

“FINAL RESULTS OF MULTIMETHODOLOGY APPLICATION AT CIVILIAN AIR NAVIGATION COMPLEX ENVIRONMENTS”

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The paper addresses the final results of a Brazilian doctoral research developed at civilian Air Navigation environments (2011-2014), with partial results already presented at past ISAPs (2011-2015). The study adopted a qualitative, systemic and anticipatory approach to increase metacognition about Team Resource Management (TRM) Training abilities, focused to Threat and Error Management (TEM) practice, with the main purpose of reinforcing operational safety as a whole. It used Multimethodology, aiming at identifying, structuring, analyzing and monitoring problems upon participants' different perspectives - operators and heads of distinct sectors. Multimethodology embraced four phases, yearly, covering multiple instruments and Theoretic Base, as Conceptual Map, System Thinking and Complexity. Some conclusions indicate: (i) organizational trend to reactive and bureaucratic cultures characterized by difficulties to deal with unexpected situations, not prescribed on standards, and to prioritize solutions to their possible effects that might be aggravated in the course of time; (ii) improvements of TRM behavior's abilities - Communication, Situational Awareness, Stress and Health Management, Team Dynamics and Decision Making, derived of critical debates and perceptions of restrictive and positive aspects at work, promoted by iterations and interactions among a diverse scope of complex system's segments, although this didn't affect directly the update of TRM Training contents, from Error Management (EM) to TEM, towards predictive interventions; (iii) global understanding about a variety of operational realities with common safety purposes, helping to manage, without guilt, conflicts and paradoxes, although this didn't seem to reach significant projections for future changes. The study suggests that Multimethodology may be adapted to other applications under validation.

This study was realized at civilian Air Navigation sets of the Airport Infrastructure Brazilian Organization (INFRAERO) and the partial results presented at past ISAPs can be found on the following articles:

- A) “A Preliminary Analysis of Aeronautical Services in Air Navigation Activity” (CABRAL, MENDES et al, 2011) – This article described the structure of military and civilian Air Navigation services in Brazil, showing the importance to increment psychologists' participation in contribution to safety, in reply to Human Factors requirements of International Civil Aviation Organization (ICAO) standards. It indicated some issues for discussion as demands to be implemented, among others: (i) intensification of proactive and predictive interventions to support aeronautical services in this area; and (ii) improvements on TRM upon TEM approach to improve operators' interdisciplinary performance.
- B) “Structuring, Analysing and Monitoring Problems and Decision Making Processes at Civil Air Navigation Sets of a Public Organization” (CABRAL & ESTELLITA LINS, 2013) – This article described the initial results of the 1st. Phase of Multimethodology applied to one of the Air Navigation sets (J) studied to stimulate interactions and iterations among workers and heads for better dealing with problems in the following services: (i) Air Traffic Control (Tower); (ii) Aeronautical Information System (AIS); (iii) Telecommunication Operation; and (iv) Meteorology. It emphasized the main purpose of identifying, structuring, analysing and monitoring problems at work, upon a collective perspective, derived of complex systems' characteristics and reinforced by the operational safety and organizational cultures, as well as their negative reflexes, supported by some Theoretic Base, as follows: (i) Conceptual Map; (ii) System Thinking; (iii) Metagovernance; and (iv) Complexity Paradoxes.
- C) “Contribution of Multimethodology to Human Factors in Air Navigation Systems” (CABRAL & ESTELLITA LINS, 2015) – This article described the results' outline of all Air Navigation sets studied, mainly, involving Complexity Paradoxes analysis on Multimethodology and its different instruments' application, aiming at reinforcing TRM / TEM abilities and better dealing with complex systems' characteristics.

The present article intends to describe the final results of the same study addressed by the referred articles, taking one of the Air Navigation sets studied as a practical example of the complete application of Multimethodology (CABRAL & ESTELLITA LINS, 2015 APUD MINGERS, 2006).

