Applying resilience approach to C2 Center during FIFA`s 2014 World Cup in Rio de Janeiro

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ABSTRACT

Rio de Janeiro's Integrated Command and Control Center (CICC-RJ) has already seen duty in several large scale events which happened in town, some planned, others not. CICC-RJ is part of Rio de Janeiro state's response to the Brazilian national government's mandate to improve the state's ability to anticipate and respond coherently to public safety events in the region. Its infrastructure is intended to enable and promote local agencies' ability to anticipate, plan, monitor, and respond to public safety events by sharing operational intelligence and acting in concert. The aim of this paper is to explore some of the CICC-RJ issues where fragility and resilience were at play during the operational management of the 2014 World Cup in Rio de Janeiro, as the CICC-RJ seeks to enhance its capabilities to promote resilience in preparation for the 2016 Olympics in Brazil.

Keywords

Emergency response, command and control, resilience, big events.

INTRODUCTION

Rio de Janeiro's Integrated Command and Control Center (locally referred to as CICC-RJ), which is relatively new, has already seen duty in several large scale events which happened in town, some planned, others not. CICC-RJ is part of Rio de Janeiro state's response to the Brazilian national government's mandate to improve the state's ability to anticipate and respond coherently to public safety events in the region. Its infrastructure is intended to enable and promote local agencies' ability to anticipate, plan, monitor, and respond to public safety events by sharing operational intelligence and acting in concert.

Brazil's performance in C2 has improved over the years, and gains from prior experiences with large events (2013 FIFA Confederations Cup, World Youth Day 2013) (Gomes F. et al., 2014) were seen to have been consolidated and applied at the CICC-RJ during the 2014 World Cup, with better planning and more dynamic plan adjustments contributing to a more resilient action.

The aim of this paper is to explore some of the CICC-RJ issues where fragility and resilience were at play during the operational management of the 2014 World Cup in Rio de Janeiro, as the CICC-RJ seeks to enhance its capabilities to promote resilience in preparation for the 2016 Olympics in Brazil.

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Conceptualizing C2 Centers

Command and Control Integrated Centers (CICC)[1] are being widely used in large cities as a way to improve interagency dynamics, awareness, and decision-making when dealing with large events. Command and Control is a fundamental activity for the success of military operations at all levels of command (USG JCS, 2010), contributing to the planning of employment and effective use of available resources, organization, direction, coordination and control of military forces for the accomplishment of assigned missions. C2 also includes responsibility for the health, welfare, morale and discipline of assigned personnel (Alberts and Hayes, 2003). The decision maker provides the initial articulation of a problem or issue at hand and establishes the conditions under which effort is applied (NATO RTO, 2002), so it is of fundamental importance for the decision maker to have information that will be critical to the anticipation of further incidents. Agents deployed on the ground act as sensors and filters of information and feed a single database, with the objective of generating situational awareness in the upper echelons. In addition to the employment of well-trained agents, technology is applied to support the flow of information to the decision maker.

The CICC's main feature is integration. Using an innovative structure in the context of public safety and coordination as its main premise, the CICC does not limit or exclude the tactical and operational skills of the legally appointed commanders. The determining success factor is the understanding that there must be interoperability among all members of the System. This includes not only technical interoperability, but also semantic interoperability (ability to fully understand each other) and "cooperability" or willingness to interact and desire to communicate clearly.

The physical structure of the regional Integrated Command and Control Centers was planned so as to facilitate interagency processes. Its floors provide an ideal space with respect to the positioning of the rooms, facilitating rapid locomotion between the different environments. Figure 1 shows the internal physical structure of a modern CICC (Alberts and Hayes, 2003).

