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POLICY DIFFUSION BY MEANS OF DEFENSE AND SECURITY SIMULATIONS AND THE USES OF AGENT-BASED MODELLING[1]

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ABSTRACT

This paper is about three elements: inter-agency cooperation simulations with security and defense practitioners as actors; policy diffusion as a way of innovative and incremental gains using practices and the observation of behaviors; and, agent-based modelling as a tool to enhance performance, observing tendencies and acquiring more visibility of the processes and practices imbibed. For this, the first part of the paper is focused on the uses of the literature that expresses decision making process behaviors as a fundamental part of the institutionalization process in terms of cooperation. Adaptive institutionalization is the core element of this approach; in which we believe policy diffusion can derive progressively and in an incremental way. Secondly, we are going to present the inter-agency simulation cases we are working with as part of an inter-institutional effort; researching on those ties and proposing new forms of arrangements and possibilities of increasing dynamics efficiency in the sector, observing both the cases and the exercises chosen in agent-based modelling (ABM).

Keywords: Simulations. Agent-based model. Decision-making.

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INTRODUCTION

Over the past years, there has been the development of many tools, systems, and models that amplify the analysis of institutional and agents' behaviors. Not only for their uses on predictions but as a way for observing practices and observing the natural world (Clarke, Primo 2007). One of the benefits, in terms of spotting choices and conducts, is that the typification of patterns may offer outputs in terms of driving agents that are subject to training.

Dealing with defense and security is about the theoretical approach around international relations, strategy and/or political science, but also, attracting practitioners' experiences to reforming and building institutionalities. In this sense, inter-agency cooperation reveals a challenging institutional building property (Bardach 1998, Raza 2002). Thus, if hierarchies, doctrine, and policies are embedded in those defense and security institutional frameworks, in between institutions there is a low level of central authority and institutional culture parity. When dealing with defense and security matters, inter-agencies experiences are pretty much recent and complex, because they derive exactly from the approximation due to the progressive demands of the uncertainties of the global order.

Our purpose in this paper is to determine some of the uses of Agent-Based Modeling (ABM), building ties that can permit us to analyze particular cases of defense and security inter-agency cooperation, comparing to those represented by the paths achieved from ABM simulations. In this way, internationalization is an aspect that is approximating progressively defense & security studies to those of complexity analysis. This phenomenon is part of the idea that sovereignty aspects are also conditioned by modifying elements, especially because of their relation to anti-TOC (Transnational Organized Crime) efforts, border controlling and the uses of armed forces and military intelligence on public security.

The premise that institutions develop themselves upon actors' choices and in an incremental way leads us to consider that processes are embedded and can be someway induced. At the other side, pragmatism under the way military and civilian officials engage help states to figure out gaps that can be better treated when the obstacles to overcome are more visible than before. Although there is the effect of bounded rationality

of the actors, one must consider that rational and irrational processes make institutions move all the time. Therefore, there are two main considerations to open in discussions: the capacity that simulating has to improve institutions, protocols, and processes, as well as the diffusion of policies that are applicable and useful.

MATERIALS AND METHODS

Agent-based models are a method to exam how individual behaviors have resulted, and how this collective pattern provokes individual behavior. The goal is to look at what the rules are that guide agent behaviors in defense and security, when considering inter-agency practices. We try to figure out macro patterns that can help improve the understanding of the process and opportunities for agents and agencies' engagement.

Therefore, one point is affected by security and defense environments, which is: the model of interaction. Considering it is a policy with a higher level of priority in both under-evolution and established democracies, defense and security are also part of a complex scheme in which both are much more inter-related than they ever have been. As complexity escapes from the researcher's ordinary viewing, the agent-based modeling can help social scientists observe parameters that can interfere in the inter-agencies social dynamics.

The synergies in between agent-based modelling and working with defense and security subjects can be organized from the recognition that micro-relations in the sub-levels of security demands can interact with macro-level strategic settings. Even if policy-oriented, one should consider that this movement is not only rationally conditioned, but in some way, has measurable results. Observing rational and non-rational conditions, organizing those elements into variables and proposing ways for interacting, may facilitate case observation and experimenting with defense and security policies.

Another relevant argument for using agent-based models is the consideration that movements and interactions may be governed by rational parameters. But, at the same time, agent-based models prove that moving parameters smoothly lead results to a completely different outcome. Even taking into account that social behavior is dependent on a bias and non-rational motivation, as long as it can reproduce rationalities, it is positive to reach the minimum visibility to expectations as to achieve policy designing.