1. Historical Background and Main Characteristics

In Brazil, the Air Space Control Department (DECEA) is a federal and military institution, subordinated to the Aeronautical Command (COMAER), which represents the aeronautical authority accountable to prescribe standards and fiscalize their application into military and civilian Air Navigation organizations, homologated by it to provide services in this area. DECEA standards (CABRAL & ESTELLITA LINS, 2015 APUD BRASIL 2005, 2008b, 2009b, 2012a, 2012b) are, mainly, based on COMAER standards (BRASIL, 1986; CABRAL & ESTELLITA LINS, 2015 APUD BRASIL 2007-2015) and ICAO standards (CABRAL & ESTELLITA LINS, 2015 APUD ICAO, 1998, 2000, 2002, 2003, 2008). Safety Management Manual (SMM) is one of the ICAO standards to be fulfilled by all countries' members, aiming at increasing, continually, safety all over the world (CABRAL & ESTELLITA LINS, 2015 APUD ICAO, 2013, 2009, 2005a), which led Brazil to establish two standards, as follows: (i) the National Safety Program (Programa Nacional de Segurança Operacional - PNSO) to be fulfilled by the Brazilian Aviation and Air Navigation aeronautical authorities; and (ii) the Safety Operational Managing System (Sistema de Gerenciamento da Segurança Operacional - SGSO) to be fulfilled by the Aviation and Air Navigation services providers (BRASIL, 2009a, 2009b, 2010).

The present study took place at some Air Navigation environments of INFRAERO, one of the organizations homologated by DECEA to provide the following services: (i) Air Traffic Control and Management on Tower and Approach (APP); (ii) Aeronautical Information System (AIS); (iii) Aeronautical Telecommunication Operation; and (iv) Meteorology (CABRAL & ESTELLITA LINS, 2015 APUD BRASIL 2010). It was realized in compliance to some ICAO Human Factors standards (CABRAL & ESTELLITA LINS, 2015 APUD ICAO, 1998, 2000, 2002, 2003, 2008), considering its important contribution to monitor aeronautical risks, as well as to decrease aeronautical incident and accident occurrences, in reply to SGSO requirements.

Initially, the study contributed to the development of some specific Human Factors standards at INFRAERO to support: (i) TRM implementation (CABRAL & ESTELLITA LINS, 2015 APUD BRASIL, 2012d), started under appraisal with DECEA from TRM Facilitators Training, homologated by it to enable TRM development by INFRAERO facilitators, as a formal organizational training for Air Navigation sets, submitted to continuous improvements, although not always observed, which represented one of the study demands; and (ii) psychologists' activities in Air Navigation sets (CABRAL & ESTELLITA LINS, 2015 APUD BRASIL, 2010b, 2012e), mainly, with the formalization of the Psychological Monitoring Program to be implemented by them, with the use of tests and interviews, to deal with Human Factors issues in operational safety practices, which represented an opportunity to proceed the study in parallel, complementing it.

2. Study Structure

2.1. Goals and Method

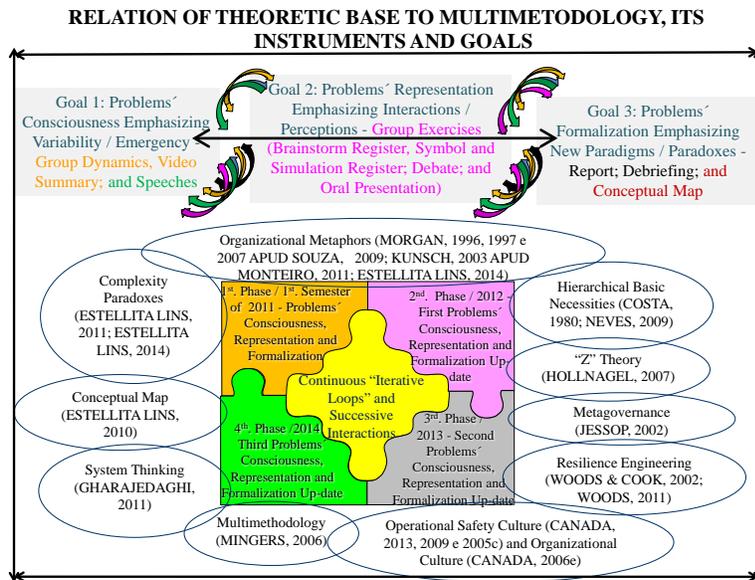
The Method characterizes a situated study, as investigative and interventionist (CABRAL 2015 APUD TRIPP, 2005), as well as active and ethnographic research (CABRAL 2015 APUD DE MATTOS, 2001), complementing the official Psychological Monitoring Program (CABRAL 2015 APUD BRASIL, 2010b, 2012b), implemented by psychologists of INFRAERO at six Air Navigation environments in the following services: (i) Air Traffic Control and Managing on Tower and Approach (APP); (ii) Aeronautical Information System (AIS); (iii) Aeronautical Telecommunication Operation; (iv) Meteorology; and (v) Airport Operation.