[1] CICC is used in this text to refer to Command and Control Integrated Centers so as to maintain consistency with the naming conventions used by local institutions

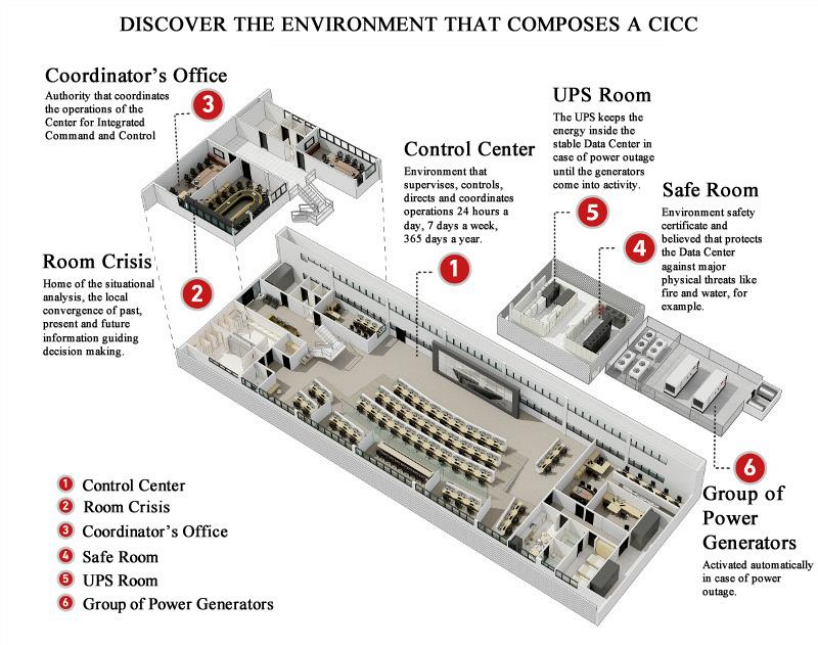

Figure 1- Composition of a CICC environment (Alberts and Hayes, 2003)

THE INTEGRATED COMMAND AND CONTROL CENTER OF RIO DE JANEIRO

The Brazilian Federal Government established the Integrated Major Events Public Safety Command and Control System (SICC) through specific legislation [Ministry of Justice Decree No. 2,164 / 2011, Sep / 2011], in order to provide support and information to enable institutions to make agile, quick, and smart decisions in an integrated manner in emergency situations - optimizing resources and actions during major events. In the SICC the Regional Integrated Command and Control Centers (CICC-R) are the components responsible for coordinating security operations at the Tactical and Operational levels. They also ensure the flow of information to the Strategic Level, exercised by CICC-N (National CICC),

and to the accessory components, such as the ADCC. Because they are directly connected to the operational level, the CICC-Rs are the principal generators of situational awareness within the Integrated System. The leadership model of the SICC is servant leadership. This means that the work done in CICC-Rs aims to support the employment of security forces that will act to ensure events are held in a safe and peaceful manner in the host cities.

Through the CICC-**R**s it is possible to monitor cameras in the capital cities and their metropolitan region. Data, images and information converge at these sites, enabling expansion of knowledge of all variables related to events and occurrences linked to the Social Defense system and thereby better service to the population. The CICC-Rs aim to share in partner institutions' individual action plans so that, upon reaching the center, information gets directed to the agency that best meets that call and the problem gets readily solved.

One of the stated objectives of the CICC-Rs is that their partner institutions share with them their plan of action for the events. The purpose is to allow all suggestions for aligning the individual organizations' plans to its (the CICC-R's) monitoring plan to be heard.

In addition to the latest technology, the CICC had individual actions of each of the institutions present there, such as the Military Police, the Civil Police, Firefighters, public lighting and transportation companies, and Integrated Advisory Bodies of the Intelligence divisions of the Social Defense System (AID) and the National Civil Aviation Agency (ANAC).

The Control Center is responsible for overseeing, managing, controlling and coordinating operations anywhere in the city. The Crisis Room is where, through meetings, and based on past, present, and future information, the situational analysis of incidents is conducted for decision-making. The Coordinator's Office is the office of the C2 center's general coordinator. The Vault is the protected environment that houses the data center. The UPS Room is the room where the no-breaks to keep the Data Center running even in cases of power outages. If the external electricity supply is not promptly restored, generators take over for the system not to stop.

