-pandemic) and post-pandemic forecasts, respectively.

Cost Parameters

$CCap_{stmp}$,	yearly fixed capacity costs [€/year]
$CLab_{k}$,	hourly labor cost in CeKi *k* [€/h]
$COper_{ktmp}$,	operational cost [€/meal]
$CSunk_{km}$,	sunk cost [€/meal]
$COpen_{kstmp}$,	depreciated investment cost for opening a new capacity [€/year]
$CClose_{kstmp}$,	depreciated investment cost for closing an open capacity [€/year]
$CLogistics_{kz}$,	logistic cost per geographic zone [€/meal]

FMC includes the cost contributions concerning the opening and closing of production capacity, the labor and logistic costs, the operational and sunk costs. $CCap_{stmp}$ represents the fixed yearly cost for a specific configuration of CeKi's capacity (size s) for client type t, meal m, and package p. This cost includes utilities fix tax, insurance fees, and waste taxes. $CLab_k$ is the hourly labor cost and changes with the CeKi. $COper_{ktmp}$ is the unit operating cost and includes utility expenses such as gas, electricity, and water, plant maintenance cost, and cleaning. This parameter depends on the CeKi k ad on the specific meal category. C&C meals are more energy-intensive due to chilling and re-heating. $CSunk_{km}$ is the sunk cost parameter and includes entries such as employee training, planning and design of possible investments, and advertising. $COpen_{kstmp}$ is the annual share of investment costs of opening new CeKis or refurbishing an existing one for a specific meal configuration and CeKi's capacity. It pertains capital costs and includes all the expenditures, from land to equipment purchasing. $CClose_{kstmp}$ is the annual share of the value of assets not yet fully depreciated when the production capacity s dedicated to a specific meal (tmp) is closed. Finally, $CLogistics_{kz}$ is the meal delivery cost for a specific geographic zone of a CeKi.

Production parameters

$Prod_{stmp}$,	productivity [h/meal]
Cap_{stmp},	capacity [meals/year]
$CapMax_{k}$,	maximum allowed capacity [meals]
$CapMin_{k}$	minimum allowed capacity [meals]
M,	a generic large number

The productivity $Prod_{stmp}$ depends on the production capacity (size s) and on the meal category. The capacity parameter Cap_{stmp} indicates the yearly production capacity of size s for meals category tmp. The total capacity of a CeKi is the sum of the activated capacities of the meal categories it produces. Since facilities might be constrained into preexisting layouts, a maximum total capacity is introduced $CapMax_k$. $CapMin_k$ compels a minimum capacity to justify the investment and the organizational effort.

2.3. Decisional variables

$$y_{kstmp} = \begin{cases} 1, & if\ CeKi\ k\ of\ size\ s, for\ client\ type\ t, producing\ meal\ m\ in\ packaging\ p\ is\ open \\ 0, & otherwise \end{cases}$$

$$x_{ksjtmp} \geq 0\ meals\ flow\ from\ CeKi\ k\ to\ client\ j$$

$$k_1 = \begin{cases} 1 \\ 0 \end{cases}$$

$$k_2 = \begin{cases} 1 \\ 0 \end{cases} \quad optional\ variables\ for\ forcing\ mutually\ exclusive\ choices\ on\ CeKis\ opening/closing$$

The opening or closing of a CeKi is determined by the binary variable y_{kstmp}, while x_{ksjtmp} is the meals flow variable specifying the number of meals (tmp) leaving CeKi k of size s to reach the client j. Lastly, couples of variables such as k_1 and k_2 are used to enforce mutually exclusive choices on two alternative CeKi configurations. For example, an existing CeKi and the same CeKi after renovation are two different CeKi for the model, but only one of them can be opened.

