

**Group 2 DEUTSCHE BAHN  
INTERNATIONAL TRAINING PROGRAM**

**“RAIL TRANSPORTATION”**

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**CASE STUDY OF THE OF MULTIFUNCTIONAL STAFF  
DEPLOYMENT AT THE STATIONS OF METRÔRIO AND VLT RIO**

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We dedicate this educational project to our families and friends, also to the new friends we made in the course.

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## **ABBREVIATIONS**

BSC: Balanced Scorecard

HC: Headcount

MetrôRio: Subway of the Rio de Janeiro

OCC: Operational Control Center

PDCA: Plan, Do, Check and Act cycle

POS: Point of Service

SIC: Incident System with Card

SWOT: Strength; Weakness; Opportunity; Threats

TPS: Toyota Production System

TVM: Ticket Vending Machines

VLT Rio: Tramway of the Rio de Janeiro



## SUMMARY

Based on the current scales and the activities currently performed at the stations, there was an opportunity to gain operational flexibility with the creation of a new position: **station operator**. A feasibility study was carried out to evaluate the impacts on customer service, training needs, how to make a transition and financial impacts.

This function will group the activities currently performed by the following positions: Attendant and Sales Operator, Selling Operator, Station Auxiliary, Platform Auxiliary and Entrance Auxiliary. The only position that will not be absorbed in this role is that of Security Agent, although some administrative functions of the agent are absorbed.

Keywords: Multifunction, Subway, Tramway.

## 1 Brief description of the chosen topic

Transport modes have, in their cost matrix, labor as the main expense line. The Brazilian Labor Laws make the journeys inflexible and a high personnel cost due to taxes and taxes associated with it, besides the practice of an extensive list of aggregated benefits, such as: transportation card, lunch card, basic food basket, health plan, vacation allowance (1/3 of the nominal salary), 30 days of vacation, among others. On average, with the charges and benefits an employee costs to his employer approximately 3 times his nominal salary.

The constant search for cost balance, the need to carry out reinvestments aiming the continuous improvement in the quality of customer service, the tendency to digitize services, the automation of some processes and the search for a profile of greater capacity to attend the stations created the idea of a multi-function collaborator to work on the operation of the stations for both the subway and the tramway systems. It is worth mentioning that although it is not the scope of this work, there are also reports of other rail systems adopting multifunctional positions in the areas of trains traffic and maintenance.

The seasonal, annual, monthly, weekly, daily and even hourly demand (chart 01, 02 and 03) is added to the above mentioned reasons, with work scales that do not allow intervals longer than a meal (about 1 hour) and make it "compulsory," whether or not they work in a 44 hours per week, with fixed work schedules that required clearances on the seventh day worked. This model does not allow to "modulate" the staff according to the demand, carrying unproductive journeys and increasing the service hours without the counterpart to the client.

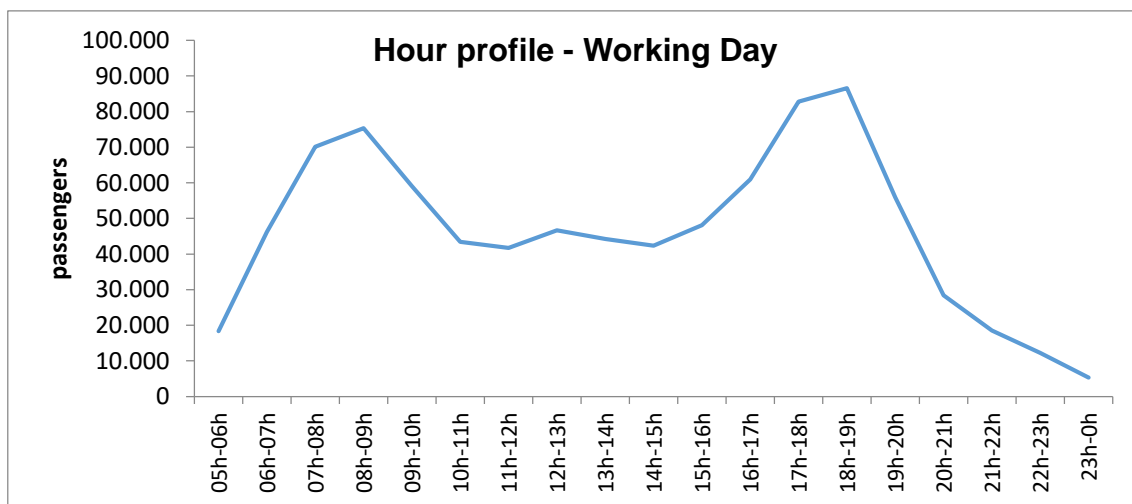
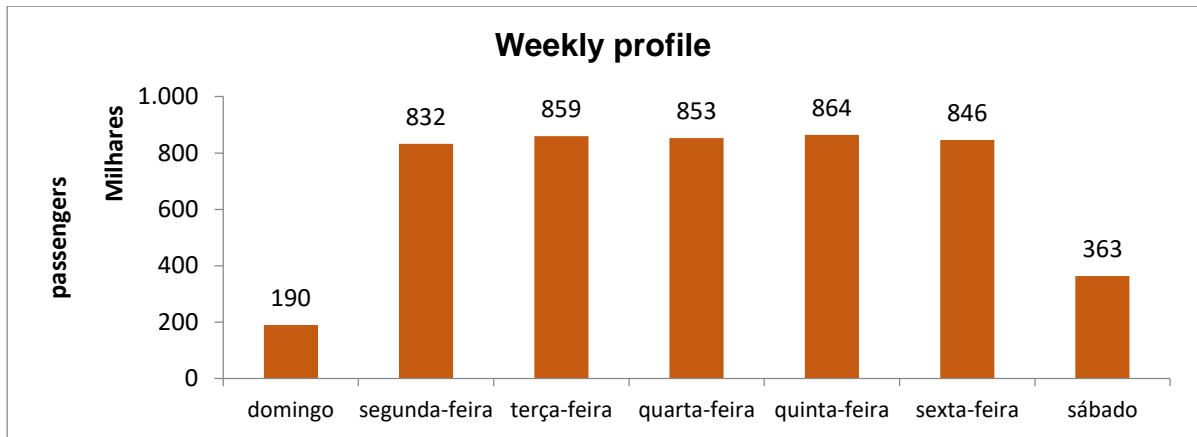
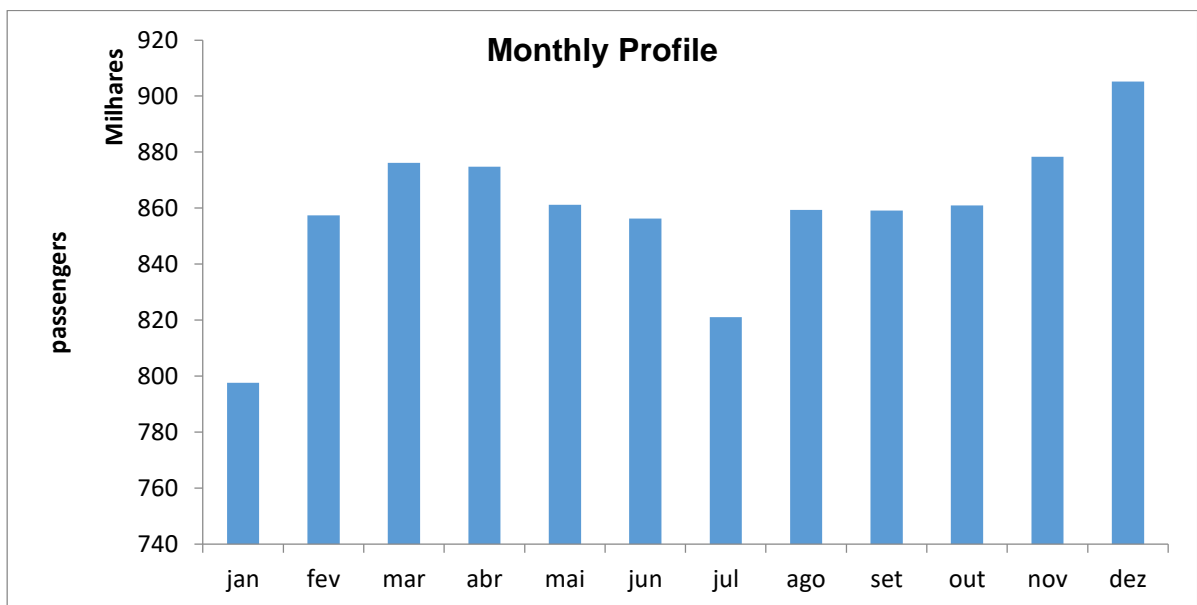