The governance structure of the Brazilian Integrated Command and Control System is divided into four levels: Political, Strategic, Tactical, and Operational. At the Political level, the National Presidency's Staff, in coordination with the Ministries of Justice and Defense, are responsible for Political Actions. At the Strategic level, the Special Secretariat for the Security of Large Events (SESGE) and the Joint General Staff of the Armed Forces (EMCFA), acting in coordination, are responsible for high-level actions and planning. These offices are represented by the National Integrated Command and Control Center (CICC-N) and the Joint Defense Operations Center (COCD), respectively.

The Operational Level is made up of Federal, State, and Municipal Agencies, through the Regional Integrated Command and Control Centers (CICC-R), and of the Army, Navy and Air Force, through the Area Coordination and Defense Centers. There was integration and cooperation at all levels. The integrated system was divided into two large areas at all levels of management. The EMCFA, through COCD, developed strategies on matters of airspace defense and air traffic control, counterterrorism, border cooperation, sensitive structures, air support, control of explosives, chemical, biological, radioactive, and nuclear defense, maritime and fluvial defense, in addition to providing the manpower. The SESGE, represented by CICC-N, worked in the fields of escorting delegations, securing hotel chains, training centers, stadiums, Fan Fest, airports, landmarks, ports, borders, highways and public spaces. At the operational level, for the World Cup the system had more complex infrastructure than for the Confederations Cup. The World Cup had twelve host cities, twice as many as in 2013, and 24 command and control centers, for public safety and national defense.

RESEARCH METHODOLOGY

This study adopted the Exploratory and Comparative Inquiry through Cognitive Task Analysis - CTA (Crandall et al., 2006) methodology to capture and situate the Command and Control (C2) dynamics that unfolded during the 2013 World Youth Day and FIFA Confederations Cup and the 2014 FIFA World Cup. In preparation of a CTA study researchers must quickly learn about the domain (Crandall et al., 2006) and we raised documentary, primary and secondary sources on Integrated Command and Control to rapidly integrate the team into the field of study as well as to streamline the selection of respondents. The information from

the interviews and the Rio de Janeiro Military Police (PM) call-center event log spreadsheets kindly provided by CICC-RJ and from other sources (e.g. news media) was structured (classified, coded, and ordered) for making timelines with the daily occurrences related to or impacting the 2014 World Cup.

Although direct observation of activities in the situation room during the World Cup events had been planned and approved, changes in the formal command structure shortly before the event introduced restrictions without sufficient time to renegotiate access. The previously planned operator interviews were augmented to make up for the lack of real-time on-site observation.

As described in the CTA, people express ideas at a speed that exceeds the interpretation of interviewers and therefore it is important to transcribe the audio to aid the identification of relevant information for the study (Crandall et al., 2006). In this case, it was essential to analyze the transcripts at a later time to ensure that no proposition was lost.

The C2 processes elicited were mapped and subsequently validated, top-down and bottom-up, with practicing CICC-RJ managers and agents.

The information from the Military Police Call-Center logs was classified in various ways so as to allow for better overall visualization in timelines. Events were grouped according to their nature (e.g. violence such as robberies, public disturbances such as protests), their relevance to the World Cup activities (e.g. logistics such as traffic artery, location such as proximity to stadium).

The timelines were built considering:

1. Standard BPMN format where you have the vertical line events;

2. The phases of the time in days and hours.

3. The location (neighborhood) where the event occurred.

4. Military Police actions and events reported in the media.

PRELIMINARY RESULTS

This paper reports on preliminary results of on-going research undertaken in what are sometimes challenging access conditions, with occasional setbacks. Below we present four items of our work which we deemed minimally far along for presentation.