There are a growing group of agent-based models that could be used in observing inter-agency behaviors with an eye on the individual and groups' manifestations. Stonedahl, Rand and Uri Wilensky (Wilensky 1997; Wilensky 1999; Stonedahl, Rand, and Wilensky 2010; Wilensky, Papert 2010) are some of the main authors dedicated to building the agent-based modeling methodology and software. Those authors promote the fostering of different ways to apply analysis to agents' choices, whether they represent a high or a lower level of rationality in their decision-making process. Marked by an evolutionary perspective, they observe both the capacity to understanding agents' behaviors and the manners to improve performance evolving decision-making measures and ability.

In this study, we are looking for the agent-based social sciences applications. This is being developed in a slower pace than other disciplines (Ghorbani, Bots, Dignum, Dijkema, 2013), due to the difficulties in inter-subjects' communications, contributions and knowledge overlap. The challenges associated to the general application of agent-based modeling to social conjectures is that it is difficult to use most part of the existent meta-models exactly, because they are not prepared to "include social structures such as norms and cultures" (Ghorbani, Bots, Dignum, Dijkema, 2013).

Accordingly, the main belief presented here is that accumulative behavior is a way to mark paths and orient policy and institutional building. Observing the results from the condition factors, in a manner to guarantee observation of the rules of complex systems, on how they are manifested and advance theory because of the practices embedded. In respect to the modeling part of observing defense and security agents' behavior, the deductive material derived from the practices may represent the manifestation of the complexity involved.

DISCUSSION

Shipan and Volden (2008) advocate that good and bad outcomes can derive from policy diffusion, thriving and contributing to the consolidation of institutional frameworks. Their theory draws on the coercion and imitation hypothesis, which states that outputs create negative and positive externalities that interfere in policy diffusion (Shipan and Volden, 2008, 842). Adherent to the institutionalist approach (Simon 1991), this interpretation enhances the effects that frameworks and structures have into social systems, but do not intend to present how

practices are oriented at the actor's level. A great part of the institutional research was dedicated to observing policy diffusion phenomena from the macro-level perspective, giving less attention to the micro-level space of exchanging and actors' interactions (Simon 1991). Given the assumption presented by Shipan and Volden, the institutional learning process is conditioned by some variables, in which the policy externality factors influence it is striking.

So, this means that processes, as well as human behavior, are manifested by interactions in which reputation and expectation matter. If externality is something which provokes spill overs, inducing behavior as to coordinate actors and externalities may be of high value. The work of Thomas Shelling focuses on the expectations that can be mathematically observed by the principle of maximization of the utility, although based on empirical data of individuals' behavior (Schelling 1971a 1971b; Simon and Schelling *et al*. 1987).

In Economics, the Subjective Expected Utility (SEU) theory has gained repercussion but, through the lens of new institutionalism, has been granted an enthusiastic approach on individuals' choices within routines and institutionalities (Simon and Schelling *et al*. 1987; Di Maggio and Powel, 1983). "How people cut problems down to size" (Simon and Schelling *et al*. 1987, p.13) is about the way people, regardless of the complexity of social systems, make decisions with an amount of rationality. So, there is a perceived trend in the middle of the tendencies, neither for pure institutionalism nor to an individual centered-approach.

The complementary theoretical approach is that of cooperation and complexity. The main scholar, Robert Axelrod, markedly defended that cooperation, even under competition and defection environments, still resists (Axelrod, 1980, 1981, 1997). So, having considered the institutional sign as a path and an individual as an active actor, cooperation may occur under significant change. Since change is part of the institutional progress and individuals are dependent on those frameworks to continuously interact, defense and security are also under the institutional pattern here supported. As part of the governance framework, intrastate coordination is a matter of substantial gaps to the state policy controlling (Beatrice, 1991).

In recent years, Brazil had faced great pressure on internationalization, as foreign policy demands were acting throughout institutions under the states' governance structure. The pressure for internationalization also created necessities for engaging the international

parameters which lie on economic cooperation, reputation, and confidence. The Brazilian foreign policy, historically considered to be an asset of the Brazilian political path, had driven Brazilian reputation to a symbol of trust, stability, and continuity. Although influenced by the turnovers of the political parties and system panoramas, the Brazilian foreign policy was granted by professional state policy. However, this does not mean that it was, especially under democracy, a centralized policy. If it is not true that there is a great significance on the independence of the intrastate institutions in internationalization matters, it is worth discussing that governance in defense and security has been more optimized because of the practices under the foreign policy central institutions.