Chart 1: Hour Profile of one working day (e.g: MetrôRio)

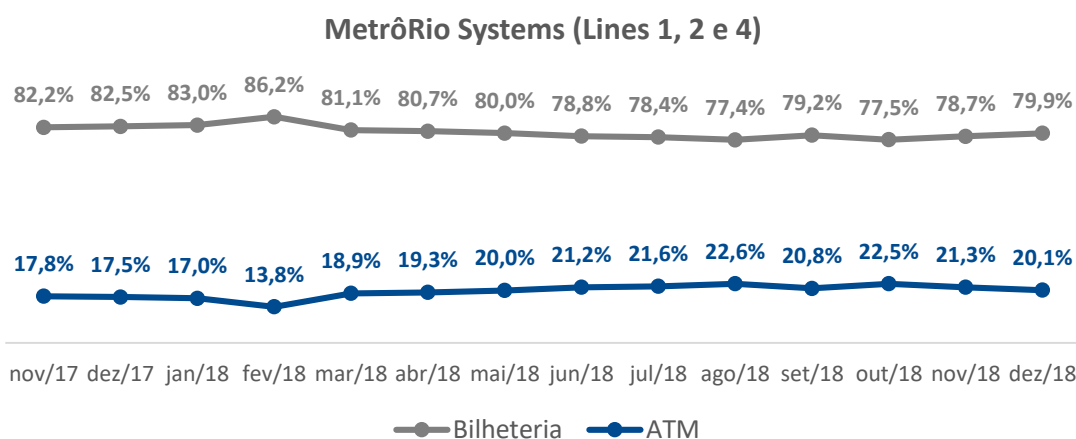


**Chart 2: Weekly Profile (e.g.: MetrôRio)**



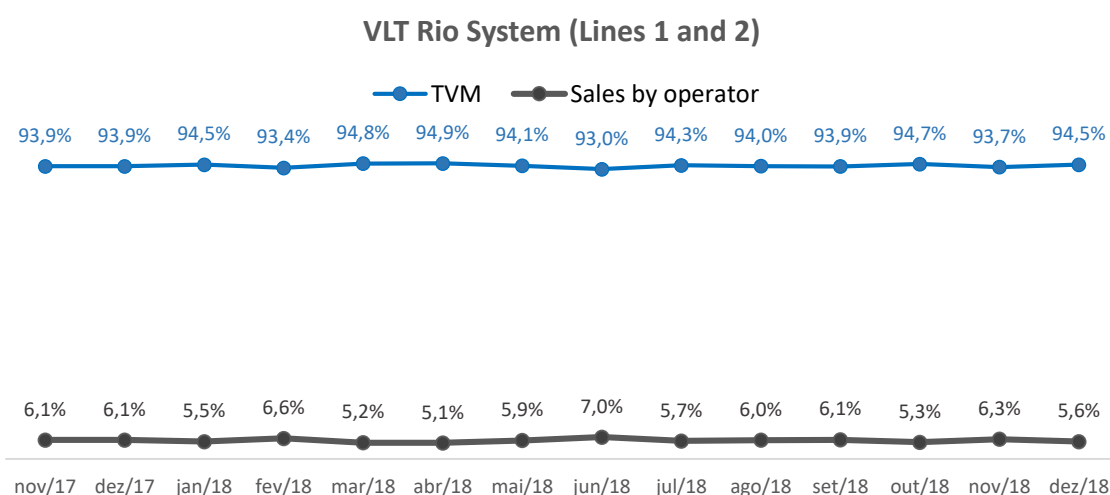
**Chart 3: Monthly Profile (e.g.: MetrôRio)**

One option to mitigate the impact on labor costs that can be generated by a seasonality, such as the one presented above, is the installation of self-service equipment for the sale of travel tickets in subway stations and the launch of the sale via the Web, and this migration from the box office sale to the other channels has gradually taken place, as can be seen in Chart 04 and 05: Participation by sales channel. These initiatives put a whole category, in this case, the sales operators, in the fear of losing their jobs and this function corresponds to 50% of the number of employees in the stations if we consider the case of MetrôRio.



**Chart 4: Monthly Profile (e.g.: MetrôRio)**

In the case of the VLT Rio, since its inauguration, all the stations have self-service machines. However, as a strategic form, itinerant sales operators were incorporated to cover possible increases in demand for the tickets purchase.



**Chart 5: Monthly Profile (e.g.: VLT Rio)**

Thus, more and more, such as the introduction of TVMs in banks, there is a migration of the demand for the purchase and recharge of tickets to the machines or virtual environment. Aggravating the issue of the disappearance of the function of the selling operator, the Government of the State of Rio de Janeiro is still working on the interoperability of transportation ticketing systems, which would make the sale possible in other systems, promulgating an interoperability decree in the Electronic Ticketing system (number 46.243 / 2018), which establishes the date of 07/02/2018 to starts.

## CHAPTER II - INTEROPERABILITY

*Art. 2 Interoperability will affect the possibility of tariff integration between road, subway, rail and waterway modes.*

*Paragraph 1. For the purpose of interoperability, all electronic cards issued by transport operators and / or that are part of the Intermunicipal Electronic Ticket System shall be accepted by the ticketing systems of the other operators.*

*Paragraph 2. The physical and systemic adequacy necessary for the implementation of interoperability shall be the responsibility of the transport operators, being prohibited the transfer of costs to the users nor the Granting Authority in the form of contractual rebalancing.*

*Art. 3 The electronic card issued by any transport operator shall allow it to be qualified for multiple functions, such as Transportation Ticket, Single Intermunicipal Ticket, Student Gratuity, Social Security Gratuity and Senior Gratuity.*

**Decree 46.243 / 2018**

This makes multi-function highly advantageous for both the employer and the employee, with a guarantee of job preservation, better training and employability, and an increase in the quality of the service provided, since it can confer agility in the service.

It is no coincidence that most subways and rail transport systems in the world adopt multifunctional staff seeking efficiency and quality.

With this vision, the interest in deploying a multifunctional staff in order to provide a more efficient service and to implement new technologies is increasing. In this study, the analysis of the station staff is limited, but, according to prospecting with other systems around the world, we realize that it is possible to do so in the maintenance and trains traffic.

### **Examples of teams:**

- Ticketing + station functions;
- Functions in stations + traffic;
- Maintenance + traffic, station or other maintenance;
- Combining multiple roles in OCC.

Technology, therefore, plays an important role in enabling ticketing employees, as ticketing becomes more self-service, with Ticket Vending Machines (TVMs), smartcards and non-contact payment cards replacing manual ticket sales, the ability to assist customers with ticket sales knowledge will become less necessary and can be combined with other station functions.

In order to prove the feasibility of implementing the multi-function, we looked for a benchmark group of the world's largest subways and we found that about 70% of the subways have or plan to deploy multifunctional teams without necessarily reducing personnel, but in pursuit of increased efficiency. Younger subways and

tramways are already born with this unique function, facilitating the distribution of resources throughout their systems.

## **2 Research Results**

In the case of MetrôRio, in order to understand the expectation of the company's board and the managers most connected to the front office, in-depth interviews were conducted to identify expectations about the main expected benefits, areas to be involved and quality indicators to be monitored.

The interviews, conducted by the internal team in January 2019, involved 3 directors, 4 managers and 8 coordinators of possible areas for the implementation of multi-function in the stations, and also the Human Resources and Training sectors, making evident the concern with the transition issues and how the migration would be seen by the employees directly involved.

In the case of the VLT Rio (tramway), since the area of operation would be basically in operations management, the interviews were restricted to the director, manager and coordinators of the operation area.

The interviews were, therefore, aimed at exploring the following points:

- Understand why multifunctional teams are used;
- Identify opportunities and possibilities to introduce these teams;
- Benefit evaluation;
- Identify potential barriers and concerns with implementation.

The point of greatest convergence was the expectation of providing a service with greater quality and speed, a factor that is seen as the main differential of the subway modal in quality research carried out with the client, giving greater autonomy to the purchase and bringing the benefit of a more personalized service in more complex issues and guarantee of the operation of the equipment at the customer's service in the stations.

There was interest in further studies for the implementation of the multi-function, being considered appropriate to the other areas of the company, such as maintenance and OCC (Operational Control Center).

In the case of VLT Rio, the multifunction in-field station agent operates the management of TVMs, public service, urban traffic control and flow control. Already the Inspection Agent from the acting within the trains and stations in order to control the non-validation levels at the VLT Rio System by verifying the users' payment of the tariff and acting as a promoter selling roaming cards when necessary.