Analysis of documentation

Our analysis of the information obtained from documentary, primary and secondary sources indicates that laws, regulations and procedural documents do not provide a meaningful framework for integration of the agencies involved in emergency response, leaving it up to each venue city to establish its own.

Analysis of military police interviews

Although CICC-RJ relies on technologically robust equipment to ensure information traffic, many agents have adopted the parallel use of informal tools like WhatsApp to communicate. The use of these informal tools has mixed results. Used to improve or enable communications, they may have caused some information losses.

There were operational problems that stressed the system and demanded CICC resilience to recover. An example seen in the transcripts was loading new routes into the Risk Manager System:

"[One] had to enter [the data] through a spreadsheet and export. [One] had to put all latitude and longitude data of requested routes into KML[2], export the latitude and longitude data, and import it into the system. There were many routes"

The transcript above shows that there was a point of tension regarding the management of routes to be used for planned events. Once the routes were inserted into the system, they could not be modified via a system function. The CICC-RJ promptly defined a workaround process whereby routes could be kept up-to-date by Intelligence and ICT personnel working together manually.

While event logging was extensive, retrieval methods fell short, and caused the following observation:

[2] *Keyhole Markup Language, a data format for geographical information*

"*[The data]'s there, but dispersed. How can you retrieve it? You can't! So much so that the systems that operate here, they all are logged. Everything you write and what you do is logged. At this time this happened, at this other time so-and-so said something…*"

Analysis of military police call-center logs

The tabulation of events and detailed analysis of the actions showed that CICC-RJ was resilient and able to execute its event management plan, and able to correctly delegate the occurrences to designated agencies. Figure 2 below shows a sample fragment of one day's timeline.

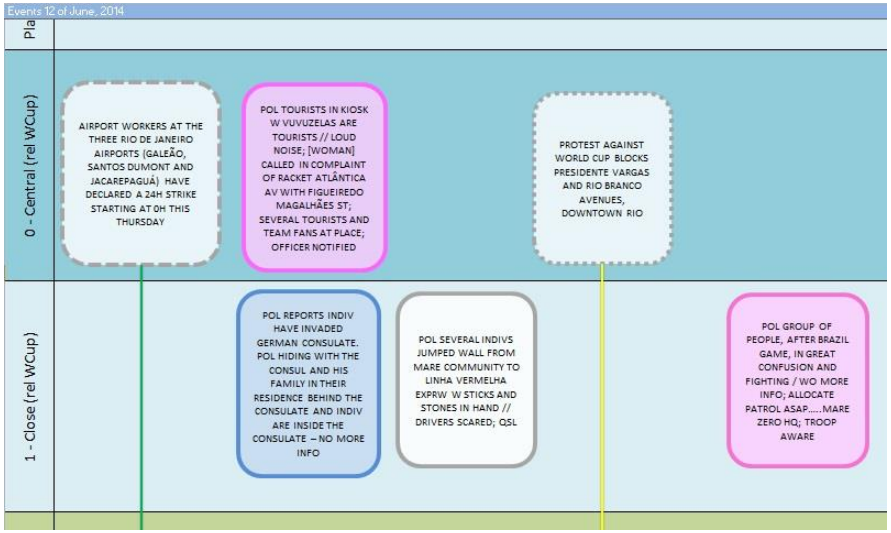

Figure 2 – Excerpt from the timeline of June 12, 2014

Some of the representation conventions adopted are visible, such as swim-lanes, border line-types, and figure color. There are several swim-lanes to allow for a geo-logistical classification of events according to their relevance to the World Cup activities, as well as one for events from the planning process and another for media input. The border line-types represent the type of information source (e.g. official logs, established media), and figure color provides an indication of event type (e.g. public disturbances, traffic accidents).