Considering there's a trend to quantitative, reductionist, immediate, reactive and linear Human Factors' approaches, raising difficulties to future foresee, which is proper of complex system's activities, this study used a qualitative, systemic and anticipatory approach at the Air Navigation sets mentioned with the main purpose of reinforcing TRM abilities to identify, structure, analyze and monitor problems and decision making processes, upon different perspectives, for better dealing with Human Factors issues in operational safety practices, characterized by systemic complexity (CABRAL & ESTELLITA LINS, 2015 APUD ICAO, 2002; HOLLNAGEL, 2007; ESTELLITA LINS, ANTOUN NETO et al, 2010).

2.2. Theoretic Base and Methodology

The study chose the following Theoretic Base to support it: (i) Human Factors Approaches comprising "Z" Theory (CABRAL & ESTELLITA LINS, 2015 APUD HOLLNAGEL, 2007) and Resilience Engineering (CABRAL & ESTELLITA LINS, 2015 APUD WOODS & COOK, 2002; WOODS, 2015); (ii) Metagovernance (CABRAL & ESTELLITA LINS, 2015 APUD JESSOP, 2002); (iii) Cultures embracing Operational Safety and Organizational ones (CABRAL & ESTELLITA LINS, 2015 APUD ICAO, 2013, 2009, 2005a); (iv) Soft Operational Research (Soft-OR) in Problems Structuring Methods (PSM) comprising Multimethodology (CABRAL & ESTELLITA LINS, 2015 APUD MINGERS, 2006) and Conceptual Map (CABRAL & ESTELLITA LINS, 2015 APUD ESTELLITA LINS, ANTOUN NETO et al, 2010); (v) Complexity and Complex Systems covering System Thinking (CABRAL & ESTELLITA LINS, 2015 APUD GHARAJEDAGHI, 2011), Complexity Paradoxes (CABRAL & ESTELLITA LINS, 2015 APUD ESTELLITA LINS, 2011, 2014) and Organizational Metaphors (CABRAL & ESTELLITA LINS, 2015 APUD MORGAN, 1996, 1997, 2007 APUD SOUZA, 2009; KUNSCH, 2003 APUD MONTEIRO, 2011; ESTELLITA LINS, 2014); and (vi) Hierarchical Human Basic Necessities (CABRAL & ESTELLITA LINS, 2015 APUD COSTA, 1980, NEVES, 2009).

Multimethodology was the methodology chosen for this study and it was preceded by a survey realized on investigation and safety visits, during the 1st. semester of 2011, to find possible demands that could justify its continuity. Multimethodology embraced a wide scope of instruments: (i) Group Dynamics, Video Summary and Speeches, emphasizing variability and emergency to achieve Problem's Consciousness Goal; (ii) Group Exercises (Brainstorm Register, Symbol and Simulation Register, Debate and Oral Presentation), emphasizing interactions and perceptions to achieve Problems' Representation; and (iii) Conceptual Map, Report and Debriefing, emphasizing new paradigms and paradoxes to achieve Problems' Formalization. These instruments were applied yearly (from the 2nd. semester to 2011 to 2014), consisting of four phases, as continuous "iterative loops" to promote successive interactions among the participants and to achieve the goals mentioned of Problems' Consciousness, Representation and Formalization. Multimethodology was substantiated by the Theoretic Base mentioned, as showed in Figure 1, which will be commented later on the final results.