2.4. Objective Function

$$
\begin{aligned}
\min TotalCost\text{:} \Bigg(\sum_{k}^{K}\sum_{s}^{S}\sum_{t}^{T}\sum_{m}^{M}\sum_{p}^{P}&\big[(\boldsymbol{CCap}_{stmp}\cdot y_{kstmp}) + (\boldsymbol{COpen}_{kstmp}\cdot y_{kstmp}) \\
&+ (\boldsymbol{CClose}_{kstmp}\cdot(1 \\
&- y_{kstmp}))\big]\sum_{k}^{K}\sum_{s}^{S}\sum_{(jtmp)}^{D}\Bigg[(x_{ksjtmp}\cdot\boldsymbol{CSunk}_{km}) + (x_{kstmp}\cdot\boldsymbol{CLab}_{k}\cdot Prod_{stmp}) \\
&+ (x_{ksjtmp}\cdot\boldsymbol{COper}_{ktmp}) + \sum_{k}^{K}\sum_{(jtmp)}^{D}\sum_{(kjz)}^{C_{zone}}\boldsymbol{CLogistics}_{kz}\cdot x_{ksjtmp}\Bigg]\Bigg)
\end{aligned}
\tag{1}
$$

The Objective Function (OF) minimizes the total cost of the catering production and distribution network, i.e., all the yearly operating cost contributions and the annual rate of depreciation for the investment costs.

2.5. Constraints

$$\sum_{k}^{K}\sum_{s}^{S} x_{ksjtmp} = D_{jtmp}\ \forall\,(jtmp)\in\mathcal{D} \tag{2}$$

$$\sum_{s}^{S} Cap_{stmp}\cdot y_{kstmp} \geq \sum_{s}^{S}\sum_{j:(jtmp)\in D}^{J} x_{ksjtmp}\ \forall k\in\mathcal{K}, t\in\mathcal{T}, m\in\mathcal{M}, p\in\mathcal{P} \tag{3}$$

$$\sum_{s}^{S} y_{kstmp} \leq 1\ \forall k\in\mathcal{K}, t\in\mathcal{T}, m\in\mathcal{M}, p\in\mathcal{P} \tag{4}$$

$$\sum_{s}^{S}\sum_{t}^{T}\sum_{m}^{M}\sum_{p}^{P} Cap_{stmp}\cdot y_{kstmp} \geq CapMin_{k}\ \forall\, k\in\mathcal{K} \tag{5}$$

$$\sum_{s}^{S}\sum_{t}^{T}\sum_{m}^{M}\sum_{p}^{P} Cap_{stmp}\cdot y_{kstmp} \leq CapMax_{k}\ \forall\, k\in\mathcal{K} \tag{6}$$

Constraint (2) guarantees demand satisfaction for each customer. Meals tmp produced in a CeKi cannot exceed their dedicated capacity (3). For each meal category tmp only one size s can be opened in each CeKi (4). Constraints (4) and (5) fix a minimum and maximum allowed capacity for every CeKi. Upper and lower bounds can be dictated by internal strategies or technical issues that could not be otherwise included in the model.

3. Case study

The model is applied to the main Italian catering player. The company manages more than 40 CeKis nationwide and employs more than 12000 people. The pandemic reduced the turnover by about 30% in 2020, exposing the inefficiencies of the production and distribution system. To address the efficient strategic planning of the network, the company must assess the FMC savings from serving new C&C meals demand. Given the concentration of the national demand in regional clusters, the model is applied to a regional network of four CeKis serving 2.5 million meals per year through the deferred system. The company is planning a post-pandemic network re-design assuming variation in the demand type, customers, and volumes (i.e., C&C meals for companies and C&W meals for schools). The model is run for three different scenarios of demand. Fig. *1* shows the main features of the case study and the different contributions of the FMC.