For maintenance work, an example of benchmarking we can mention is the Barcelona tramway, where it was verified, in a technical visit carried out in 2015, the multi-function occurring in operation and maintenance.

According to figure 1 below, we perceive the same employee acting on three different workbenches (parts washing machine, traction motors bench, service station):



**Figure 1: Act in parts washing machine, traction motors bench, service station**

In these interviews, there was a concern about the employability of the employees that are being affected by the automation of sales processes and with a migration of the client habit from buying in other types of services, besides an evaluation of the type of service of the current employees, dealing with other tasks, with different degree of complexity and skill required.

Another concern was about the training period required for the new occupants of this function due to their complexity and scope, as well as the legal aspects of this migration.

As a clearer way of seeing the whole process, a SWOT matrix (table 1) was developed in order to map the strengths, weaknesses, opportunities and threats of adopting this new position in the company.

SWOT: multi-function		
Internal	<p><b>Strenght:</b></p> <ul style="list-style-type: none"> <li># Highest quality service</li> <li># Rationalization of teams</li> <li># Possibility of cost reduction</li> <li># Easier to manage</li> <li># Increased team motivation</li> <li># Developing new skills</li> <li># Reduction of losses in the production process</li> <li># Flexibility to prioritize critical activities and absense coverage</li> <li># Improved customer service through staff reallocation</li> </ul>	<p><b>Weakness:</b></p> <ul style="list-style-type: none"> <li># Employee profile do not fit for new functions (requires longer training time)</li> <li># Old assumptions of the rational organization of work</li> <li># Inflexible working days</li> <li># Fear of the Comfort Zone</li> </ul>
External	<p><b>Opportunity:</b></p> <ul style="list-style-type: none"> <li># Employability</li> <li># Migrating the customer's buying habit to other channels</li> <li># More personalized service</li> <li># Greater attractiveness in the new function performed</li> <li># Career development plan</li> <li># Greater proximity to the customer</li> </ul>	<p><b>Threats:</b></p> <ul style="list-style-type: none"> <li># Legal aspects of the functions should be considered</li> <li># Team Safety</li> <li># Fear of the unknown (greater contact with clients)</li> <li># Negative perception of clients (reduction of staff at certain time of the day)</li> <li># Workers Union</li> </ul>

**Table 1: SWOT matrix analysis**

### 3 Hypotheses

The multifunctional team is defined as one that performs more than one function regularly and spends at least 10% of the time with the new functions, excluding those that only in case of incidents or occasionally perform a function different from their original one.

There are many possibilities of combining functions, and may be in the same area or in different areas, merging functions of the columns of Table 2 - Possibility of implementation of multifunction, as below:



Sector:	Traffic [T]	Stations [S]	Maintenance [M]	Other [O]
Function:	<ol style="list-style-type: none"> <li>1. Traffic Control (line controller, overall OCC supervision)</li> <li>2. Signalling (in OCC or signal box)</li> <li>3. Driving in service</li> <li>4. On train but not driving (e.g. guard; attendant on automated line)</li> <li>5. Shunting</li> <li>6. Driver supervision (e.g. personnel management, sign on/off, briefing)</li> <li>7. Incident Response (e.g. on-site incident management)</li> </ol>	<ol style="list-style-type: none"> <li>1. Ticket Sales</li> <li>2. Customer Information</li> <li>3. Station Operations (gateline/ticket collection, platform and dwell time management)</li> <li>4. Staff Management (sign in staff, briefing, supervision, rostering)</li> <li>5. Station Administration (e.g. sign in contractors, lost property)</li> <li>6. Incident Response (e.g. sick passenger, train door failure)</li> <li>7. Basic Corrective Maintenance (e.g. restart escalator, fix ticket machine jam, repair platform door)</li> <li>8. Security</li> <li>9. Light cleaning (tidying litter etc.)</li> </ol>	<ol style="list-style-type: none"> <li>1. Heavy Cleaning (including station spills/body fluids / deep clean)</li> <li>2. Running Repairs (incident response during service hours)</li> <li>3. Non-specialist (lighting, tiling)</li> <li>4. Station equip. (ticket machines, gates)</li> <li>5. Escalators, lifts</li> <li>6. Rolling Stock</li> <li>7. Signals</li> <li>8. Track</li> <li>9. Power</li> </ol>	<ol style="list-style-type: none"> <li>1. Office Work (e.g. senior management)</li> <li>2. Revenue Control (roaming ticket inspections)</li> <li>3. Any other role</li> </ol>

**Table 2: Possibility of implementation of multifunction – Source: MetrôRio internal research with one of the biggest subway benchmarks groups in the world.**

The choice of hypothesis should be based on interviews with the project sponsors, focusing on simplicity of implementation and reduction of risks. In addition to focusing on improving the service offered to the client.

The “Turtle Diagram” is a good tool for visualizing processes that are made up of inputs, outputs, criteria, to assist in their effective execution and improvement.

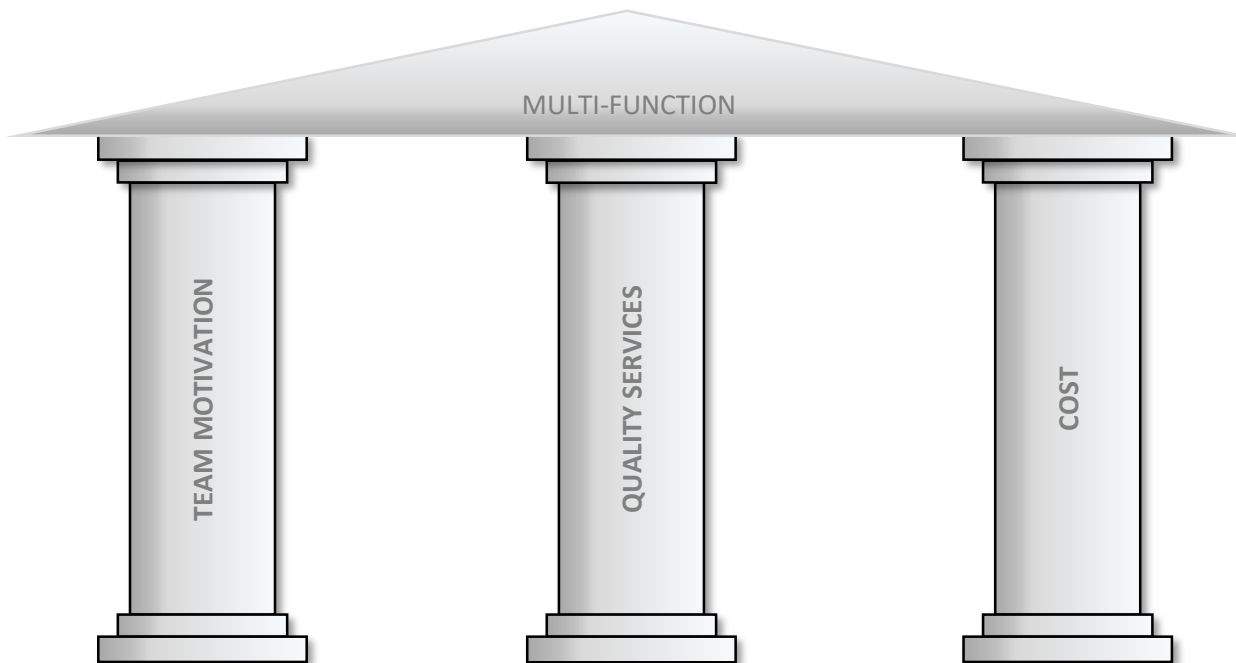


**Figure 2: Turtle Diagram**

With this Turtle Diagram we will be able to have an effective tool to better understand the processes perspectives and identify gaps in the new structure created.

#### 4 Generate Ideas

The chosen implementation hypothesis was to restrict itself to the universe of stations and work with a focus on the implementation of a new function that strengthens the pillars of motivation, quality and costs.



*Figure 3: Multifunctional pillars*

In this way, all the functions that currently exist in the stations were studied and worked in such a way as to allow agglutination of functions with a quality gain for the client, allowing the maximum utilization of the workforce already in operation and that brings all the motivational aspects involved.

The functions raised were (MetrôRio):

- Selling Operator: sale of tickets at stations;
- Collection Operator: Collection and repository of TVMs machines;
- Attendee Operator: help in the use of TVMs and their operation;
- Station Auxiliary: control of gratuities in the blocking lines;
- Platform Auxiliary: platform flow control and assistance to people with disabilities;
- Entrance Auxiliary (currently outsourced): patrimonial at dawn in the stations.

