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Artigos

WORKFORCE MANAGEMENT AND VACATION PLANNING: A CASE STUDY IN BANK BRANCHES

GESTÃO DA FORÇA DE TRABALHO E PLANEJAMENTO DE FÉRIAS: UM ESTUDO DE CASO EM AGÊNCIAS BANCÁRIAS

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Abstract: The problem of vacation and workforce allocation has been a broad field for conducting research in management and operational research. However, even though it is a common and well-known problem, finding good solutions is usually a difficult task given its combinatorial feature, making it even more difficult to find the optimal solution in order to minimize costs, tailor planning to workers' preferences, distribute shifts equally and meet the constraints of labor. This paper addresses the vacation and workforce allocation problem considering a banking sector scenario, developing a solution approach based on heuristic procedures and mixed integer linear programming. As a result, the proposed approach was able to generate a coverage and allocation matrix for workers and identify shortcomings in the company's vacation coverage capacity.

Keywords: Workforce allocation. Vacation planning. Optimization.

Resumo: O problema da alocação de férias e força de trabalho tem sido um campo amplo para a realização de pesquisas em gestão e pesquisa operacional. No entanto, embora seja um problema comum e conhecido, encontrar boas soluções costuma ser uma tarefa difícil dada a sua característica combinatória, tornando ainda mais difícil encontrar a solução ótima para minimizar custos, adequar o planejamento às preferências dos trabalhadores, distribuir turnos igualmente e atender às restrições de mão de obra. Este artigo aborda o problema de alocação de férias e força de trabalho considerando um cenário do setor bancário, desenvolvendo uma abordagem de solução baseada em procedimentos heurísticos e programação linear inteira mista. Como resultado, a abordagem proposta foi capaz de gerar uma matriz de cobertura e alocação para os trabalhadores e identificar deficiências na capacidade de cobertura de férias da empresa.

Palavras-chave: Alocação da força de trabalho. Planejamento de férias. Otimização.

1 Introduction

Since the 1970s, allocation of vacations and workforce problem has been a broad field for conducting research in the areas of management and operational research, both in theoretical and practical aspects (Costa, Jarray, & Picouleau, 2006). However, the problems dealt with today are quite distinct from the problems addressed in pioneering studies (Dantzig, 1954; Edie, 1954), and this evolution is due to the differentiation over time of work needs, by considering skills with the insertion of new technologies and by variations in shift division.

The vacation allocation and workforce problem is present in any organization, whether it is a small, medium or large business. Studies on the subject are found in literature in various environments, such as the creation of itineraries and division of labor in call centers (Bhulai, Koole & Pot, 2008), air transport (Kohl & Karisch, 2004), postal services (Bard, Binici, & deSilva, 2003), health services (Burke, Causmaecker, Berghe, & Landeghem, 2004), tank trucks (Solos, Tassopoulos, & Beligiannnis, 2016), among several others. Full reviews on the topic are presented in (Ernst, Jiang, Krishnamoorthy, Owens, & Sier, 2004; Ernst, Jiang, Krishnamoorthy, & Sier, 2004; Brucker, Qu, & Burke, 2011; Van den Bergh, Beliën, Bruecker, Demeulemeester, & Boeck, 2013; Bruecker, Van den Bergh, Beliën, & Demeulemeester, 2015).

However, even though it is a common and well-known problem, finding good solutions is usually a difficult task given its combinatorial nature, making it even more difficult to find the optimal solution in order to minimize costs, adjust planning to workers' preferences, distribute shifts equally and meet the constraints of the need for work (Ernst, Jiang, Krishnamoorthy, Owens, & Sier, 2004). Still, this problem grows in complexity as the size of the organization increases, given the growth in the number of employees and skills required. Thus, this is a very relevant problem mainly for medium and large companies.

Another aggravating factor for solving the problem is the consideration of the organization's existing skill set. In workforce planning, the ability is the capacity of a worker to perform a particular activity (Sadegui-dastaki & Afrazeh, 2018). The ability directly affects the way the activity is performed and the degree of efficiency during its execution (in terms of time and quality, for example).

Faced with the aspects and variations of the labor allocation problem, some studies discuss the solution techniques used for its resolution and the application areas of this problem (Brucker, Qu, & Burke, 2011), both industrial and in services. Among the resolution techniques, those in the operational research area, such as linear programming, mixed integer programming and heuristic methods stand out.