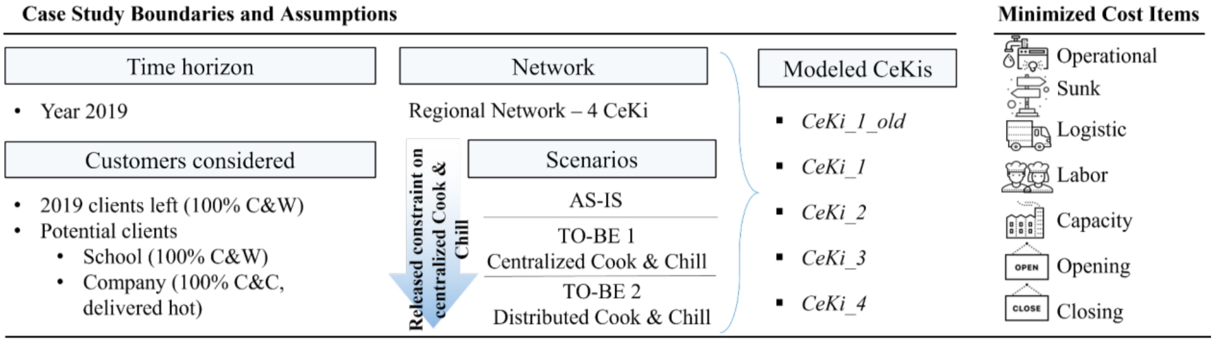


Fig. 1 Parameters valorization methodology

The company's initial decision wanted the production C&C meals through the refurbishing of one existing CeKi in the regional network (*CeKi_1_old*). Because the C&C meals are produced in the renovated CeKi (*CeKi_1*), the post-pandemic demand could force opening the new CeKi according to a centralized production system (To-be 1). In a second scenario (To-be 2), the post-pandemic demand is used to evaluate both the centralized and the distributed production of C&C meals. In this way, the business strategy can be compared with the optimal solution suggested by the model. Lastly, in order to compare the FMC under pandemic and post-pandemic, the model is fueled by the As-Is demand, forcing the actual network configuration.

3.1. Parameters valorization

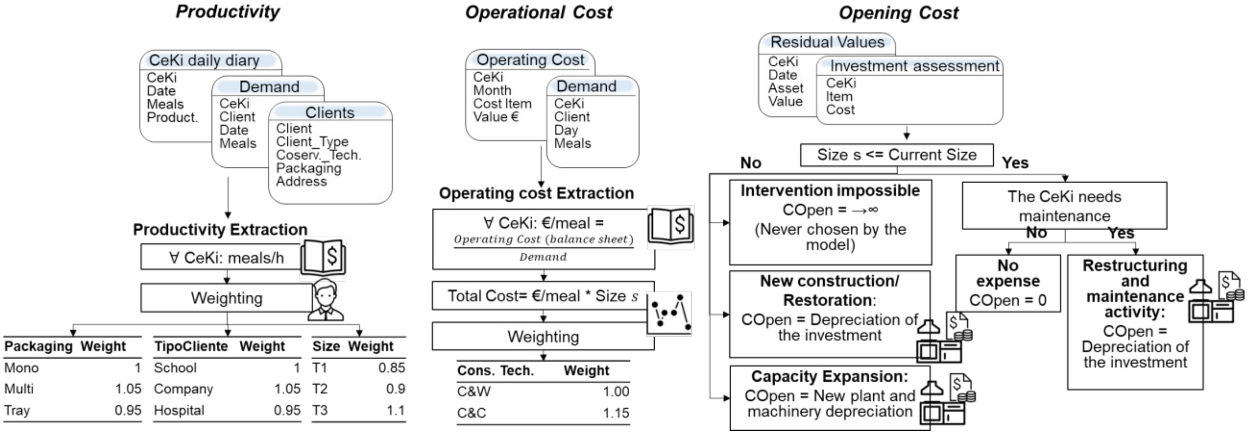
Using specific meal's and CeKi's features to characterize parameters allows for a more precise and punctual cost quantification, crucial into the capacity location problem. Nevertheless, when dealing with a real-world instance, capturing reality's nuances and embedding them into a parameter is ambitious and challenging. The available data is gathered from the balance sheets, released as aggregated indicators like daily kitchen productivity or annual logistics cost. Because of the incoherent scale and specificity of data, valorizing the model parameters requires manipulation and normalization as follows.

Demand - $D_{jtmp} \sim \mathcal{N}\left(\bar{d}_{jtmp}, vd_{jtmp}\right)$

The demand profile from the 2019 is gathered by the company's ERP. For each CeKi the daily demand from a given client is available and characterized by a client typology, a packaging system, and a conservation technology. All the clients lost (i.e., service closure) during the pandemic in 2020 are excluded from the dataset.

Productivity - $Prod_{stmp}$

The daily production mix and the labor hours for every CeKi of the network are tracked daily. The 14,600 annual records have been analyzed and discussed with the company management in order to weigh the three aforementioned meal drivers (tmp). Fig. 2 presents the followed process and the defined weights.