“Figure” 1. Relation of Theoretic Base to Multimethodology’s instruments and goals.

Each phase of Multimethodology ended up with Conceptual Map, either as a conceptual base and as an instrument, to “achieve the goal” of Problems' Formalization (CABRAL & ESTELLITA LINS, 2015 APUD ESTELLITA LINS, ANTOUN NETO et al, 2010). Debriefing was applied only on the 1st. Phase because of time limitations to join managers.

Table 1 indicates: (i) the six Air Navigation sets submitted to the study, referred by their first names' letter; and (ii) the participation rates on each set, from 2011 to 2014. One of the points to emphasize is that there were no negative impact derived of low participation rates. This article will comment the final results of one of these sets (G), which had the following participation rates: (i) 89,74% (1st. semester of 2011); (ii) 74,30% (2nd. semester of 2011); (iii) 16,66% (2012); (iv) 47,15% (2013); (v) 44,11% (2014); and (vii) 51,28% (total).

Table 1.

Global Rates of Participants (CABRAL & ESTELLITA LINS, 2015 APUD MINGERS, 2006)

WHERE	2011 / 1 st . Semester	2011 / 2 nd . Semester	2012	2013	2014	TOTAL
→ (G)	89,74% (70 participants from the total of 78)	74,39% (61 participants from the total of 82)	16,66% (13 participants from the total of 78)	47,14% (33 participants from the total of 70)	44,11% (30 participants from the total of 68)	55,05% (207 participants from the total of 376)
(M)	69,47% (66 participants from the total of 95)	53,60% (52 participants from the total of 97)	30,52% (29 participants from the total of 95)	31,81% (35 participants from the total of 110)	35,29% (36 participants from the total of 102)	43,68% (218 participants from the total of 499)
(C)	91,66% (11 participants from the total of 12)	75% (9 participants from the total of 12)	100% (12 participants from the total of 12)	77% (10 participants from the total of 13)	84,61% (11 participants from the total of 13)	86,48% (53 participants from the total of 62)
(T)	100% (7 participants from the total of 7)	85,71% (6 participants from the total of 7)	75% (6 participants from the total of 8)	33% (3 participants from the total of 9)	100% (8 participants from the total of 8)	76,92% (30 participants from the total of 39)
(D)	60% (34 participants from the total of 57)	52,54% (31 participants from the total of 59)	33,33% (21 participants from the total of 63)	34,37% (22 participants from the total of 64)	48,39% (30 participants from the total of 62)	45,24% (138 participants from the total of 305)
(J)	79,54% (35 participants from the total of 44)	62,5% (30 participants from the total of 48)	42,55% (20 participants from the total of 47)	41,66% (20 participants from the total of 48)	55,55% (25 participants from the total of 45)	54,62% (130 participants from the total of 232)
TOTAL	76,10% (223 participants from the total of 293)	61,96% (189 participants from the total of 305)	33,33% (101 participants from the total of 303)	39,17% (123 participants from the total of 314)	46,97% (140 participants from the total of 298)	51,28% (776 participants from the total of 1513)

Table 2 shows this study participation at (G), yearly, during four periods, constituted by different phases, characterized by continuous “iterative loops” and successive interactions. It doesn’t indicate the study participation on the 1st. semester of 2011, already mentioned in Table 1, because this doesn’t consist of a Multimethodology phase or “iterative loop”, but a period of previous survey to detect demands that would justify its implementation, from the 2nd. semester of 2011 to 2014. A point to emphasize in Table 2 is that Debriefing to managers about the problems detected on the 2nd. semester of 2011 was only realized on the 1st. Phase because of difficulties in time to join them, considering operational priorities. Table 2 also indicates that the study’s participants at (G) embraced the following operational functions: (i) Aeronautical Information Service’s Technicians (AIS); (ii) Aeronautical Telecommunication Service’s Technicians (OEA); (iii) Meteorology Technicians (PMET); (iv) Meteorology Professionals; (v) Air Navigation Specialists (ENA); Airport Operation Technicians (PSA); and leaderships (managers, coordinators and supervisors) (CABRAL & ESTELLITA LINS, 2015 APUD BRASIL, 2010a, 2010b). Apart to this, it’s necessary to explain that there were no participation of Air Traffic Controllers (PTA) of INFRAERO at (G), once this service over there is provided by military technicians of DECEA.