This article addresses the problem considering banking industry scenarios. The contribution of this study is to present a decision-support approach (DSA) for planning vacation allocation and workforce coverage in this environment, thus removing the subjectivity of empirical decision. This article is organized as follows: Section 2 gives a brief description of the problem, addressing its constraints and objectives; Section 3 describes the proposed solution approach; Section 4 contextualizes the target case study of this paper; Section 5 demonstrates and discusses the results obtained; finally, Section 6 presents the final considerations.

2 Problem description

The problem of this study consists of a set of bank branches each having a set of qualified workers who perform operational or managerial activities. Each worker has a period in which his vacation must be taken and, depending on his function, his post must be occupied by another worker during the concession period. There is a group of workers, called "flywheels", who are responsible for covering all the agencies. For the coverage, the qualifications of the worker and the flywheel must be compatible.

In this problem, each worker has similar holiday periods (30 days) that must be taken in full and uninterrupted. All workers must have their vacation granted on the annual planning horizon.

In order to be considered viable, planning of vacation and coverage concessions must have the following characteristics:

- The maximum allowable period for employee vacation cannot be exceeded.
- The vacation period cannot be divided.
- All awards must be made within the annual planning period.
- If the function of the worker requires coverage, it must be performed by a flywheel.
- A flywheel can only cover a worker if their skills are compatible.
- A flywheel cannot hold more than one cover at a time.
- A flywheel cannot cover during its own vacation period.

At the same time, in order to carry out good planning, it must be built with the following objectives:

- Allocate the covers to a particular flywheel so that the agency of the worker to be covered is as close as possible to the base on which the flywheels is allocated.
- Assign, in the same agency, the minimum necessary concessions at the same time to avoid large fluctuations in the local workforce.
- Use as few flywheels as possible to make the covers.

3 Solution approach

To solve the problem proposed in this study, a decision-support approach (DSA) was developed, composed by the integration of heuristic methods and two mathematical models, which are based on assignment and task sequencing problems.

The solution of the problem is built by the DSA in four decision steps. The first one evaluates if the flywheels are sufficient to make the covers within the proposed horizon, adding artificial flywheels to the problem if necessary. In the second step, a search algorithm evaluates workers where the need for coverage should be removed. Already in the third stage, a mathematical model is responsible for performing the assignment of the covers, informing the flywheel responsible for the vacation coverage of each worker. Finally, another mathematical model is used in the fourth step to allocate the vacation dates for each worker, including the flywheel.

3.1 Removal of Coverage Need

The stage presented in this subsection becomes necessary due to a peculiarity existing in the scenario used in the case study of this research. Among the functions performed at the service agencies, the functions “Supervisor”, “Relationship Manager” and “General Manager” have similar skills and, thus, can perform mutual coverage in the event that both exist in the same agency. Also, if there is more than one worker for one of these functions, mutual coverage can also be performed. An agency cannot be, at any time on the planning horizon, without either skill. A breakdown of all functions in the environment used is given in Section 4.

Seeking to reduce the need for coverage by the flywheel responsible for such a function, vacation periods for managers who have this scenario, in the same agency, should be granted at different times, excluding the need for coverage of these workers. Algorithm 1 demonstrates the analysis process performed.

Algorithm 1: Procedure for removal of coverage need

DSA-1 ():
    $\mathcal{A}$ = set of bank branches
    $\mathcal{W}_a$ = the coverage need for each bank branch $a \in \mathcal{A}$
    $\mathcal{G}_a^S \subseteq \mathcal{W}_a$ = set of Supervisors in the bank branch $a \in \mathcal{A}$
    $\mathcal{G}_a^R \subseteq \mathcal{W}_a$ = set of Relationship Managers in the bank branch $a \in \mathcal{A}$
    $\mathcal{G}_a^G \subseteq \mathcal{W}_a$ = set of General Managers in the bank branch $a \in \mathcal{A}$

    for ($a \in \mathcal{A}$) do
        if ($|\mathcal{G}_a^R| + |\mathcal{G}_a^G| + |\mathcal{G}_a^S| \geq 2$) then
            Remove ($\mathcal{G}_a^R \cup \mathcal{G}_a^G \cup \mathcal{G}_a^S$) from $\mathcal{W}_a$
        end if
    end for
end (DSA-1)
return [$\mathcal{W}_a$, $\forall a \in \mathcal{A}$]
Source: Authors (2019).

