

# **A PARTICIPATORY APPROACH TO IMPROVE RESILIENCE IN COMMAND AND CONTROL (C2) SYSTEMS: A CASE STUDY IN THE RIO DE JANEIRO C2 SYSTEM**

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## **ABSTRACT**

A fundamental Command and Control Centre (C2) strategy is to forecast and plan responses to incidents. However, there are incidents that defy forecasting and/or planning, cannot be completely understood while they're occurring, and should be treated ad-hoc. Such incidents, if not properly managed, may produce catastrophic outcomes. This article describes how the Integrated Command and Control Centre of Rio de Janeiro City (CICC-RJ) responded to unexpected and improbable events related to protests that took place during the 2013 FIFA Confederations' Cup in Rio de Janeiro.

## **Keywords**

C2 Center, protests, unexpected, Rio de Janeiro, Resilience

## **INTRODUCTION**

Rio de Janeiro State has an Integrated Command and Control Center (locally referred to as CICC-RJ) based on C2 Model (Builder, Bankes and Nordin, 1999) that seeks to promote coordination among security, health, transportation and public service agencies by providing a venue for their interaction. These agencies deal with routine daily operations, emergencies, large events (e.g. major weather events), and Large Events (e.g. FIFA World Cup).

At the time of the events considered in this article, CICC-RJ was grappling with challenges on three fronts: it had a Large Event (FIFA Confederations Cup) under way; it was undergoing tests for FIFA's World Cup competition (which included the Confederations Cup); it and its participating agencies were learning to interoperate. In the midst of this, unexpected massive protest demonstrations arose, driving the Centre's operations beyond previously considered bounds.

The aim of this paper is to analyze, through a scientific perspective, how the CICC-RJ behaved face of the unknown and discuss aspects of resilience and brittleness of the organization against these incidents. To do this we used several techniques of Cognitive Task Analysis (CTA) (Crandall, Klein and Hoffman, 2006) to better understand people's work at the CICC-RJ.

## **CICC-RJ ORGANIZATION, STRUCTURE, AND OPERATION**

Rio de Janeiro State's Integrated Command and Control Centre is one of six similar regional nodes in Brazil's National Integrated Command and Control System (SICC). As a regional node of SICC it coordinates neighbouring states' CICCs when appropriate. In its usual role as the state's CICC it provides a common organizational structure to enable local public service organizations to work collaboratively. It can deploy mobile units that are adapted trucks that aim to provide tactical support and are equipped with communications, video monitoring, and event management systems.

CICC-RJ coordination ensures the smooth running of the Centre and promotes the integration of the participating organizations. Each of the participating organizations retains its autonomy and command structure, and shares, or not, its information and experiences with other agencies. At the time of the FIFA Confederations Cup and the events reported here the participating organizations were just beginning to be integrated into the Centre.

Communication between agencies happens through each agency's representative, in person. Although each agency has a phone available for internal and external communication, interviewees reported and observations corroborate that these phones are hardly ever used for interagency communication.

The CICC does not impose a communication standard upon participating agencies. Agencies use their own pre-existing means (often radio) for intra-agency communications, augmented *ad hoc* by instant messaging or chat software apps, not provided by the Centre.

#### **FIFA Confederations Cup 2013 plan**

During the Confederations Cup, the CICC-RJ housed the following agencies:

- Security:** Federal Police (PF), Federal Road Police (PRF), National Security Force (FSN), Air Defense Command and Control (CCDA), Cyber Defense Centre (CDCIBER), Military Police (PMERJ), Civil Police (PCERJ), Municipal Guard (GM-Rio)
- Safety:** Civil Defense, Mobile Emergency Service (SAMU), Fire Department (CBMERJ)
- Transportation:** Highway concessionaire (Lamsa), Train Company (Supervia), Traffic Engineering Co. (CET-RIO), Urban Transportation Office (SMTU), Bridge Concessionaire (CCR / Ponte), Airport Infrastructure Co. (INFRAERO), Transport Agency (Agetransp), Subway Company (MetroRio)
- Communication:** Telecommunication Agency (Anatel).
- Public Administration:** Operations' Centre of Rio de Janeiro City (COR - RIO), Rio de Janeiro State Chief of Staff, Internal Revenue Service (RF), FIFA Local Organizing Committee (COL).