As a characteristic of the foreign policy, compliance with international protocols, in terms of guaranteeing those decisions inside government structure is substantially low (Jacobson and Weiss, 1995; Simmons, 1998). Nevertheless, internationalization had boosted the viability of states cooperating and integrating efforts and agencies in the lower side of the Brazilian government institutions. Subsequently, initiatives were put forth for agency cooperation intensification, in the distinct instances of the defense and security institutions, focused on federal controlling, at one side, or state/federation, at the other.

A further problem is about the procedures and outcomes to be observed and reported regarding the exposure of different views, behaviors, and effects beyond agency experiences. The quality of knowledge absorbed is not high normally because experiences are not organized in benefit of institutional progress. In this sense, simulations and joint or combined exercises are a common mode to enhance awareness on practices and register them with theoretical scope and value for the future. Although internationalization was governed by the foreign relations office in Brazil (called also *Itamaraty*, referring to the building in which the agency is installed), this was not at the same pace when considering cooperative strategies among intra-state agencies. Up until the Major Events in Brazil (Confederations Cup, 2013; World Youth Journey 2013; World Cup, 2014; Olympics, 2016), practices and legal frameworks were still under development and large scale and complex inter-agency models were not applicable.

Considering this period of growth in the Brazilian internationalization, efforts on simulations for cooperative frameworks were central in the policy arrangements undertaken. While simulation

models were part of the defense efforts to deal with new signs of the XXI century – arms traffic, terrorism, civil crisis, epidemics, political crisis, immigration or piracy - domestic institutions were dealing with this complexity with a lot of insecurities on attributions. Overlapping procedures and the lack of resources to comply with all attributions were evident. Likewise, the Ministry of Justice - from where public security would be governed till the creating of the Ministry of Public Security in 2018 - had important challenges on dealing with subnational and federative scopes, that figures an important grade of independence, even though submitted to federative budget limits and constraints.

Thus, it is important to note the relevance of some of the initiatives that Brazil had coordinated within its federal and federalist structures, and also, those of international participation where the scope is comparable. While Brazil had a lot of incentives to participate in the international sphere of those insecure scenarios, there was also great importance of the agencies participation where Foreign Relations agency could not afford to coordinate. Experimenting with years of budget restrictions, central foreign policy would diminish its participation, giving place to technical cooperation as continuously representing an asset of the Brazilian Foreign Policy. Once resources were limited and institutional conditions were far from being sufficient, this became focused on the controlling of those framework agreements.

Otherwise, institutions not typically beneath security scope were spread and enhancing internationalization in that matter. In the present work, we are going to offer some of the experiences around inter-agency cooperation, from inside to outside of the Brazilian landscape. Based on different institutional ties, we have selected three main cases, as follows: the interagency models and the creation of command and control instances in Rio and the Federal government right before the World Cup (1) and Olympics (2); and the US Coast Guard on integrating maritime procedures and information sharing with the Federal Police and other agencies from Brazil and different countries from America (3).

The common element of those initiatives is that they were consolidated around the understanding that for combatting narco-traffic, trafficking of firearms, human trafficking and smuggling in general, there was a need for protocols and information sharing throughout national and international spheres. The principal agenda was undertaking mechanisms

and upholding combined and joined activities to permit adjustment and focus on problem-solving strategies.

In this regard, putting those practices under observation and figuring out what the improvements around security matters are in terms of efficient experiments. It appears to be a promising strategy to fill in the gaps that central government cannot deal with anymore. Decentralization and technical cooperation in benefit of development and security show a tendency. Bottom-up experiences and initiatives are being spontaneously guided toward internationalization in this sphere. That is why policy diffusion is proposed within the lens of practices and creating institutional robustness for the next challenges.

The need to expand and deepen inter-agency relationships in decision-making processes is one of the most important guidance for crisis resolution and/or prevention. States have adopted improved techniques in the conceptual understanding and combined work of agencies, as a mechanism of greater efficiency against threats that act within the national context and that suffer interference from the international environment.

In this way, governments have stimulated joint actions among agencies to stimulate and accelerate the decision-making process about a certain situation, that operates within a possible theme or region, but which is linked to a possible more severe crisis. Establishing those mechanisms seems to be a method to speed up control, rationalize costs, and reduce the risks of actions under security and defense spaces.