3.2 Coverage Feasibility Assessment

In order to assess whether there is sufficient availability of flywheels to make the necessary coverages, this step aims to evaluate the existing cover capacity. Let $\mathcal{F}$ be the existing functions set and $\mathcal{M}_f$ the available flywheel sets for each function $f \in \mathcal{F}$, the maximum covering capacity for each function is given by the flywheel cover capacity multiplied by the number of existing flywheels for the function.

If there is not enough capacity to meet the existing demand for a particular function $f \in \mathcal{F}$, artificial flywheels should be added to the $\mathcal{M}_f$ set to enable the next steps of the DSA to be performed. Algorithm 2 presents the heuristic method responsible for this analysis.

Algorithm 2: Procedure for coverage feasibility assessment

DSA-2 ():
    $\mathcal{F}$ = set of functions
    $\mathcal{M}_f$ = set of flywheels for each function $f \in \mathcal{F}$
    N_f = set of coverage need for each function $f \in \mathcal{F}$

    for ($f \in \mathcal{F}$) do
        Be q the coverage capacity of a flywheel
        Define λ as $\frac{|N_f|}{q}$
        if $(\lambda > |\mathcal{M}_f|)$ then
            Add $\lceil\lambda\rceil - |\mathcal{M}_f|$ artificial flywheel to the set $\mathcal{M}_f$
        end if
    end for
end (DSA-2)
return $[\mathcal{M}_f$, $\forall f \in \mathcal{F}]$
Source: Authors (2019).

The artificial flywheels demonstrate the need for hiring so that all workers have their concessions made within the planning horizon. In addition, the coverages attributed to artificial flywheels show the workers that they will not be able to enjoy their vacations if the hires mentioned above do not occur.

3.3 Definition of The Coverage Matrix

To perform this step, an iterative execution of the Generalized Assignment Problem is used in this paper. In this problem, we have agents and $\mathcal{M}$ activities such that $|\mathcal{M}| < |\mathcal{N}|$, each activity must be performed by a single agent and each agent can perform more than one task. This problem is said to be classic in literature, and its modeling is described by (Arenales, Morabito, Armentano & Yanasse, 2015) and presented in equations (1-4).

$$\min \sum_{i \in \mathcal{M}} \sum_{j \in \mathcal{N}} c_{ij} X_{ij} \quad (1)$$

$$\sum_{i \in \mathcal{M}} X_{ij} = 1, \qquad \forall \, j \in \mathcal{N} \quad (2)$$

$$\sum_{j \in \mathcal{N}} a_{ij} X_{ij} = b_i, \qquad \forall \, i \in \mathcal{M} \quad (3)$$

$$X_{ij} \in \{0,1\}, \qquad \forall \, i \in \mathcal{M} \quad \forall \, j \in \mathcal{N} \quad (4)$$

The objective function (1) minimizes the costs of allocating activities to agents. Constraints (2) guarantee that all activities will be performed by only one agent, while constraints (3) define that the capacity b_i of agent $i \in \mathcal{M}$ cannot be violated. Constraints (4) inform the domain of the variables. Finally, the variable X_{ij} inform if the task $j \in \mathcal{N}$ has already been assigned to agent $i \in \mathcal{M}$.

To apply the designation model in the scenario presented in our study, the set $\mathcal{M}$ of agents is composed of the flywheels, the set $\mathcal{N}$ of activities is composed of the coverage needs, the costs c_{ij} are defined from the distance between the agency to which the flywheel belongs and the agency in which it will be covering. Thus, the objective function (1) seeks to minimize the total distance traveled by all flywheels to make the vacation coverage.