CICC-RJ's Confederations Cup plan mapped out in detail the competition's areas of interest. These included stadiums, hotels where the national teams, referees and FIFA representatives were staying, the routes between those hotels and other areas of interest and other events related to the Confederations Cup. The plan also mapped out other events of interest which, although not directly related to the Confederations Cup, involved the presence of someone related to the Cup (e.g. players' visits to slums, parties, and so on). Every item listed received an action plan aimed to prevent incidents and protect the public directly and indirectly involved in the Confederations Cup. These action plans involved: escort of delegations, blocking streets near Maracanã Stadium, police reinforcements, mass transportation services, unauthorized radio broadcast monitoring, strategic positioning of the police and public safety agents, intense monitoring by cameras throughout the city, telemetric systems, georeferencing, firearms detection systems, among others.

#### **RESEARCH METHODOLOGY**

Cognitive Task Analysis (CTA) techniques were employed to understand and study the process of managing major events (Crandall, Klein and Hoffman, 2006) to identify and analyse aspects of CICC-RJ resilience and brittleness. The research team chose the CTA because this is a study applied to a complex context where events happen in a nonlinear manner and need a systemic approach to be analysed (Hollnagel, 2006). The research comprises two steps: data collecting, and analysis and representation.

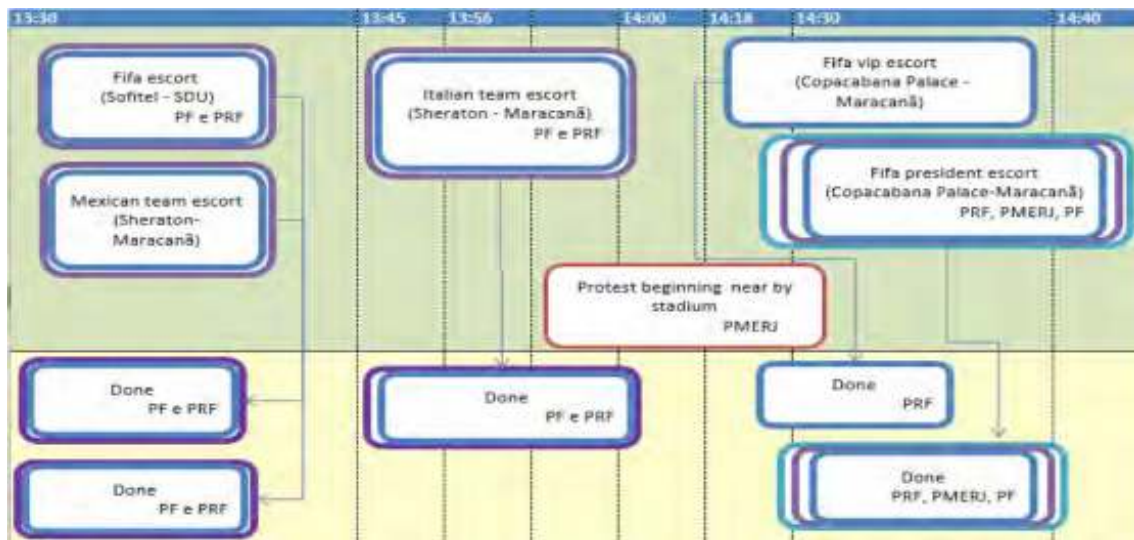
The CTA techniques used were:

- to capsule incident accounts to reduce the interviews' observations' narratives, and to capture key decisions, using key words such as: protest, planning, coordination, cooperation, communication, areas and events of interest, transportation, incident, and emergency, among others.
- to use criteria for grouping cues, actions, and patterns culled from the database and interviews to generate a critical cue inventory. The criteria adopted were: incident solving, inter-agency collaboration, intra-agency communication (between representatives at CICC and agents in the field), and conflict resolution
- to search for and identify a set of themes to provide a convenient view of the flow of activities through time. The themes we adopted are listed below:
  - Planned Events** – items such as games, road blocks and detours, mobilization of security officers, escorting teams, referees, FIFA and government representatives, etc. Source: CICC-RJ database.
  - Realized Events** – record of performed actions, planned or otherwise. Sources: CICC-RJ database and interviewees.