Therefore, we suggest that national security is the appropriate conceptual framework to express those interferences on the domestic security scene, derived from outside and more importantly related to those challenges involving national states temporarily. Inter-agency initiatives do evoke and aggregate some practices that can be seen as matters of figuring out forms of dealing with those moving challenges (Bardach 1998). Homeland Security directly reverberates not only in understanding, but more concretely in practices, processes, and structures of both public security and national defense, as shown in the figure.

In the last decade, the state has undergone transformations and reforms. Within this framework, are the approaches that advocate the constitution of political structures that enable the effectiveness and efficiency of public policies (Wallner, 2008; Simon, 1991). In the case of national security in Brazil, the reform process initiated in the 1990s is the result of systemic pressures in the post-Cold War environment, as well as the need

for adequate processes and practices to enabling appropriate responses to the contemporary challenges imputed to States (Raza 2002, Paiva 2016).

In the post-Soviet collapse, the security agenda became more comprehensive and multifaceted, given the complex reality of the new international order. If, in the context of the Cold War, the source of threats arose from the conflicting nature of the inter-state relationship in the international environment; now the problem of security is projected beyond pure inter-state relations being over-influenced by the globalization process.

In this context, threats would be configured in two ways: they surpass the boundaries of the nation-state and they are interconnected through processes of globalization. No state can manage the array of threats to its own security, nor can anyone manage the threats to the security of its neighbors, both inside and outside its region. (Burgess, 2007).

If it is increasingly difficult to establish an intelligible conceptual distinction between global and national aspects of security, then the roles and missions of the armed forces can become even more challenging. In this sense, a process of changes in the functions of the armed forces is emphasized, in both domestic and international levels. Beyond borders, the international environment has undergone significant changes that have transformed the security outlook. Nowadays, state stability is no longer seen exclusively within the territorial limits, but from a regional logic. Subsequently, security problems have become problems of a regional and global nature.

Of course, the new goals in the area of security eventually demanded new forms and patterns of engagement by security actors; a fact that contributed to the reassessment of the foreign missions promoted by states and international organizations. Since traditional methods of external defense, such as deterrence, can no longer be applied as before. Examples such as the Gulf War have reinforced the need to update military and national security strategies (Steveson, 2006).

Thus, it is clear that the global approach to security requires reforms that include new methods and tools. However, the implications for the state in promoting external security remain unclear. In any case, it is now known that military commands require different forces from those used in past conflicts, and although technical aspects are indispensable, new equipment and training are required in the face of the novelty of postmodern conflicts. After all, it is necessary to strengthen the coordination and cooperation of

the various security agents in the different theatres of operation, that is; the soldiers should cooperate with the police units and with civilians, even in specific cases acting as substitutes for them (Weiss, 2011). This is in the case of environmental disasters and peace missions, which involve internal and external security interests (Kapucu, 2006).

As national security institutions, the literature considers all the institutional arrangements that are part of the work on behalf of security under a given state; thus, the federalist part of the arrangement is case by case threatened. Also, standardization is a natural tendency for making institutions capable of dealing with Transnational Organized Crime using the same parameters. This means the criminalization of practices in a normative framework are dependent on information sharing and common understandings (Lemieux, 2013). It is worth noting that there are aspects from both legal and illegal economics in place, as there is a more contemporary view of the criminal actors and processes not out of the society – previously considered aliens - as Beare and Naylor (1999, p.10) stated: "it is the interwoven aspects of organized crime that makes it so difficult to detect and control".

If there is something about planning on theoretical paradigms, it is also of importance to those experiences that matter to the ongoing plans and projects inside state agencies. Practitioners are a huge source in what is the memory of some of the changes and some of the routines that interfere in the possibility of good practice. In this respect, international police cooperation is markedly in the literature as one of the best practices in terms of reachable outcomes (Lemieux, 2013).

> "Valid and timely information sharing is also critical in emergency response operations. Hierarchical networks can work efficiently during routine operations, but they function very poorly in dynamic environments of emergencies". (Kapucu, 2006, p. 208)

An important range of organizations, in both the Global South and North, allow us to observe the precarious or underdeveloped framework from a low budget and low control, to complex institutions within high standards of bureaucracy. Even though there are common architectures and ways of governing defense and security matters, one of the main challenges is to build the adequate structure, as to permit the better acceptable governance and process in dealing with the demands. Thereby,

the political legitimacy is derived from both the governing structure and planned fundamentals, as well as it can be offered by the good functioning of the procedures, processes, and instances.