In the case of VLT Rio, the functions would be:

- Sales Operator: sale of itinerant tickets at major stations
- Inspection Agent: checks if customers have validated the ticket inside the train
- Station Agent: control and support of customer service in the stations
- Onboard Agent: control and customer service support within the compositions

**Note:** In this first moment, could merge the position of the Inspection Agent with Salling Operator and the Station Agent with the Onboard Agent.

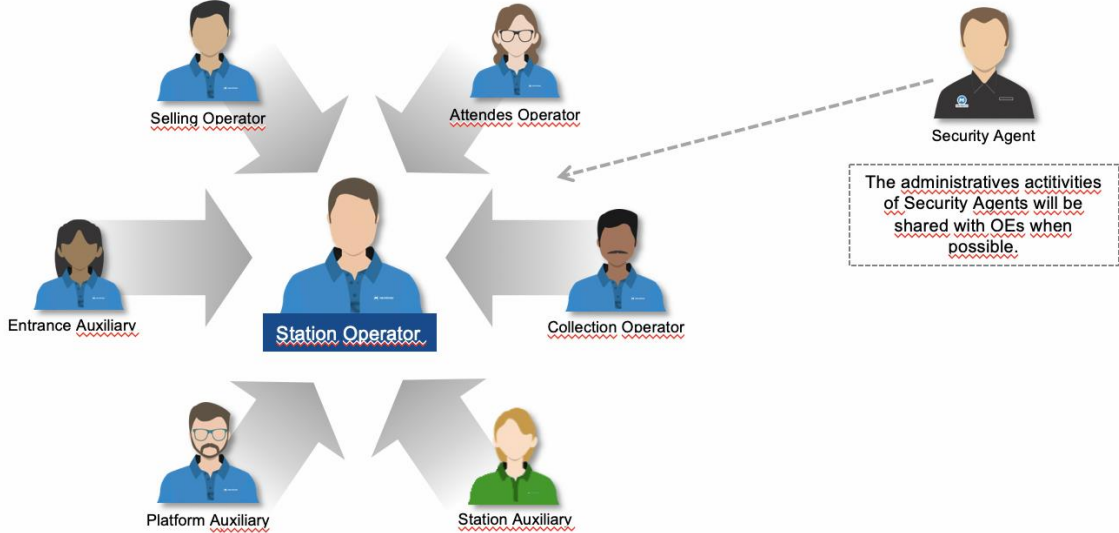
Here are the responsibilities of each position (MetrôRio):

- Selling Operator: Perform sales and service of the company's products, through operational equipment, in addition to ensuring the execution of the procedures and financial integrity of the company.
- Collection Operator: Responsible for the collection of cards in the tourniquets (turnstiles) at the stations, delivery of cards and tickets from C.A (?) safe in the ticket offices, Surface Subway and Supervision room to guarantee the necessary inputs for operation(?)
- Attendee Operator: Attending to customers at the stations, identifying their needs and providing necessary information on available products and services, making sales at the station, freeing customers and supporting customers in the use of self-service machines, in addition to performing first service when they are faulty;
- Station Auxiliary: Perform the release and control of gratuity in the blocking lines, through the operational cards, guiding customers with the necessary information and ensuring the legitimacy of gratuity, in order to avoid revenue evasion;
- Platform Auxiliary: Perform the control of the flow of customers in and out of trains, with the purpose of ensuring the regularity of the intervals between the compositions, in addition to providing customer service and driving people with special needs;
- Entrance Auxiliary (currently outsourced): Carry out the patrimonial guard and administrative activities of authorization of entrance and execution of maintenance through contact with the Control Center in the stations of low complexity of the system during the dawn. Quem executa as atividades durante a operação comercial?

For VLT Rio, the positions studied are:

- Inspection Agent: Acting within the trains and stations in order to control the non-validation levels of the VLT Rio System by verifying the users' payment of the tariff. Acting as a promoter selling roaming cards when necessary.
- Station Agent: Carry out service to users, identifying their needs and guiding them with all the necessary information, with the objective of providing a quality service in all stations and trains of the VLT Rio, besides curbing illegal activities in the interior these locations. Acting in the servicing of small failures in the self-service machines to the customer, replenishing printer coils, resetting the equipment and eventual obstructions in the input and output devices.

Figure 4 shows the positions agglutinated by the Station Operator in MetrôRio and illustrates how many functions are being condensed in a single multifunction position. In VLT Rio, the agglutination is simpler, with the Station Agent being the result of the joining of two positions and the Supervisory Agent another junction, as shown in figure 5 and 6 below.



**Figure 4: Positions agglutinated by the Station Operator in the MetrôRio**



**Figure 5: Positions agglutinated by the Station Agent in the VLT Rio**



**Figure 6: Positions agglutinated by the Supervisory Agent in the VLT Rio**

**5 Theoretical foundations**

According to consultancy McKinsey, by 2030 more than 15 million Brazilians will be affected by the advanced in the field of robotics and automation. Many jobs today occupied by humans will be replaced by machines, such as robots and increasingly efficient management systems.

SALIBY (1997) argues that the recent technological advances have created an environment where customers are increasingly demanding looking for superior quality at lower prices. This factor puts pressure on corporations to offer superior services. To achieve these goals companies, must reduce costs to enable the practice of prices demanded by the market. In this scenario, decreasing costs through increasing efficiency and productivity is very important and automation is a tool capable of contribute to the achievement of this organizational goal.

In this context, it is necessary to reinvent yourself and keep in mind that human capital will be redirected to strategic areas. This change also has a positive bias, since it frees professionals from repetitive and monotonous tasks, which in turn, can be performed in a more agile and efficient way when automated.

Faced with this practically irreversible trend, companies must have a forward-looking view of the reallocation of their human material in activities that can contribute to maximizing the value added, that is, reallocate human resources in the performance of functions that assist the company in the fulfillment of its strategic objectives of maximizing the level of service offered to customers.

The future trend is to increase the interaction between men and machines and greater empowerment on the part of the operators that will be able to perform in several functions, that is, increasing their technical and analytical capacities.

According to MONDEN (1984), Toyota was an icon of an innovative company regarding the training of workers in the exercise of multifunctionality, since it developed and applied a system of rotation of work, which sought to enable the worker to operate any machine on your desktop.

In Ghinato's view (1996) the development of Japanese competitiveness after World War II had as one of its pillars the lean management mode where the Toyota Production System (TPS) stands out. The success of this system is coupled with a host of other elements that support the corporation as a whole. Cellular layout, standardized operations, autonomy and multifunctionality are examples of tools and concepts that allow competitive advantage.

Another positive factor in the use of multifunctional labor is the flexibility to adapt to changing demand. This possibility of displacement of the worker throughout the cell allows greater ease of adaptation in relation to the variations in demand, because when it grows it is possible to increase production by the addition of workers. However, if demand decreases, the number of workers in the cell can be reduced. This condition of adjustment and flexibility to meet demand is called "Shojinka".

For Luzzi (2004) the traditional production systems allocation of workers to the jobs is carried out in a rigid and unproductive way.

The adoption of the "Shojinka" represents an opportunity for a better use of human resources, since it allows greater operational flexibility to respond to the fluctuations of demand since the labor force is able to perform several functions throughout the productive process.

In order to implement the Shojinka concept, three factors are prerequisites: (i) adequate design of the machines layout; (ii) versatile and well-trained operators, for example a multifunctional operator; (iii) continuous assessment and periodic reviews of standardized operations routines (MONDEN, 1984).

Multifunctionality allows the development of another element of the lean production system: "Nagara", which, in the strict sense of the term, is the simultaneous execution of secondary or selected operations and the main operation, using the existing slack times (SHINGO, 1996).

"Nagara" is the simultaneous execution of secondary operations, ie in addition to the main operations, the operator performs other functions such as feeding machines or repositioning parts so that the work load along the production line is balanced and the material is allocated more efficiently. Conceito repetido nos 2 parágrafos

It is also important to reflect that in the companies, in general, labor costs are not only restricted to wages, they also include costs of benefits, charges and even labor liabilities that affect any worker. It is therefore necessary to consider the proper use of human resources, avoiding excessive fluctuation of the number of workers in the process and using the maximum number of working hours available efficiently.