Packaging	Weight
Mono	1
Multi	1.05
Tray	0.95

TipoCliente	Weight
School	1
Company	1.05
Hospital	0.95

Size	Weight
T1	0.85
T2	0.9
T3	1.1

Cons. Tech.	Weight
C&W	1.00
C&C	1.15

Fig. 2 Parameters valorization methodology

Operational cost - $COper_{ktmp}$

$COper_{ktmp}$ includes the direct production costs such as gas, electricity, water, heating system, and cleaning supplies. The conservation technology influences $COper_{ktmp}$. Indeed, the blast-chilling and cold rooms required by the C&C technology are energy-intensive compared to the C&W. Since the actual scenario (As-Is) is almost entirely based on C&W technology, C&W weight is set to 1.00. The incrementing factor of the C&C meals is defined results from the energy consumption of the installed cooling systems scaled to the single meal.

Capacity cost $CCap_{stmp}$

Capacity cost depends on the production capacity (size s) and the meal category (tmp). Insurance, taxes, and rentals are examples of voices falling into this category.

Sunk cost $CSunk_{km}$

A clear dependence between the submerged costs (e.g., vehicle maintenance, employee training, and consulting) and the configuration of the kitchen is hard to find. The specific facility and the conservation technology of meals are the only drivers considered.

Opening cost $COpen_{kstmp}$

The opening cost collects every voice associated with the investments needed to increase the productive size s of a specific meal category tmp or to keep working with an existing size s (i.e., maintenance costs). As shown in Fig. 2, whether the size chosen is lower than the current size, only the maintenance costs are considered. Otherwise, $COpen_{kstmp}$ collects the annual depreciation of building, restoration, or capacity expansion activities. Whether technical constraints prevent the CeKi expansion, $COpen_{kstmp}$ is set to infinite and neglected by the model.

Closing cost $CClose_{kstmp}$

Contrary to opening costs, closing costs incur if the size chosen is smaller than the current. $CClose_{kstmp}$ represents the share of assets value not yet fully depreciated and lost due to the service closure.

3.2. Logistic and transport cost modeling

Meals are distributed using milk-run deliveries. Some kitchens use their own trucks, other employ 3PLs. Despite pre-set routes, carriers can follow different paths according to the kitchen's priorities and clients' habits. Costs, traveling and fuel consumption of each route remain unknown. Moreover, the deferred demand is subjected to seasonality, and routes change weekly and sometimes daily. The poor control on the routing process discouraged LRP formulations that have been neglected in this study.

Without routes, the logistic cost can only be estimated by the clients' geographic distribution, i.e., the distance between CeKi and customers and the customers' density in the served areas. For example, dense distribution of clients favors longer routes while still meeting the expected time-windows. A three-step methodology is developed to estimate logistic costs in terms of *€/meal*zone* depending on the specific network topology.