An important point to note during the cover allocation process is that the number of covers made by flywheels of the same function should be as close as possible. To generate such equilibrium in the presented model, the b_i capacity of each agent was defined according to equation (5). The parameters a_{ij} were defined according to equation (6). Thus, constraints (3) inform the maximum amount of coverage to be performed by agents.

$$b_i = \frac{|\mathcal{M}|}{|\mathcal{N}|} + 1, \qquad \forall \, \mathrm{i} \in \mathcal{M} \tag{5}$$

$$a_{ij} = 1, \qquad \forall \, \mathrm{i} \in \mathcal{M} \quad \forall \, \mathrm{j} \in \mathcal{N} \tag{6}$$

The model is executed in such a way that, in each execution, the flywheel set $\mathcal{M}$ and the cover requirement set $\mathcal{N}$ are defined for each function in which coverages are required. Algorithm 3 presents the proposed procedure.

Algorithm 3: Procedure for definition of the coverage matrix

DSA-3 ():
  $\mathcal{F}$ = set of functions
  $\mathcal{M}_f$ = set of flywheels for each function $f \in \mathcal{F}$
  N_f = set of coverage need for each function $f \in \mathcal{F}$

  for ($f \in \mathcal{F}$) do
    Define $\mathcal{M}_f$ as $\mathcal{M}$
    Define N_f as $\mathcal{N}$
    Define $b_i, \forall \, \mathrm{i} \in \mathcal{M}$ as given in equation (5)
    Define $a_{ij}, \forall \, \mathrm{i} \in \mathcal{M}, \forall \, \mathrm{j} \in \mathcal{N}$ as given in equation (6)
    Solve the Generalized Assignment Problem
    Define θ_f as the result obtained
  end for
end (DSA-3)
return $[\theta_f, \ \forall \, f \in \mathcal{F}]$

Source: Authors (2019).

3.4 Sequencing of the Vacation Concessions

For the assignment of the vacation concession moments to the workers it was proposed in this work a mathematical model having premises of a Job Shop Scheduling problem. In this problem, there are $\mathcal{N}$ tasks to be performed on $\mathcal{R}$ resources and by $\mathcal{J}$ operators, with each resource executing only a certain range of tasks and the tasks having precedence relation to each other. Precedence relations, as well as the allocation of certain tasks in the same resource or operator, mean that they cannot be executed in parallel, one waiting for the other to finish.

Being the vacation time to be given to the worker considered in this model as the duration d_j of the task j $\in \mathcal{N}$, the model proposed in equations (7 – 15) seeks to find a viable solution to the problem so that all tasks (holiday periods) are allocated within the planning horizon, respecting the constraints of non-parallelism.

Constraints (7) and (8) have the role of assigning the execution times of the tasks. Constraints (9) and (10) inform whether two activities $i \in \mathcal{N}$ and $j \in \mathcal{N}$ have been allocated in parallel. Constraints (11) ensure that there are no parallels between activities that are performed on the same resource or by the same operator. Constraints (12) delimit the maximum completion time of a given task $j \in \mathcal{N}$, according to its production deadline, and the minimum task start time, in case of technological limitations. Finally, the variables F_j inform the end time of task $j \in \mathcal{N}$, the variables P_{ij} inform if there is parallelism between two tasks $j \in \mathcal{N}$ and $j \in \mathcal{N}$, being P_{ij}^1 and P_{ij}^2 auxiliary variables for the definition of P_{ij}.

$$F_i - F_j + d_j \leq M \cdot \mathrm{P}_{ij}^1, \quad \forall\, i \in \mathcal{N}, \quad \forall\, j \in \mathcal{N}, \quad i \neq j \tag{7}$$

$$F_j - F_i + d_i \leq M \cdot \mathrm{P}_{ij}^2, \quad \forall\, i \in \mathcal{N}, \quad \forall\, j \in \mathcal{N}, \quad i \neq j \tag{8}$$

$$\mathrm{P}_{ij}^1 + \mathrm{P}_{ij}^2 - 1 \leq P_{ij}, \quad \forall\, i \in \mathcal{N}, \quad \forall\, j \in \mathcal{N}, \quad i \neq j \tag{9}$$

$$\mathrm{P}_{ij}^1 + \mathrm{P}_{ij}^2 \geq 2 \cdot P_{ij}, \quad \forall\, i \in \mathcal{N}, \quad \forall\, j \in \mathcal{N}, \quad i \neq j \tag{10}$$

$$P_{ij} \leq 0, \quad \forall\, (i,j) \in (\psi^1 \cup \psi^2 \cup \psi^3) \tag{11}$$

$$d_i^{min} + d_i \leq F_i \leq d_i^{max}, \quad \forall\, i \in \mathcal{N} \tag{12}$$

$$P_{ij} \in \{0,1\}, \quad \forall\, i \in \mathcal{N}, \quad \forall\, j \in \mathcal{N} \tag{13}$$

$$\mathrm{P}_{ij}^1 \in \{0,1\}, \quad \forall\, i \in \mathcal{N}, \quad \forall\, j \in \mathcal{N} \tag{14}$$

$$\mathrm{P}_{ij}^2 \in \{0,1\}, \quad \forall\, i \in \mathcal{N}, \quad \forall\, j \in \mathcal{N} \tag{15}$$