As commented previously, 70% of the metros in the world, have already adopted the figure of the multifunction in their staff of employees, some have already been projected like this as several VLT Rio. In a survey with the metro and tramways operators, it is possible to verify their satisfaction with the adoption of measures that have brought benefits on the following fronts:

- Ease of management
- Mix of personnel and coverage of scales
- Ease of indicating needs at the station
- Single training and recruitment
- Motivation of Personnel
- Better Wages
- Eliminates repetitiveness in task execution
- Create career
- Eliminate the "ghost of unemployment" in functions exclusively related to the tickets sale
- Service quality
- Greater agility in customer service
- Possibility of prioritization in the most critical activities
- See and act behaviour
- Customer perception

Highly applicable, with attention to the transition period, some obstacles were also raised, but all have contour solutions, according to table 3 - Obstacles x Contour Solutions.

<b>Obstacles</b>	<b>Contour Solutions</b>
Team adaptation	Training
Team safety	Risk assesment Training
Skills and team training required	Needs survey Training Follow-up
Resistance to the change (Employes)	Change Management Benefits Presentation Transparency
Negative perception of customers (station staff reduction at certain times)	Marketing campaign

**Table 3: Obstacles x Contour Solutions**

For the risks, they were distributed by nature:

<b>Nature</b>	<b>Risk</b>	<b>Contour Solutions</b>
Legal	Risk of employees requesting salary equalization	Extinguish positions that have lost function.
Legal	Alteration of the employment contract in a way prejudicial to the employee (increase of tasks with small value added to the salary).	1 - Create 2 positions, segregating activities and balancing salaries; 2 - Match the salary, minimally to the Sales Operator, with addition of cash breakage, in addition to readjustment.
Legal	Labor claim due to misuse of function, since less complex activities will be added to the new position.	Readjust the salary according to the compatibility of the position.
Legal	Labor claim related to the accumulation of function between the existing positions	There is none

	and the future station operator. Similar case to the station officer and the current security officer.	
Human Resources	Penalties due to the reduction of the number of disabled people in the company's staff, since many of them would not fit the new position.	Maintain the position of Station Agent for some stations, ensuring the number required by law of disabled people in the company staff.
Human Resources	Many employees been dismissed at the same time can be considered as a massive dismissing.	1 - Report to the Union; 2 - Internally relocate the maximum number of professionals.
Human Resources / Operational	Team resistance in new activities	Define the change management, transition and work management plans previously, based on the employees' experience.
Operational	Adequacy of profiles of employees who remain in the new position.	Train and efficiently manage the teams, adjusting them according to the historical turnover.
Operational	Change fund management in the new model that is in the deployment phase.	Create a transition plan that includes the necessary resources.
Recursos Humanos / Operational	Discontent of the teams with the possible end of the option to shifts in workplaces.	Negotiate with the Union.

**Table 4: Risk x Contour Solutions**

#### Scopes and Limitations - Security Agent and Station Limited

Despite the possibilities of implementing the multifunction in several areas and even in combined areas, which is done in some metros and tramways in the world such as Chile (stations) or Barcelona (combined areas), the modalities involved in this study opted for the implementation which finds customer service as a point of convergence, thus limiting itself to the scope of the stations. The exception is done with the security agent function, since it requires a more extensive training and characteristic profile for performance of the function, considering that in some systems in the world it is the police that play this role.

Therefore, the function description, for example, of the Station Operator, is as follows:

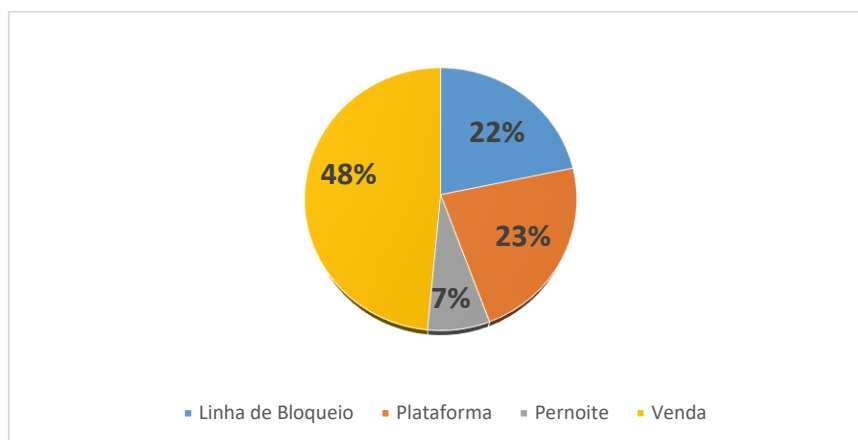


Station Operators serve customers at stations, identifying their needs, conducting sales, and providing necessary information about available products and services. They serve free customers and control the flow of customers in and out of the trains.

The head count of the station operator is scaled based on customer movements at stations, considering free and paid tickets, as well as the ratio of sales volume to production capacity.

Main responsibilities:

- Ensure the values of the exchange fund and card quantities in the safe, through conferences and records in the systems;
- Watch over the stations, as well as, in the control of people, employees or not, who wish to access the said stations, in the period in which there is no commercial operation (overnight);
- Perform the collection of cards in the turnstiles of the stations, count them and deliver them in ticket offices;
- Acting in the flow orientation of clients in the stations in order to facilitate the displacement and to guarantee the fluency;
- Operate lifts in the transport of people, observing the defined weight limit;
- Conduct conference and reading of station equipment such as hydrometer, tourniquets, and others.
- Immediately communicate, by radio or in person, to the station security officer any loss of property or security claim;
- Inform the Operational Control Center (OCC), when identified, of possible failures in the compositions;
- Operate the emergency traction power switch, when necessary, and inform the reason immediately to the OCC;
- Manually collect the cards, according to the orientation of the operational strategy;
- Carry out cutting cue sales, when necessary;
- Assist in the evacuation of trains and stations in case of operational problems; and
- Register the incidents and occurrences of the stations in the operating systems.



**Chart 6: Station Operator Occupation by area**

With activities distributed in several disciplines. Some of them based on:

- need, that is, the teams perform the tasks according to the demands of customers (Sale of tickets, information, guide, etc);
- routine activities, according to the demand of managers such as: inspections in stations, organization of material, request, sending of lost and found, among others;
- rotation, the team turns in the functions for a determined period of days or hours;
- missions, ad hoc activities as a result of extraordinary activities, eg passenger counting, annotation of behavior, factual audits.

For example (figure 7), we present the effective distribution in a metro station with an average of 70 thousand passengers / day, which serves two lines of Metro:

### Central Station

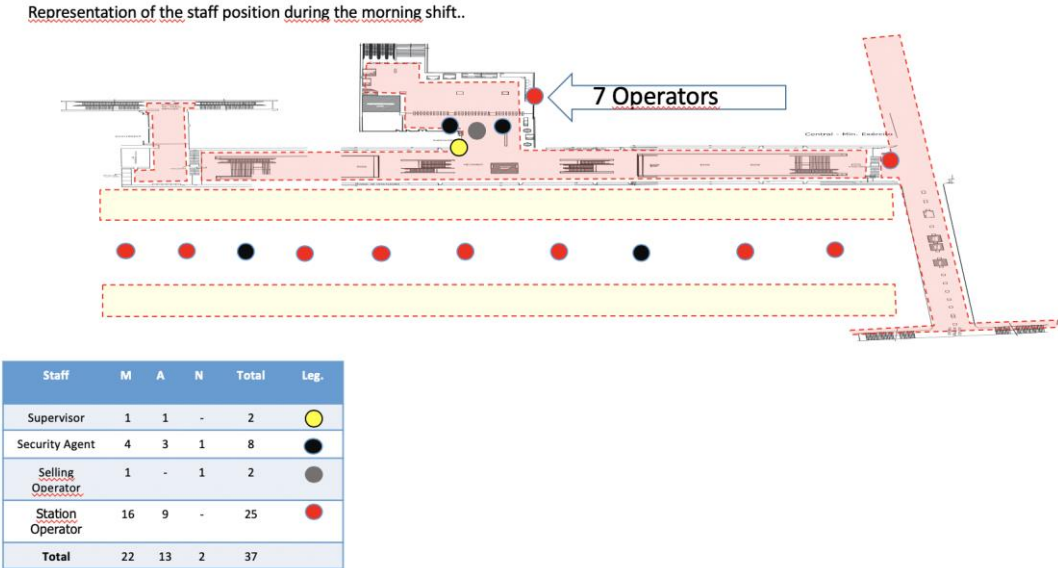


Figure 7: Example of Head Count distribution at Central Station

The activities of security officers who deal with police, fire-fighting and first-aid activities were excluded from this agglutination of functions. In some subways around the world, these activities are carried out by local police or by staff exclusively with safety assignment, which is not the case with MetrôRio since agents provide assistance to the disabled and assist clients with information besides acting in the local restoration of first service in the traffic or auxiliary power failures, as well as the transportation equipment.