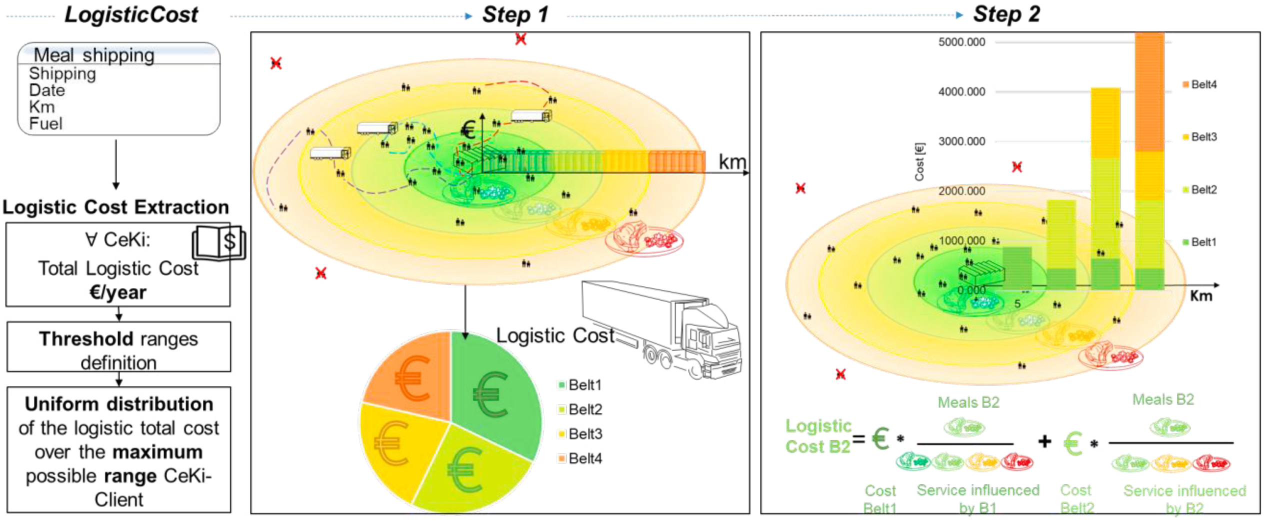


Fig. 3 Parameters valorization methodology

Fig. 3 summarizes two of the three steps used for unit logistic cost estimation exploiting annual logistic costs. The first step involves the definition of the area of influence of the kitchen. The clients within such area can be served by a CeKi, whilst outside clients are served from another CeKi. This area is then split into several concentric zones. The zones are homogeneous by demand density and distance from the CeKi, but their number and ray are arbitrary. In this case study, four concentric belts are defined per each CeKi. The annual logistic cost is evenly distributed on the maximum reachable ray. According to *Step 1*, a share of the annual logistic cost is allocated to each zone based on its width.

Because longer routes serve both closer and farther clients, the distribution cost for the former is paid by the latter. Therefore, in the second step, the cost allocated to the first belt must be redistributed throughout the other belts. Likewise, the cost to reach the second belt must be redistributed between the second, third, and the fourth. The total cost allocated to a belt results from the sum of cost shares of the previous. For instance, the cost allocated to the second belt (*LogisticCost(2)*) combines the first belt cost, distributed over all the belts, and a share of the second belt, distributed among the second, third and fourth (*Step 2* of Fig. 3).

Once the logistic cost is shared and allocated across the belts, the *€/meal*km* (zone-dependent) is found in *Step 3* through the following equation:

$$\frac{€}{meal * km}(b) = \frac{LogisticCost(b)}{Meals(b) * AvgDist(CeKi; b)} \qquad \forall\, belt\ b \tag{7}$$

Through this formulation, even if from *Belt a* to *Belt b* the distance from the CeKi increases, the number of potential clients could increase that much to decrease the $€/meal * km$.

4. Results discussion

The two To-Be scenarios lead to the same conclusion: the optimal network configuration comprises the centralization of the C&C meals production. For this reason, even when the model is relaxed, the refurbishing of the CeKi (CeKi_1) is still suggested. In the following, the As-Is scenario is compared to the unique To-Be scenario.

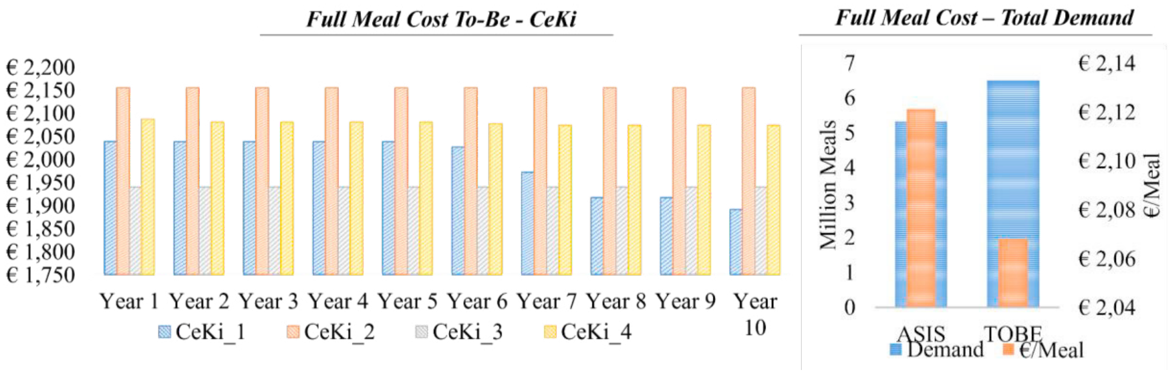


Fig. 4 Results: Full Meal Cost Comparisons

Despite the C&C centralized production, the To-Be configuration is still composed of four CeKi. Three of them (*CeKi_2*, *CeKi_3*, *CeKi_4*) consist of existing CeKis with enhanced productivity for some meal categories, while *CeKi_1* corresponds to the renovation of an existing CeKi. The model closes the old CeKi (*CeKi_1_old*) and opens the new one. On the left of Fig. 4 is shown how the FMC varies among the four CeKis in the To-Be configuration. In *CeKi_1*, the FMC decreases over time due to the end of the investment depreciation process for restructuring the facility. On the right, the average FMC of the network for the As-Is and To-Be scenarios are compared. Despite the more expensive C&C meal production and the investment required to increase the production capacity and meet the demand, the To-Be scenario reduces the FMC.