For the application of the task sequencing model proposed in the presented scenario, the $\mathcal{N}$ set of activities is composed by the coverage needs. The sets ψ, which are responsible for storing tuples of parallels that cannot occur, are generated based on three decisions: ψ^1 are formed by the relationships of non-parallelism arising from the cover decisions. Workers who will be covered by the same flywheel cannot enjoy their vacations simultaneously. ψ^2 is formed by workers who fall under the circumstances where it is possible for coverages to be carried out without the allocation of a flywheel. These cases are detailed in Section 4. ψ^3 are formed by relationships of non-parallelism within the service agency. For all agencies except MTZ, tuples have been defined so that no parallelism occurs. For the MTZ agency, which has a lot of work that makes non-parallelism impossible throughout the year, two subgroups of workers were created so that tuples were created internal to this subgroup. The workers were randomly and evenly divided.

4 Case study

The object of this study is set in a Credit Brank of the state of Minas Gerais. The structure of the organization is made up of an administrative headquarters and seventeen other service agencies throughout the state. The study focuses on six categories of functions that are identified as critical by the organization: General Managers (GM), Relationship Managers (RM), Service Agents (SA), Treasury Tellers (TT) and Supervisors (SV). For workers of the functions described, there are flywheels responsible for vacation coverages. In all, the functions considered in this paper add up to 92 workers, including 15 General Managers, 12 Relationship Managers, 38 Customer Service Agents, 25 Treasury Tellers and 2 Supervisors.

In order to meet the demand of different skills in different cities, the service agencies have different numbers of workers for each function. Table 1 presents this distribution.

Table 1 - Distribution of workers by function and bank branch

Bank Branch	TT	GM	RM	SV	SA
MTZ	4	3	1	0	5
RPC	1	0	0	0	3
NVE	2	1	0	0	2
PRT	2	1	0	0	2
CRZ	3	1	1	1	1
BVL	1	0	0	0	1
STB	1	1	1	0	2
BCC	1	0	0	1	3
ALV	1	1	0	0	3
ITA	3	1	1	0	4
BLZ	0	1	3	0	1
OPT	2	0	2	0	0
CAE	1	1	0	0	2
MAR	1	1	2	0	4
ITO	1	1	0	0	2
NVL	1	1	1	0	2
OUB	0	1	0	0	1

Source: Authors (2019).

In order for vacation concessions to be allocated, the credit union has specific workers who cover for their respective categories of duties. These workers will be called “flywheels”. Thus, decisions regarding the allocation of the workforce of the flywheels must be made to make the covers. There are three cases in which service agencies can cover internally, i.e. without the need to allocate a flywheel.

Case 1: The service agency has the functions GM and RM.

Case 2: The agency has more than one GM or RM worker.

Case 3: The agency has the SV function and the GM or RM functions.

Once the foregoing cases have occurred, if the vacation concession of workers involved in the informed duties does not occur in parallel, flywheel cover is not required. SA and TT functions must have their vacation concessions covered by a flywheel.

The company studied does not have an adequate dimensioning of flywheels, so it does not know if its quantity is enough to meet the demand of covers to be realized in the year. For this reason, it is common that emergency hires take place or workers do not have their vacations released, generating discontent and accumulating demands for coverage for the next year. The Credit Cooperative currently has three TT flywheels, one GM/RM/SV flywheel and one SA flywheel.

Another existing factor is the decentralization of decision making on concessions and coverages, leading to parallels and replacements that could be avoided. In the company's current working method, this task is performed with a focus on the short term, forcing the manager to review planning several times over the planning horizon.