With this, optimizing the training that for this security team lasts about 5 months, the functions were kept separate. For the Station Operator, the training is 30 days, and it is ready for the execution of its activities at the end of the period since it has passed grade 8.0 in all disciplines.

Below is the programmatic content of the new position of Metro Station Operator:

- Operational communication via radio and operational communication (example: yellow stripe warning);
- Activation and normalization of emergency traction power switch;
- Recognition of external signaling of trains, Platform signaling and rolling stock;
- Approach and driving of Persons with Visual Disability, Person with great difficulty of locomotion and Person of Wheelchair, in the Escalators and Fixed Ladder;
- Practice Handling equipment: Incline Lift, Vertical Lift and Portable Lift;
- Escalator: Recognition of technical alarms and operation of commutators (up, down, normal stop and emergency stop commands);
- Recognition of fire panels and presence detector;
- Service, Release and control of Gratuities in the blocking lines;
- Platform Services;
- Control of the administrative documentation of the Supervision Room (Security Agent);
- SIC - Incident System with Cards- control of incident records with cards in the blocking lines;
- Collection of Unity Cards in the Tourniquet;
- Customer service and opening of boxes at the box office;
- Queuing service, when necessary;
- Control of the safes at the box office (change fund and cards) with the necessary records in systems;
- Collection of values with service to the carrier of values
- TVM processes - Attendance, supplies, collection, etc., with due records in systems.

For the VLT Rio Station Agent, the training content is:

- Customer service in the lines, stations and interior of the VLT Rio trains;
- Approach of third parties practicing illicit activities inside VLT Rio trains and stations;
- Attendance of people with physical disabilities, the elderly, pregnant women and students according to the norms of attendance established to this public;
- First-aid care and removal request for hospital care, if necessary;
- 5 S on the premises;
- Respond to occurrences with users or collaborators;
- Record in the book of Occurrences the routine activities;
- Assistance in the rescue of objects, animals and victims of road accidents during the operation, with the aim of restoring the normality of the system;
- Track inspections at stations and interstages during operation, including at night, in order to guarantee Operation;
- Attendance of the Self-Service Machine (TVM) to purchase and recharge cards, reporting any incident to the Control Center;
- Acting as a Traffic Agent in situations that directly impact the Operation of the VLT Rio;
- Supporting the Supervisory Agent in approaches in the absence of the Municipal Guard.

- Labor standards and procedures

For the Inspection Agent, also in VLT Rio, it is:

- Approach users with the purpose of identifying the validation of the ticket (inspection);
- Support the ticketing process in an emergency, selling and recharging **Rio Card** through POS (Point of Service);
- Guidance to users on VLT Rio usage and payment rules (itineraries, available products, purchase of tickets, integrations, correct use of validators, among others);
- Close, download and transmit POS validation files;
- Direct users to send suggestions, criticisms and doubts about the service received at the stations and stops to the VLT Rio ombudsman channel;
- Labor standards and procedures;
- Activation of the municipal guard whenever there is a need for assessment in users who did not perform validation at the time of shipment;

## **6 Project Plan and Change Management Plan**

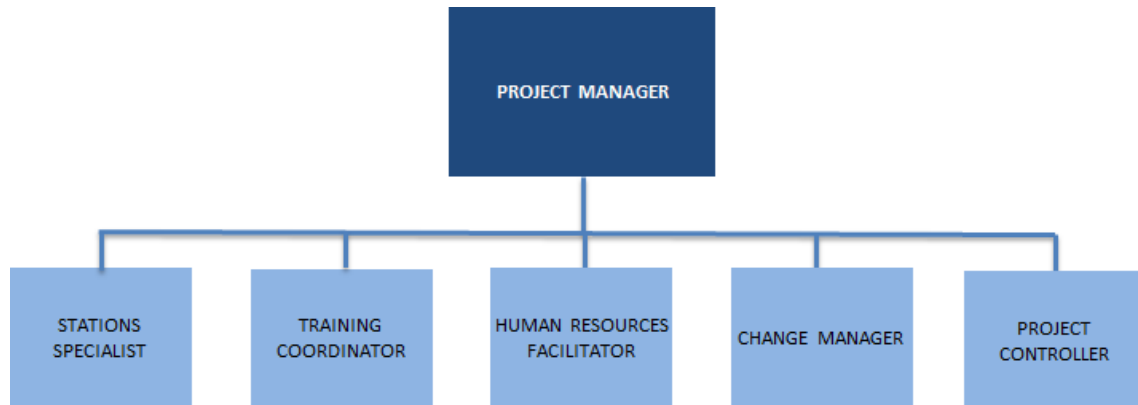
The project consists of the training of 430 employees of the service teams in MetrôRio stations and 89 employees in the VLT Rio to be able to exercise the full range of station services necessary for a service rendering to customers of the mobility system.

Through the training, the objective for the business is greater productivity of the station personnel and the maintenance of the staff by preparing the teams for a more cohesive function of the changes coming from the technology and the consumption profile of our customers. There are several factors that should be considered in the project plan so that the technical preparation of the teams, the transition strategy for the new positions, as already mentioned in this paper, and the perception of the benefit by the employees are carried out successfully.

The project, in addition to the formal process of project management, whose routine management, financial control and reporting to the board will be described in detail later, the project has a strong human side. The change that will be generated represents a change in the professional life of the employees and a change in the *modus operandis* of a very significant department for the business, because it is a project with a strong impact on people we will have a lot of focus on the human factor for the management of the changes, since it can be a decisive factor in achieving success

## 6.1 Project Management

The structure of the project consists of:



*Chart 7: Structure of the project*

The Project will be split in three phases:

Phase 1: Detail and specification: stage in which the station agents training program will be developed, workflow, transition plan, communication plan and implementation schedule.

Phase 2: Implantation: stage in which the trainings will be carried out following the training program and the transition by season.

Phase 3: Conclusion: Project closure and start of benefit verification phase

For the preparation of a macro schedule for the project, the following premises were assumed:

### MetrôRio

- Hiring of 45 temporary workers to cover classes in training
- 10 training groups with 43 employees each and lasting 20 working days
- At the end of the second class of trainees it will be carried out a prototype in a station
- After approval of the prototype, 8 migrations will be carried out contemplating 5 stations each.

### VLT Rio

- 5 training groups with 20 employees each and lasting 10 working days
- When finished the training of the staff the multifunction will be implemented

Find below the MetrôRio Planning

Number	Task	duration	DAYS													
			20	40	60	80	100	120	140	160	180	200	220	240	260	
1	<b>Detailment</b>															
2	Training Program Definition	20	█													
3	Transition Plan	10	█													
4	Change Plan	20		█												
5	<b>Deployment</b>															
6	Training group 1	10			█											
7	Training group 2					█										
8	Training group 3	20					█									
9	Training group 4	20						█								
10	Training group 5	20							█							
11	Training group 6	20								█						
12	Training group 7	20									█					
13	Training group 8	20										█				
14	Training group 9	20											█			
15	Training group 10	20												█		
16	Prototype Station	10					█									
17	5 Stations Migration	10						█								
18	5 Stations Migration	10							█							
19	5 Stations Migration	10								█						
20	5 Stations Migration	10									█					
21	5 Stations Migration	10										█				
22	5 Stations Migration	10											█			
23	5 Stations Migration	10												█		
24	5 Stations Migration	10													█	
25	<b>Conclusion</b>															
26	Final Report	10														█
27	Project Closure	1														█

Table 5: MetrôRio Planning

Find below VLT Rio planning

Number	Task	duration	predecessor	DAYS								
				10	20	30	40	50	60	70	80	90
1	<b>Detailment</b>											
2	Training Program Definition	20										
3	Transition Plan	10										
4	Change Plan	20	3									
5	<b>Deployment</b>		2; 3; 4									
6	Training group 1	10	2									
7	Training group 2	10	6									
8	Training group 3	10	7									
9	Training group 4	10	8									
10	Training group 5	10	9									
11	Multifunction implementation	1	10									
12	<b>Conclusion</b>											
13	Final Report	10	24									
14	Project Closure	1	26									

**Table 6: VLT Rio Planning**

At the end of the deployment phase, a quality survey will be conducted with the passengers to assess the opportunities for improvement and it will be applied the Plan, Do, Check and Act cycle (PDCA).

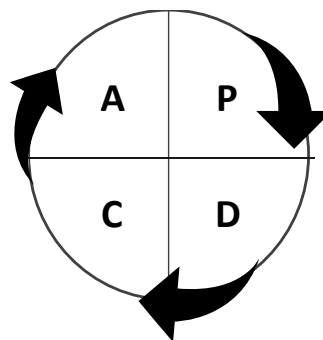
The PDCA methodology was developed by Walter A. Shewhart in the 1930s and consecrated by William Edwards Deming from the 1950s when he was successfully employed by Japanese companies to increase the quality of their processes (CICLO PDCA 2005).