Table 2.

(G) Multimethodology Phases’ Participation (CABRAL & ESTELLITA LINS, 2015 APUD MINGERS, 2006)

(G): "Iterative Loops" Participation in all Phases / 2011 to 2014 of Multimethodology - Problems’ Consciousness, Representation and Formalization													LEGEND: * No Debriefing	
PERIODS	DEBRIEFINGS TO MANAGERS	PARTICIPATION								GLOBAL PARTICIPATION			TOTAL	
		AIS	OEA	PTA	PMET	MEG	ENA	PSA	Manager	Presence	% Participation	Absence		
05 a 07, 09, 13 and 23.12.11	15.01.12	7	5	0	20	12		16	1	61	74,40%	21	82	AIS - Aeronautical Information Service’s Professionals
07 to 21.12.12	*	4	2	0	2	1	0	4	0	13	16,66%	65	78	ENA - Air Navigation Specialists
03 to 21.06.13	*	7	0	0	11	5	0	8	2	33	47,14%	37	70	MEG - Meteorological Professionals
25.03 to 07.04.14	*	7	1	0	9	3	1	6	3	30	44,11%	38	68	OEA - Aeronautical Telecommunication Service’s Professionals
Total		25	8	0	42	21	1	34	6	137	45,98%	161	298	PMET - Meteorological Technicians
														PSA - Safety Airport Professionals
														PTA - Air Traffic Controllers (Tower)

3. Final Results

The quantitative analysis of the study was realized after each Multimethodology’s Phase and is related to the Opinion Survey Questionnaire’s answers, which results pointed out to a prevalence of “satisfactory” compared to “over expected”, “regular”, “insufficient” and “not necessary” answers. Furthermore, the qualitative analysis was realized by integrating the results of all Multimethodology’s Phases and was divided into: (i) Opinion Survey Questionnaire related to the suggestions’ answers; (ii) Compatible Analysis related to the problems and situations detected; (iii) Theoretic Base Contribution related to the analysis of each concept’s effectiveness on supporting the goals of Problem’s Consciousness, Representation and Formalization “to be achieved” or presenting “difficulties to be achieved” or even “not achieved”; (iv) Global Demands related to the analysis of the problems plotted compared to the demands introduced by the previous survey (1st. semester of 2011), which justified the study, confirming them or not and verifying if there were any improvements; and (v) Other Considerations aside these analysis described. The final results of the qualitative analysis are extense and will not be described completely in this article, which is restricted to some points considered relevant.

Firstly, in the Opinion Survey Questionnaire, some relevant points to be emphasized as final results are: (i) importance of different functions and sectors’ participation, mainly during the 1st. Phase, when the heads’ participation showed to be decisive; (ii) demand for videos of real work situations (CABRAL & ESTELLITA LINS, 2015 APUD VIDAL & MÁSCULO, 2011); (iii) more time for problems’ debate and consciousness about work routines; and (iv) improvements in communication and interaction between workers and heads, as well as in integration among all systemic segments and levels as a whole, involving either human and organizational issues.