5 Results and discussions

The computational experiments were performed using the actual data provided by the Credit Cooperative studied. All codes were implemented in Python 2.7 and the models were solved using the commercial Gurobi Optimizer solver. The experiments were performed on a notebook with Inter (R) Core (TM) i5-4210U 1.70GHz processor, 8 GB DDR31600 MHz RAM and Ubuntu 16.04 operating system.

The proposed DSA was able to solve the problem presented by the company. To make the covers feasible, the DSA-2 step created the creation of 3 artificial SA type flywheels. The categories, number of coverages made and occupancy rates of the real and artificial flywheels are presented in Table 2. For comparison criteria, in the last planning period, the company was able to grant vacations to only 58\% of its workforce, i.e., 53 of the 92 employees.

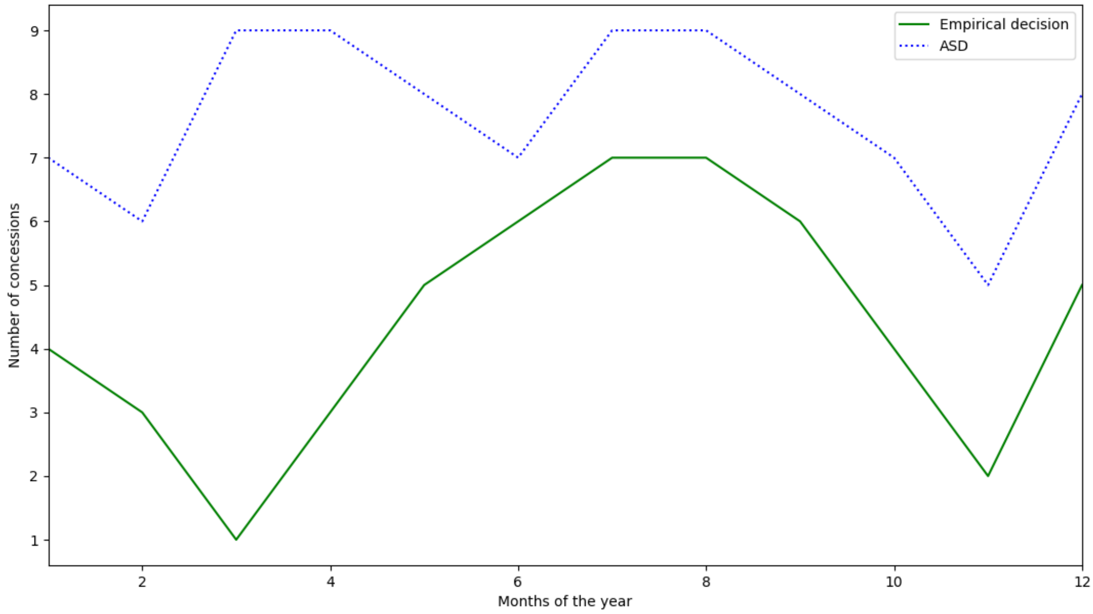
Table 2 - Number of coverages made and occupancy rate of real and artificial flywheels

Flywheel	Function	Coverages	Occupancy
Flywheel 1	TT	8	67%
Flywheel 2	TT	9	75%
Flywheel 3	TT	8	67%
Flywheel 4	GM / RM / SV	6	50%
Flywheel 5	SA	10	83%
Artificial 1	SA	10	83%
Artificial 2	SA	10	83%
Artificial 3	SA	8	67%

Source: Authors (2019).

As for the number of concessions, decision making centrally increased the level of this parameter over the months of the year. Figure 1 shows the number of monthly holiday grants for the proposed DSA and the current approach taken by the company and applied during the last planning period. Together, the method was also effective in minimizing the number of parallel concessions in the same service agency, with parallelism occurring in only one of the agencies.

Figure 1 - Number of concessions over the planning period



Source: Authors (2019).

It is observed with the creation of artificial flywheels that the current coverage capacity is not sufficient to meet the company's annual holiday demands. It is noteworthy at this point that the assignment of artificial flywheels demonstrates, in practical environments, the need for hiring new workers responsible for covering holidays. Thus, the workers who had their cover assigned to the artificial flywheels could not, in the current scenario, make the request of their vacation period. These demands would be allocated in the next planning period, i.e. next year.