- **Unexpected Events** – incidents directly related to the protests that occurred on the day of the game. Sources: CICC-RJ database and interviewees.
- **Information Requests** – information requests between the CICC-RJ and field agents during the protest. Source: Interviewees.
- **Decisions** – key decisions made toward ending the protest, by personnel at the CICC-RJ or field agents. Source: Interviewees.
- **Feedback** – field agent reports to the CICC-RJ on effects of decisions. Source: Interviewees.
- **Other Incidents** – incidents not directly related to the protests, such as illegal ticket sales, robberies, etc. Source: CICC-RJ database.

## DATA ANALYSIS AND REPRESENTATION

We used a timeline with swim-lanes to represent the elicited data. The timeline shows events in Rio de Janeiro on June 16th, 2013, day of the Italy vs. Mexico game. It represents the sequence and duration of events, incidents, actions, perceptions and decisions. It attempts to show the communication among the various agencies involved in the events and how the decision making process actually transpired. Figure 2 is a sample that illustrates several events spanning a little more than an hour of that day.



**Figure 1. Timeline, June 16th 2013, 1:30pm to 2:40pm**

The records and timeline show actions by 11 of the 24 CICC-RJ participating agencies:

- **Security:** Federal Police (PF), Federal Road Police (PRF), National Security Force (FSN), Military Police (PMERJ), Civil Police (PCERJ)
- **Safety:** Fire Department (CBMERJ)
- **Transportation:** Bridge Concessionaire (CCR / Ponte), Transport Agency (Agetransp), Subway Company (MetroRio)
- **Communication:** Telecommunication Agency (Anatel).
- **Public Administration:** FIFA Local Organizing Committee (COL).

The juxtaposition of planned and realized events on the timeline highlights the discrepancies between actions as planned and as realized, due to plan input issues (e.g. updates to personnel movement), execution issues, and changes in circumstances (e.g. demonstrating crowds). Two striking absences were reported in the interviews and visible in the database: plan changes and under-reporting of realized actions. Plan change information input into the database overwrote planned events records, leaving no change history and making it impossible to assess plan evolution dynamics, and the change's possible impact on execution. We checked other Confederations Cup game days for under-reporting of realized actions, and observed this to be a broad pattern. These absences are unfortunate, as they undermine the CICC-RJ's organizational learning and ability to improve its planning and operations.

### **The Protest**

During the pre-game mobilization, Military Police in the field perceived people gathering, and at approximately 2pm alerted the CICC-RJ that a protest demonstration was forming. The leadership at the CICC-RJ decided to not interfere in the developments at that time, but to maintain a watch on the unfolding activity. Officers on patrol in the field detected people carrying potentially dangerous materials and apprehended gasoline and opportunity weapons such as rocks and wood planks. At 3pm the protesters moved to occupy the streets near Maracanã Stadium. The game was scheduled to start at 4pm. The officer in charge of the Military Police troops in the field decided to intervene and preclude that the protesting demonstrators reach the Stadium. The ensuing mayhem resulted in injuries, tear gas intoxication, property depredation, and arrests.

In their effort to keep the protesters from reaching Maracanã Stadium, the military police drove them towards the Quinta D'Or Hospital. Panic broke out and people sought shelter in the hospital, whose entrance was vandalised. From the vicinity of the hospital the protesters were driven to Ceará St., from where the demonstrators dispersed around 7pm. Details of these actions were not recorded in the CICC-RJ database.

### **Few Collaborative Actions**

Analysis of the available data on this protest incident indicates a low level of collaboration among the participating agencies and a low level of interaction between officers at the CICC-RJ and in the field. Only 2 of the 25 actions represented on the timeline to manage incidents were collaborative. The officer in the field made most decisions alone: of the 19 communications actions related to this incident identified by this study only 7 were between field agents and the CICC-RJ.

The interviewees reported that not enough information flowed from the field to support decision making at the CICC-RJ. Examples of information they would have liked to see in the studied incident included whether weapons were present (how many and which type); protest leadership; presence of people with limited capability (children, elderly, handicapped, etc.); if the movement towards the train and subway stations was in search of refuge or a protest action; if there were injured people; etc. This information would have been useful to support decisions on whether to keep stations open or close them, and on whether to mobilize more police or paramedics to the protest site.