According to Table 3, Compatible Analysis classifications are, as follows: (i) Material and Organizational Problems involving external decisions, not depending on (G) initiative, but with negative impacts on its operation; (ii) Human Group Problems involving internal conflicts and relationships as negative barriers to work contexts; (iii) Operational Problems inherent to service and related to standards as restrictions to operation; (iv) General Problems involving global aspects with indirectly reflexes to harm work routines; and (v) Positive Aspects, which, fortunately, were raised. Also, each of these classifications adopted different colours to distinguish the problems and situations plotted, as follows: (i) black to initial ones; (ii) blue to “new” ones; (iii) wine to “reincident” ones; and (iv) brown to the ones “on approval”, which needed to be confirmed. Some main points to be emphasized are, among others: (i) although the high quantity of reincident problems, there were more Positive Aspects compared to all classifications of problems; (ii) there were more Material and Organizational Problems than other ones, with higher reincident compared to them, probably because they refers to subjects which decisions depend on higher organizational levels outside (G); (iii) mostly Human Problems are affected by communication’s limitations, relationships’ conflicts and a trend to find guilts; (iv) Operational Problems, in majority, need continuous standards’ adaptation and up-date focused on daily activities’ practice, prone to constant variability (internal and external), derived of complexity characteristics, proper of complex systems. Table 3 demonstrates, not all, but some examples derived of Compatible Analysis, based on the classifications described.

Table 3.
Study Compatible Analysis Examples

SOME EXAMPLES OF COMPATIBLE ANALYSIS' RESULTS				
	Initial	New	Reincident	On Approval
Material and Organizational Problems (TOTAL = 15)	Insufficient training	-	Airport privatization with posterior consolidation	Slowness on material reposition
			Change of work shift for worst	Substitution of INFRAERO Air Traffic Management System (SGTAL) by Aircraft Services Messages Handling System (AMHS)
			Failures on internet	
Human / Group Problems (TOTAL = 13)	Different procedures for workers' rest payment	Expectations about Meteorological Information Translator System (STIM) implementation	Centralization of informal routines on the same workers	Trend to work in homogeneous teams
	Trend to find guilties		Problems on workers' vacations planning	Indication of higher valuation of Meteorological activity compared to others
Operational Problems (TOTAL = 8)	Low frequency of Operational Meetings	Bureaucratic routines at Meteorological Sector involving Meteorological Briefing	Over-use of taped phone at AIS Room deviating line to Meteorological Sector because of the high quantity of Flight Plans related to the number of workers	Deficiency on addressing messages
				Permanence at workplace during rest time
General Problems (TOTAL = 12)	Individualism, isolation	Emphasis on Selfdeception and Subject Indivisibility Complexity Paradoxes	Unbalanced of Physiological Necessity related to sleep because of worker shift change	Alert to SGTAL not to accumulate message
	Dispersion, lack of interest, desmotivation		Emphasis on Isolated Parts, Information	
	Trend to follow standards and difficulties on improvisation in unexpected situations		Localization and Preservation involving Complexity Paradoxes	
	Do strictly what's necessary		Mechanicist and Domination Metaphors	
Positive Aspects (TOTAL = 23)	Knowledge and cooperation among different functions to "armor" against error	Meeting-room	Improvements on communication and cooperation among different sectors	Improvements on problems' feedback and planning
	Creation of new services procedures	Planning of work shift by each sector		
	Change of meteorological teams	Learning and Art of Analysis Metaphor		
	Common lunch-room and coffee place	Separate rest-rooms for men and women		
		More space of work rooms		