Another aspect to be observed is the amount of coverage performed for the GM/RM/SV functions. Only 6 coverages were performed in a total of 29 category workers, demonstrating that the proposed method explored the use of cases in which the coverage can happen internally at the agency (Appendix C). As an example, Appendix A shows the vacation allocation for an agency and Appendix B shows the coverage made by flywheel 1.

6 Conclusions remarks

This research presents an optimization approach based on mathematical and heuristic models to deal with workforce planning and vacation concession, evaluating allocation scenarios for multiple agency flywheel employees of a Credit Bank. The results were discussed and validated by the managers of the collaborating company of this research.

The computational results showed that the solutions are feasible to be put into practice. As it is an automated decision support system, the proposed approach generates solutions in times shorter than those currently practiced by the company, generating great potential for reducing operational efforts.

For future research, the authors of this study point to the insertion of existing aspects into national vacation concession laws, such as limitations on start dates, for example. It is also suggested to consider the coverage logistics, such that once a flywheel goes to a particular agency, it remains there until all the covers allocated to it on that same agency are applied. This study remains on the authors agenda.

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APPENDIX A – ITA agency vacation grant and coverage times by month

Period	Function	Coverage	Concession	Return
MAR	SA	Artificial 2	03/02/2019	03/31/2019
APR	TT	Flywheel 2	04/01/2019	04/30/2019
MAY	RM	-	05/01/2019	05/29/2019
JUN	TT	Flywheel 2	05/31/2019	06/29/2019
AUG	SA	Artificial 2	07/04/2019	08/02/2019
SEP	GM	-	08/09/2019	09/01/2019
OCT	TT	Flywheel 2	09/02/2019	10/01/2019
NOV	SA	Artificial 2	11/01/2019	11/30/2019
DEC	SA	Artificial 2	12/01/2019	12/30/2019

Table 3 - ITA agency vacation grant and coverage times by month.
Source: Authors (2019).

APPENDIX B – Bank branches and vacation coverages performed by Flywheel 1

Bank Branch	Concession	Return
MTZ	01/01/2019	01/30/2019
NVE	01/31/2019	03/01/2019
MTZ	03/06/2019	04/04/2019
PRT	04/05/2019	05/04/2019
PRT	05/05/2019	06/03/2019
MTZ	07/05/2019	08/03/2019
MTZ	08/04/2019	09/02/2019
NVE	12/01/2019	12/30/2019

Table 4: Bank branches and vacation coverages performed by Flywheel 1.
Source: Authors (2019).

APPENDIX C – Granting periods and vacation coverages for management and supervisory functions

Bank Branch	Function	Coverage	Concession	Return
ALV	GM	Flywheel 4	05/01/19	05/30/19
BCC	SV	-	08/29/19	09/27/19
BLZ	GM	-	04/01/19	04/30/19
BLZ	RM	-	12/01/19	12/30/19
BLZ	RM	-	03/02/19	03/31/19
BLZ	RM	-	01/01/19	01/30/19
CAE	GM	Flywheel 4	09/02/19	10/01/19
CRZ	GM	-	10/02/19	10/31/19
CRZ	RM	-	09/02/19	10/01/19
CRZ	SV	-	05/05/19	06/03/19
ITA	GM	-	08/03/19	09/01/19
ITA	RM	-	05/01/19	05/30/19
ITO	GM	Flywheel 4	04/01/19	04/30/19
MAR	GM	-	07/04/19	08/02/19
MAR	RM	-	12/01/19	12/30/19
MAR	RM	-	11/01/19	11/30/19
MTZ	GM	-	04/05/19	05/04/19
MTZ	GM	-	06/04/19	07/03/19
MTZ	GM	-	08/03/19	09/01/19
MTZ	RM	-	01/31/19	03/01/19
NVE	GM	Flywheel 4	03/02/19	03/31/19
NVL	GM	-	12/01/19	12/30/19
NVL	RM	-	07/04/19	08/02/19
OPT	RM	-	08/03/19	09/01/19
OPT	RM	-	09/02/19	10/01/19
OUB	GM	Flywheel 4	12/01/19	12/30/19
PRT	GM	Flywheel 4	10/02/19	10/31/19
STB	GM	-	08/03/19	09/01/19
STB	RM	-	07/04/19	08/02/19

Table 5 - Granting periods and vacation coverages for management and supervisory functions.
Source: Authors (2019).