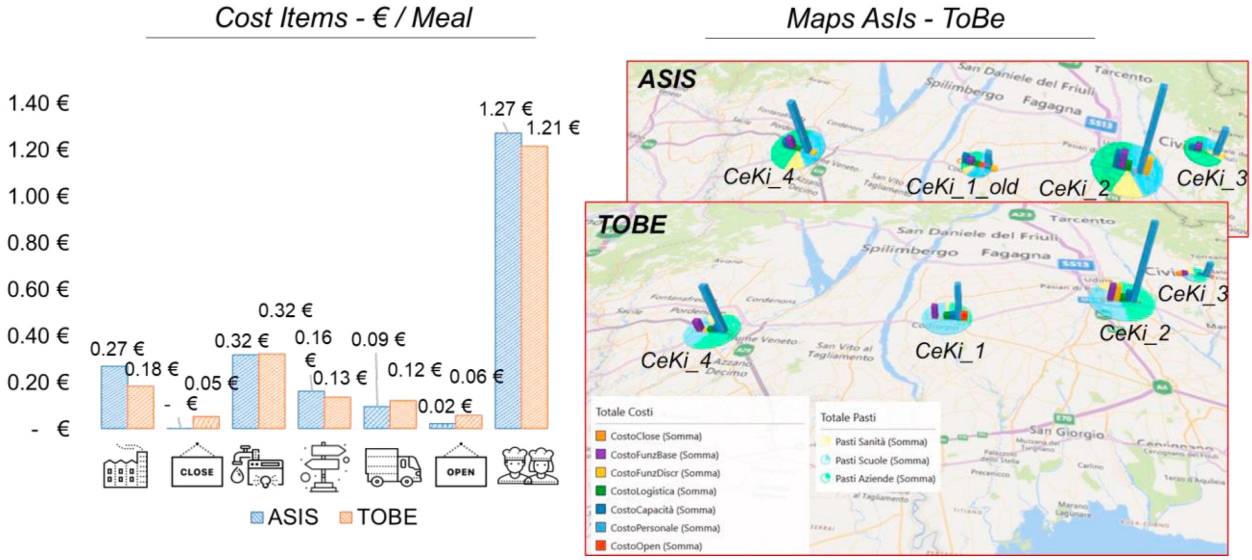


Fig. 5 Results: Cost Items and Demand distribution maps.

Seeing Fig. 5, the logistic cost increases because of production centralization. Opening and closing costs are negligible in the As-Is scenario because no substantial investment is planned. The operational cost is stable despite the more energy-consuming C&C meals. The higher impact of C&C meals is balanced by the higher efficiency of the new CeKi and the economies of scale due to the production centralization. Labor, Sunk, and Capacity costs are reduced in the To-Be configuration. On the right of Fig. 5, the two configurations are compared with a bird-view. The new *CeKi_1* replaces the old one enabling the allocation of specialized capacities over the CeKis network.

5. Conclusions

The C&C technology benefits in the control of post-pandemic demand are studied from a cost accounting perspective. The results suggest the economic viability of the C&C technology implementation in a regional catering production and distribution network. Operation research represents a valuable tool to help decision-makers with quantitative strategic solutions.

In this practical application, the full potential of C&C technology remains unexplored due to two main reasons. A strategic model should be applied to the national network to better capture all the logistic implications and to allow synergies among the regional networks. Moreover, demand uncertainty can be embedded through the definition of a set of scenarios with different levels of probability solved using robust or stochastic programming. The decision-makers could then compare different optimal configurations for different risk levels for the business. Other investigation lies on the opportunity of heating chilled products at the consumer's point (canteen). Network design could benefit from this opportunity, but new problem formulations should be developed.

Finally, the estimation of weights and the parameters valorization can benefit from data-driven support tools based on machine learning (e.g., artificial neural network, ANN). For each cost contribution, a multi-variable cost function based on the aforementioned drivers/features (e.g., size, meal packaging, client typology, conservation technology) could then be found even for new CeKis, instead of relying on the subjective experience of the catering management.

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