According to QUINQUIOLO (2002), the PDCA Cycle, also known as Shewhart Cycle, Quality Cycle or Deming Cycle, is a methodology whose basic function is to aid in the diagnosis, analysis and prognosis of organizational problems, being extremely useful for problems solution.

The PDCA Cycle is also closely linked to the management of organizational processes and the pursuit of continuous improvement. Its application goes from the management of an entire Organization, projects or application in the daily routine of work.

The methodology of the PCDA has four distinct and well-defined phases, being: P - Plan; D – Do; C - Check and A - Act.

- 1st Phase - Plan: consists of the definition of goals and objectives of the process and of the methods and tools that will be used to achieve the proposed goals.
- 2nd Phase - Do: consists of the actual execution of the plan. At this stage **training / training** and the execution of the tasks take place.
- 3rd Phase - Check / Monitoring: Consists of checking the data collected and analyzing the results of the tasks performed in the previous phase.
- 4th Phase - Act: consists in actions / adjustments over the process to avoid deviations and increasing the efficiency and quality of the process



**Figure 8: PDCA Cycle: Source the author**

## **6.2 Change Management**

According to GONÇALVES and CAMPOS (2016) human beings change spontaneously when a change is more comfortable than the current situation. But some changes can be difficult, they can involve anxieties of loss, complexity of new



tasks, fear of the new, and risk of non-adaptation. In situations of complexity the process of change can put the person in a state of mourning. Mourning is a necessary state of transition, after its elaboration comes the re-signification of the new reality, stabilization and a new adapted state. But sometimes the anticipation of mourning can turn into a strong factor of antagonism to a change. Usually this antagonism is constructed by an unsuitable communication process. It gives the importance of the Change Management in projects with strong human factor in its base.

According to GONÇALVES and CAMPOS (2016) change management will consist of managing three elements:

- Conflicts: Assess potential conflicts to understand their root cause and act as moderator.
- Motivation: Define the profile of the team that will be motivated by the change, evaluate its engagement, act to ensure motivation and strengthen the communication of this group with the other project stakeholders as multipliers in the meetings with the base.
- Stress: Observe stakeholder mood and balance the strategy of change by considering this point.

The first step in mitigating the antagonism of stakeholders involved in change is communication. For this project the following communication plan was defined (table 7):

<b>Communication Plan</b>						
<b>N°</b>	<b>What?</b>	<b>Why?</b>	<b>Who?</b>	<b>To Whom?</b>	<b>When?</b>	<b>How?</b>
1	Kick Off - Presentation of the Project	Inform about the achievement of the project, objectives and solve questions.	Project Manager	Project Team, Project Clients, Project impacted areas	Once	Presentation
2	Project Management	follow-up of the project (concluded activities, deviations, next steps)	Project Manager	Project Team	Weekly	Meeting
3	Project status	Information about the follow-up of the project (concluded activities, deviations, next steps)	Project Manager	Change Support Agents	Biweekly	Meeting
4	Project informations	Information about the follow-up of	Change Support Agents	Employees	Biweekly	Team Meeting

	to the base staff	the project (concluded activities, deviations, next steps)				
5	Project status to the the base staff	Information about the follow-up of the project (concluded activities, deviations, next steps)	Project Manager	Employees	Bimonthly	Team Meeting
6	Main project milestones	Inform the main project milestones	Internal Communication	employees	Eventual	e-mail or billboard
7	Feedback meeting of the Project team to the Directors	Update about the project team activities	Project Team	Directors	Bimonthly	Meeting

**Table 7: Communication Plan**

The objectives of this communication plan are:

- Communicate clearly and objectively the progress of the project
- Align the purpose of change
- Generate forums with stakeholders so that it is possible to identify supporters and antagonists to the project and deal with through the change management plan.

The next step is to develop a Stakeholders Matrix, that will define how every important stakeholder of the project is facing the changes. Through the change management meeting action will be started to interact with all the relevant stakeholders

Below it can be found an example of a milestone communication to base staff (figure 9):

## TER BOAS REFERÊNCIAS SIGNIFICA ESTAR SEMPRE EM EVOLUÇÃO

O MetrôRio segue na busca constante pelo aprimoramento de seus processos para oferecer um serviço cada vez melhor ao usuário. Para isso, nossa Companhia está sempre atenta às melhores práticas do mercado metroviário.

Você está convidado a participar da nossa próxima palestra de benchmarking.

Confira abaixo as informações sobre esse encontro:

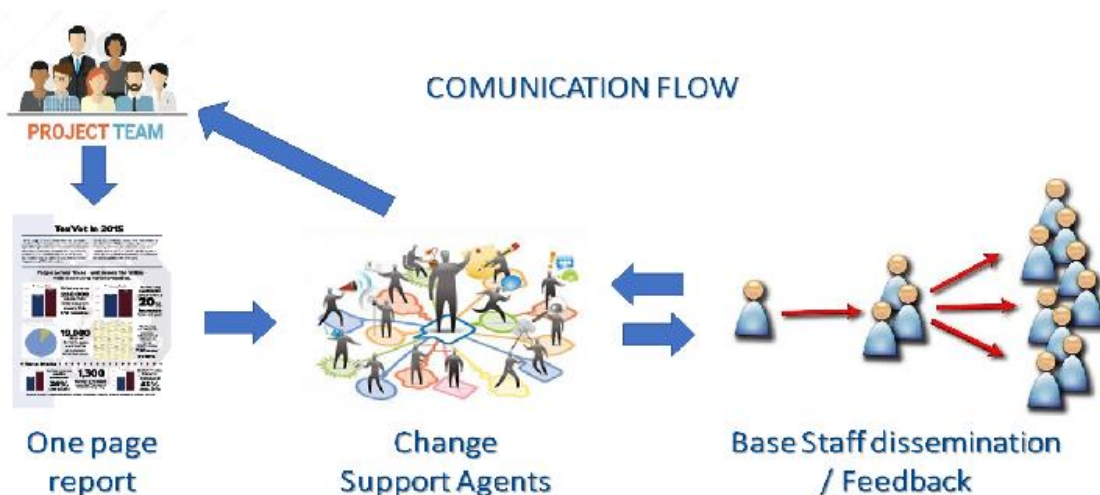
**Tema:** Equipes multifuncionais.  
**Data:** XX/XX/XX  
**Horário:** de 10h às 12h  
**Local:** Auditório do CA




**Figure 9: Communication to base staff**

An important step in the communication plan is the "Project Status to the base staff" meetings, this ritual will be the moment when the Change Support Agents, employees selected in the staff that will pass through the change, will present the project status to their teammates, a strategy aligned with motivation management.

One page reports, made by the project team, will be used to pass the status and the Change Support Agents will feedback the project management with feedback from the teams involved, making the actions for change management more precise and having a better result. Participation of employees that will pass through the change as disseminators of the project status has a strong appeal to the group as the communication filters will be eliminated. The graphical representation of this flow is shown in the figure 10.



**Figure 10: Communication Flow**

## 7 Cost-Benefit Analysis

The analysis of the economic-financial viability of a project happens through a comparison of investments made with the projected operating profits with the consequent generation of cash for the business, and the result of this analysis can be positive or negative and is based on predefined parameters that include basically the maximum acceptable return period for the required investment, the expected minimum return rate, and whether the return value is greater than zero.

Another way to strategically analyze the business, not just through the financial dimension, is to use the Balanced Scorecard (BSC) that reveals the key drivers an organization needs to have competitive and long-term financial performance. Its structure is formed by four perspectives: financial, customers, internal processes and learning and growth. Figure 11 shows the integrated perspectives for a performance view.



**Figure 11: Balance Score card**

Below is the strategic map built for the multifunction deployment project:

<b>BSC Indicators</b>	<b>Strategic Map</b>
Financial	<ul style="list-style-type: none"> <li>• Growth revenue</li> <li>• Decrease costs</li> </ul>
Clients	<ul style="list-style-type: none"> <li>• Loyalty</li> <li>• Raising the quality of service</li> </ul>
Internal Processes	<ul style="list-style-type: none"> <li>• Decrease customer response time</li> <li>• Increase productivity</li> </ul>
Learning and Growth	<ul style="list-style-type: none"> <li>• Better training of employees</li> <li>• Career path</li> </ul>

**Table 8: Strategic map**

When the outcome of an investment is evaluated, it is expected value to be created. Value creation is not just a technicality, it is a parameter which must evaluate the results of the operational decisions that are taken in all projects.