About Theoretic Base Contribution, there are some points to be emphasized, among others: (i) all goals of Problems' Consciousness, Representation and Formalization were achieved related to Conceptual Map (CABRAL & ESTELLITA LINS, 2015 APUD ESTELLITA LINS, ANTOUN NETTO et al, 2010), which represented, at the same time, a conceptual base and a Multimethodology instrument (CABRAL & ESTELLITA LINS, 2015 APUD MINGERS, 2006), used in all its Phases and functioning as a chain of connection among the others, as well as to System Thinking (CABRAL & ESTELLITA LINS, 2015 APUD GHARAJEDAGHI, 2011), once all instruments used promoted it, representing the main theoretic framework of this study; (ii) non of these goals related to Organizational Metaphors (CABRAL & ESTELLITA LINS, 2015 APUD MORGAN, 1996, 1997, 2007 APUD SOUZA, 2009; KUNSCH, 2003 APUD MONTEIRO; 2011; ESTELLITA LINS, 2014) were achieved, considering these weren't used during the study phases, but only on its analysis, but, nevertheless, brought significant questions; (iii) the goal of Problems' Formalization indicated "difficulties to be achieved" in the majority of conceptual base compared to the goals of Problems' Consciousness and Representation, which includes Multimethodology itself, Cultures, Metagovernance and "Z" Theory, mainly, because of the negative impacts derived of reactive and bureaucratic cultures represented by Mechanicist Metaphor and hierarchical governance, disabling to make collective and anticipatory changes with future prospectives; and (iv) the majority of goals of Problems' Consciousness and Representation were achieved, reinforcing the Theoretic Base Contribution to this study implementation, for instance, the ones related to Complex Paradoxes (CABRAL & ESTELLITA LINS, 2015 APUD ESTELLITA LINS, 2011, 2014), which, on the other hand, had difficulties to achieve the goal of Problem's Formalization, for the trend to Localized Information, Preservation of Processes, Subject Indivisibility, Selfdeception and Unification (CABRAL & ESTELLITA LINS, 2015 APUD ESTELLITA LINS, 2011, 2014).

The majority of the Global Demands raised on previous survey (1st semester of 2011) derived of the investigation visits weren't contemplated, once the study focus was safety, except the one related to TRM, which indicated the need for some important improvements, such as: (i) participation of all segments, including heads; (ii) use of Multimethodology to reinforce it, as an organizational diagnosis to adequate its contents and framework; (iii) inclusion of improvisation and creativity abilities to deal with internal and external variabilities, once the other abilities were improved with the study; (v) inclusion of TRM on formation courses, based on TEM model, once EM is still adopted. On the other hand, the study confirmed many demands derived of safety visits, some mentioned at the Compatible Analysis, which weren't removed completely and, although there's concerning about them, the improvements were temporary and limited to internal solutions, which were considered insufficient to safeguard their recurrencies.

Finally, about General Considerations, there are some relevant points, as: (i) dual negative and positive meaning for some terms, as “adversities”, “standard” and “technology”; (ii) application of Multimethodology in parallel to the Psychological Monitoring Program, limiting time for both; (iii) except on the 2nd. Phase, which didn’t have heads participation, but without significant damage on its results, there was a gradual increase either on their participation and their convergence to workers; (iv) Airport Operation Service’s workers represented the connection among others, indicating Learning and Art of Analysis Metaphor; (v) no Air Traffic Control and Management Service’s participation didn’t reduce the importance of the other services studied upon the whole system appreciation; and (vi) non-existence of civilian national standards for Air Navigation workers to support the problems plotted.

4. Conclusion

This study was realized into six Air Navigation sets and this article presented the final results of one set (G) studied. It chose Multimethodology as the methodology to implement, based on a qualitative, systemic and anticipatory approach, which was applied after raising some demands derived of investigation and safety visits (1st. semester of 2011). Multimethodology consisted of four annually phases (from 2nd. semester of 2011 to 2014) and used different instruments to achieve the goals of Problems, Consciousness, Representation and Formalization. The final results embraced a quantitative analysis, indicating a prevalence of “satisfactory” answers, as well as a qualitative analysis, both derived of the Opinion Survey Questionnaire. The qualitative analysis also comprised: (i) Compatible Analysis; (ii) Theoretic Base Contribution; (iii) Global Demands; and (iv) General Considerations. All goals of Conceptual Map and System Thinking were achieved, considering the Conceptual Map as the chain of connection among all other instruments, as well as System Thinking as the main theoretic framework of the study. These results indicated some limitations and benefits, such as: (i) promotion of interactions among the participants (workers and heads), as its main benefit, learning to develop creativity in face to work problems and positive situations, considering complex characteristics upon a systemic perspective, in complementation and reinforcement to TRM, as well as giving some suggestions to improve it; and (ii) reactive and bureaucratic cultures, as its main limitation, representing a negative barrier to collective and anticipatory agreements related to the problems plotted and future projections for their necessary changes, which indicates researches as positive to enable interactions’ intensification beyond internal contexts to outsider segments, sectors and organizations.

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