The records provided by the PM (Military Police) contained 585 events in the city of Rio de Janeiro, distributed among 125 neighborhoods, a sampling of which follows: threats made to people (26), indecent exposure (4), pedestrians run over by vehicles (4), Police Authority request for assistance (1), Military Police request for assistance (7), suspicious person / vehicle check (48), public right-of-way obstruction (demonstrations) (11), victimless vehicle collision (1), Patient transportation (1), disturbing the peace (65), crime against women (1), property damage (1), contempt of authority (1), reckless driving (1), firing of a firearm (1), drunk driving (3), robberies (89), thefts (16), corpse found (1), drug use or possession (11), theft at a financial institution (1), burglary (1)

Analysis of the "Risk Manager" support system (ICT) for CICC operations

During the World Cup the Risk Manager support system was used for integration of the Intelligence, Planning, and Security sub-systems. Table 1 indicates some fragilities of the system. However, it is not yet possible to assess the real extension of the problems arising from the use of the system.

Table 1 – Problems, fragilities, and work-arounds of the Risk Manager System.

Event	Description
Trouble adding routes to the Risk Manager data base	An initial set of routes for authorities' and escorts' movements had been established and pre-loaded into the system, which did not provide functionality to configure new routes without intervention from IT personnel. Adding or changing routes turned out to be required more often than foreseen. A task-force of IT and intelligence personnel was established to ensure needed routes were in the system.

Event	Description
Only partial adoption of Tablets in operations	Tablet computers should have been used by teams in the field. They provided access to many modules of the integrating system. However, as the field agents' overall ICT adoption rate was low, the use of the tablets in the field became more hindrance than help. Additionally, 3G signal problems and the lack of team members responsible for communications, made their use harder still. Higher level personnel were deployed to the field and alternative means of communication were accepted, with additional personnel assigned to integrating incoming information.
Lack of adoption of available ICT resources by personnel.	There was generalized difficulty in using the technological resources available in the system. The Call Answering and Dispatch Module was not used, and the use of tablets and Route Management were precarious. Knowledge transfer was made difficult by the high turnover of the teams, which operated in shifts, and required more effort than the ICT provider or the CICC could bring to bear.
Inadequate knowledge transfer	Knowledge transfer from the ICT provider was troublesome, due principally to the high turnover of the agents between the operating teams. The CICC and the ICT provider had trouble controlling the flow of agents through the training program because each participating agency was left in charge of its own personnel.

CONCLUSION

The Major Events held in Brazil have forced the authorities to develop and adapt their management mechanisms, since the level of systemic complexity has reached ever higher levels. On account of the 2014 FIFA World Cup, the Public Safety and National Defense systems were integrated, as the practice of command and control becomes of essential importance as challenges emerge from apparently disjointed events. Although much progress has been made, and the CICC-RJ has proved itself capable of contributing to Major Events and large events management, and has shown itself able to learn from its and others' operations, there are still many low hanging fruit available for its improvement.

The information about incidents, such as that shown in the timelines prepared during the course of this research from military police records, official and extra-official media sources, and field agents' communications during the events, is still not integrated in a meaningful way in the CICC-RJ's information support system, which makes decision-making more difficult during unforeseen situations.

Also, although the organization has already shown an ability to learn from its operations, management, interacting with this research team, has identified actions that will certainly improve this capacity. Some of these actions include improving record keeping of actions taken and decisions made during events, more learning focused debriefings, and richer simulations training. In addition to simulation exercises where participants know beforehand what to expect, for the first time, in late 2014, a simulation exercise was held where they were not forewarned of the events they would encounter.

Within the research underway on CICC we are using a variety of empirical research methods to explore aspects of computer-mediated activities in situations where we are unclear of what the detailed features of the work context might be. Our approach has been based on lightweight, on-the-fly techniques for exploring potential design spaces, and move away from more traditional summative evaluation protocols, towards more open proactive formative methods of assessment and engagement with workers while co-constructing their activity spaces.

Possible directions for our future research include using CTA techniques to interview representatives of the 30 organizations taking part in CICC and identify issues warranting attention and action through Critical Decision Method, analogous to the present work with the Military Police.

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