### **Supportive infrastructure**

CICC-RJ is the first time working together in a single location for many of its participating agencies. The building that houses it has easy access, “intelligent”, with well distributed and accessible spaces. It is use-oriented and an example of space designed to enhance the resilience of the institution (Botterell and Griss, 2012). Agency representatives were trained in the use of the space and technology available in the Command and Control Centre.

It was observed that these agencies work together in planning and implementing activities related to major events. Also that CICC-RJ has norms that aim to structure the organization and resolve doubts about planning, areas of activity and limits of each agency, the operationalization of the system, etc. How people actually perform their work (normal behaviour) usually differs from procedures (normative behaviour). This dichotomy was observed when the unexpected protests broke out. At that moment the crisis response plan's inadequacies led agencies' representatives at CICC-RJ to work in an *ad hoc* mode (improvisation), without a clearly defined structure for decision making. While this was reported as an unwelcome surprise by the interviewees, the distinction between normal (realized) and normative (prescribed) behaviours is not unusual (Hollnagel, 2006; Gomes et al., 2009). The difference between normal and normative behaviours does not necessarily cause a failure (Dekker, 2006); much to the contrary, it may strengthen coupling.

### **Communication**

Interviews and observations showed that communications between the field and the CICC-RJ suffered from lack of structure and resources. Field personnel used radio and mobile phones to report any relevant information to their respective agencies at the CICC, who then proceeded to disseminate it verbally among the other agencies present. The absence of an established information sharing structure compromised the CICC's and agencies' situational awareness, and impaired their ability to respond promptly and appropriately.

Near game-time on June 16<sup>th</sup>, near the stadium, the challenge was to make best use of the forces present to keep the flow of game-goers moving and separate from demonstrators, and to isolate the small number

of violent demonstrators ('black-blocks') from the larger mass of peaceful ones. Achieving this while attempting to maintain the CICC informed using the existing communications resources revealed the extreme workload involved, and most decisions were made with little CICC interaction. To get some level of situational awareness, CICC agents resorted to local TV news, Internet 'Ninja' Media raw reports, and monitoring cameras.

### **Poor Preparedness**

CICC-RJ preparedness is poor due to several factors:

1. Absences: agencies are not required to participate in the CICC-RJ, and some don't.
2. Lack of continuity: agency representatives participating in planning meetings aren't necessarily the ones tasked with execution, in-existent handover design.
3. Poor simulation exercises: although simulation exercises were undertaken, they suffered from low fidelity (policemen cast in the role of rioters [ were apathetic | played the part unconvincingly ]) and incompleteness (health and transportation agencies were absent; geography was not covered).
4. Untrained personnel: CICC-RJ management provided training in its processes and technologies to all participants, but agency personnel changes undermined this, compromising collective performance.

### **CONCLUSION**

This study sought to understand the operation of a C2 centre, how it worked on the preparation and execution of safety and security actions of a major sporting event, and how it dealt with unexpected violent protests that broke out during the event. The planning for the Confederations Cup of the studied centre was successful since the escort, scheduled events and games happened as expected. There was no need to deploy alternative plans, but improvisation played a key role in achieving satisfactory results.

We believe that there is still much work ahead especially in relation to crisis management. Although participants of the agencies had some understanding of their roles and executed some joint actions, what was observed was lack of efficient communications and coordination between agencies, and poor decision making processes. The CICC-RJ should review and update its infra-structure and organization design to improve these issues, and others, related to knowledge management, that are compromising its preparedness, such as handover, debriefing, and lesson learning. Its preparedness must be improved through higher fidelity simulation exercises.

In our view, it is extremely important to develop systems capable of capturing the unfolding of events and supporting the execution of actions; supporting tactical and operational decision making; capturing incidents and supporting the deployment of resources to solve these incidents; and supporting communication. These systems should maintain records of all activity, including communication recordings, for use in possible studies and improvement plans. Additionally, these systems should be designed to support not one, but a variety of Command and Control approaches and, as a result, be better able to cope with unexpected communications and interoperability challenges even during stress situations.

As future work this research team will propose the construction of the aforementioned systems and will continue to analyse the CICC-RJ's operations, both run-of-the-mill and the exceptional ones, be these emergent large events or scheduled Large Events, such as the upcoming Olympic Games in 2016. The purpose of the analysis is to propose, in collaboration with members of the CICC-RJ, techniques, frameworks, software and processes that are able to increase the resilience of this centre.

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