Creating value is, then, the duty that management has in order to guarantee the company's perennality. However, the value aspect in this project is not restricted to a merely economic-financial evaluation, as already mentioned in previous chapters, but in productivity gains and quality of service rendered.

Nevertheless, in order to carry out a cost analysis before and after the project and to maintain the confidentiality of the data, the nominal values of the salaries were indexed and the costs of benefits and charges were inserted in the order of 3 times the nominal salary in such a way evaluate the 6 positions in multifunction:

Function	HC Inicial	Nominal Salary	Cost por person	Total Cost/month	HC Final	Nominal Salary	Cost por person	Total Cost/month
Station Operator		R\$ 1.000,00	R\$ 3.000,00	R\$ 0,00	430	R\$ 1.000,00	R\$ 3.000,00	R\$ 1.290.000,00
Plataform Auxiliary	80	R\$ 881,68	R\$ 2.645,05	R\$ 211.604,31				
Entrance Auxiliary	20	R\$ 1.058,57	R\$ 3.175,70	R\$ 63.514,05				
Attendes Operator	4	R\$ 1.332,68	R\$ 3.998,05	R\$ 15.992,22				
Collector Operator	10	R\$ 936,43	R\$ 2.809,29	R\$ 28.092,92				
Attendes Operator (higher qualification)	34	R\$ 1.533,22	R\$ 4.599,67	R\$ 156.388,75				
Selling Operator	249	R\$ 1.058,57	R\$ 3.175,70	R\$ 790.749,89				
Station Auxiliary	40	R\$ 881,68	R\$ 2.645,05	R\$ 105.802,15				
<b>Total</b>	<b>437</b>			<b>R\$ 1.372.144,30</b>	<b>430</b>			<b>R\$ 1.290.000,00</b>
<b>Annual</b>				<b>R\$ 16.465.731,54</b>				<b>R\$ 15.480.000,00</b>

*Table 9: Cost analysis*

For VLT Rio, this analysis is simplified since there is no reduction of HC and the salaries are equivalent, maintaining the annual cost.

As implementation costs for MetrôRio, the only costs are to hire the equivalent of a training class so that the positions are not overdrawn. That is, hire 43 temporary workers for 13 months.

The cost of this hiring can be seen in the table below:

Training	HC Inicial	Nominal Salary	Cost por person	Total Cost/month
Station Operator	43	R\$ 1.000,00	R\$ 3.000,00	R\$ 129.000,00
<b>Total</b>	<b>43</b>			<b>R\$ 129.000,00</b>
<b>13 months</b>				<b>R\$ 1.677.000,00</b>

Table 10: Cost Training

Given that the annual savings are of R\$ 985,831.54, in the purely financial aspect, the project is paid in 20.4 months.

**8 Physical and Financial Progress**

In these final chapter it will be demonstrated the expected physical and financial progress of the project for MetrôRio. For the VLT RIO as there are no costs involved it will be just a physical progress. It can be seen in the chart 08 and 09

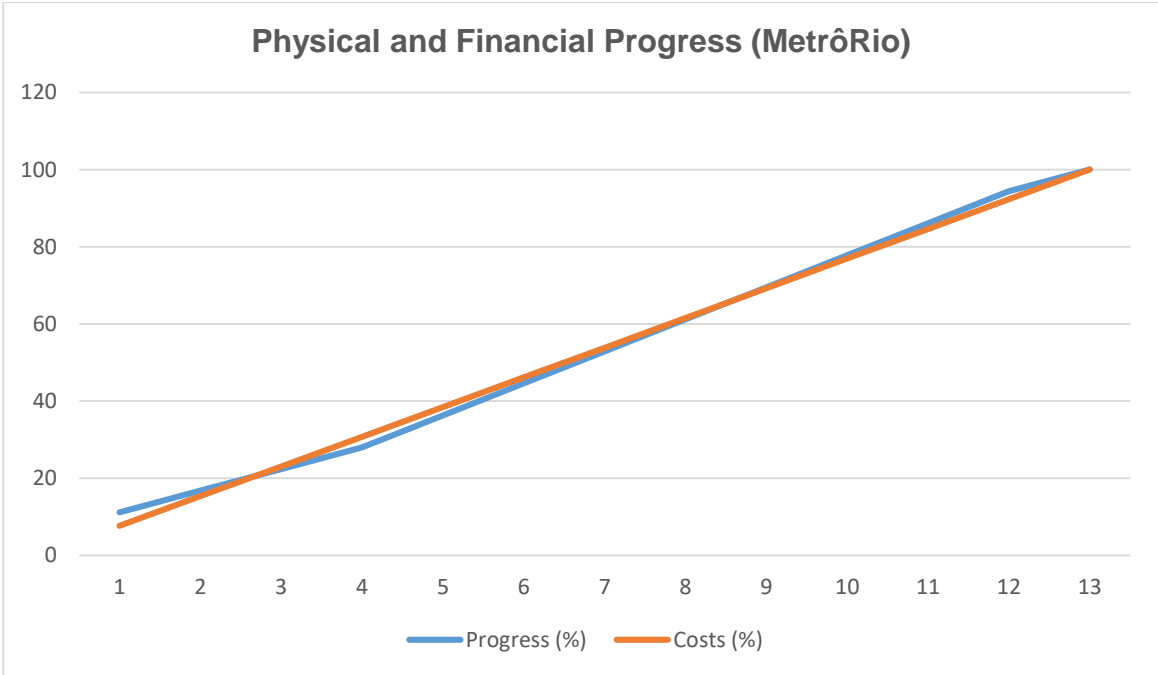
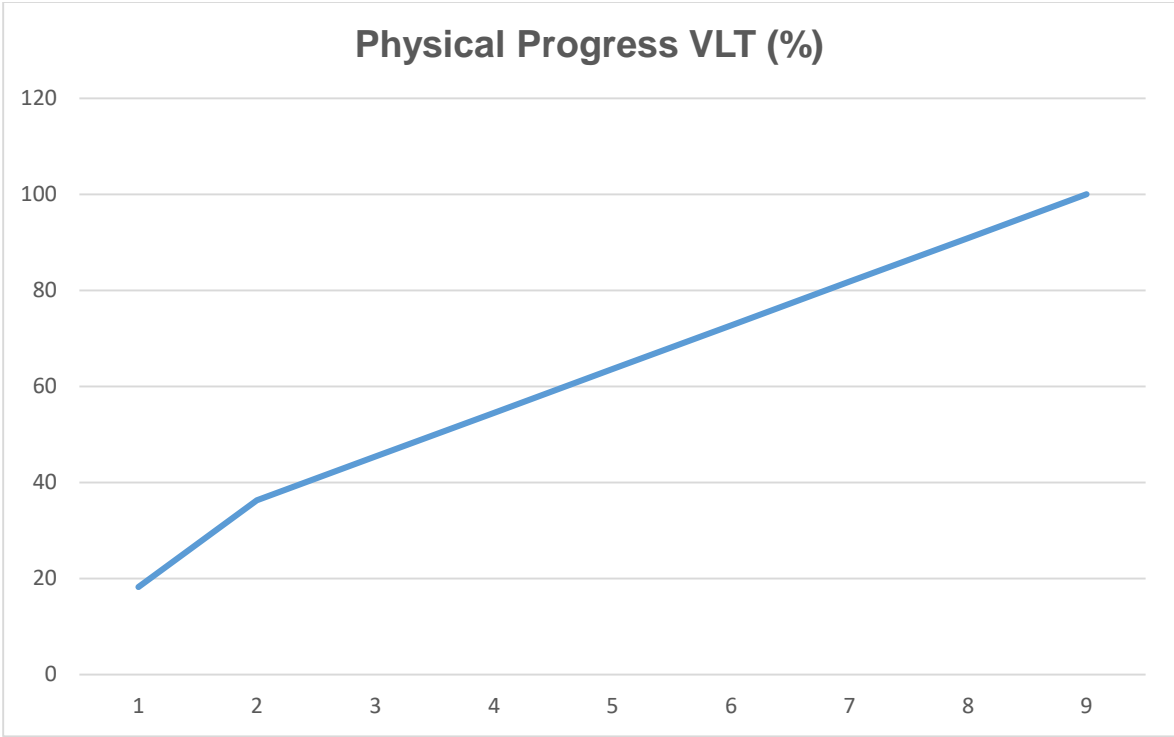


Chart 8: Physical Progress (MetrôRio)



**Chart 9: Physical Progress (VLT Rio)**

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