That is the reason those efforts involving agency improvements and preparedness is considered a way to certify the surveillance of those practices, in building memory and spreading actionable plans (Shipan and Volden, 2008). So, first was the need to select the cases in which inter-agency is the archetype process; the challenge is the observance of the absence or the existence of a rationalizable framework for the interaction of the actors. In this perspective, we have selected different experiences of simulating or integrating security and defense forces, due to specific requirements.

RESULTS

The experiences observed here represent a selection of initiatives that deal with security and defense challenges, figuring as common threats and destabilizers of the national, regional and international scenes. As Bardach (1998) stated, there is a group of practices that revel the state of the art of the common ground in between agencies. The experiences chosen are all internationally driven, although they represent different patterns in each one of the cases. Seen in this perspective, the inter-agency cases observed are part of different attempts to put down vulnerabilities which can also be shared.

The first case observed is the inter-agency cooperation simulation, which was part of a project (2011) from the Rio de Janeiro Civil Police Academy (Acadepol) for the preparedness of the police forces in an integrated manner and focused on the events of the World Cup, which would happen in 2014. A year before, the World Youth Journey also gave reason to the investments for the institutional reviewing on what would be the most important stakes and how the state agencies should move forward on capacities and strategic plans. Even though there was no central guidance for this planning, preparedness initiated with some proposals around the possibility of terrorism, with a committee dedicated to this study and coordinated by the Rio de Janeiro Public Security Secretary.

These movements led to the Civil Police Academy to organize the first experience integrating private and public security representatives, including from outside of Rio de Janeiro, in what they called Cogest (*Curso de Capacitação de Operadores em Segurança de Grandes Eventos e Segurança*

Turística); the course on the capacitation of security operators for the major events. As with the responsibility of promoting protocols and diminishing differences among agents, in terms of the understanding of the attributions and scopes, more than a suitable course was to gather backgrounds and offer the possibility of an academic integration, which appeared to be unique and with lots of compromise and liberty.

Not only were they submitted to a simulation on projecting a common action plan for a case, which would evolve during the simulation, but the agents were asked to propose their scopes of action in those designed plans. Up until 2014, there were differences of official's training reaching a total of 2000 agents that participated in the initiative - which moved the way the academy would deal with its defiance. Exposed also to "on the ground" simulations involving chemical attacks or bombs in a soccer stadium, actors would also compose networks, which are still in course as created in the period.

The second experience which is here observed was the Olympics preparedness, based on the defense forces coordination of the public security of the events (2016). In this scene, special work groups took place to temporarily govern structures on behalf of a unique plan of security and defense during the Olympics. Inside this framework, the Brazilian Navy coordinated a special workgroup on guaranteeing efficiency in the ground, from the strategic to the tactical levels, and also, making the ties in between the main actors in the ground possible and tuned up. With the responsibility of controlling the principal part of the coast of Rio de Janeiro, the task force objective was to measure its capacities in what was reached as the more probable cases.

The nature of this cooperation dilemma would be a matrix, when evoking police institutions together with defense ones, but also, hierarchical, based on the needs in terms of preparedness from the strategic to the tactical actions. Coordination, therefore, was the utmost concern in boosting Brazilian capacity of guaranteeing a major event without incidents (which was already rare in the case of Olympics). As an output of the simulation, there was the evidence that the higher the position of the official, the more cooperative the decision-making process tended to be, showing possible challenges when the matter would touch the lower levels of decisions, in terms of legal frameworks and protocols.

The third case for this article is the summit sponsored by the United States Coast Guard and the Federal Police, in Brasilia (2015), in

which many agency representatives from various countries were sharing normative, protocols and cases on behalf of renewed practices in combating transnational crime, considering those already in place. Organized by subdivisions in themes and practices, participants could dialogue with the partner, with provided space for bilateral or multilateral meetings that could provoke new arrangements in the future. So, actors experienced a huge group of examples and knowledge, trying to bridge the gaps they observed in their own institutions and countries. Face to face meetings evolved with very experienced officials that could guide processes and suggest new forms of sharing and debating for the next meetings.

The material prepared before, and the after-action report were part of a memory that could reveal others' experiments, for the participants that made different choices of themes and practices. It lays on the United States Coast Guard, as one of the actors in the most complex defense and security scheme, the responsibility to govern and promote those initiatives on maritime security in America, with different covers and approaches, including the participation of those agents invited by them to other regimes.

As it could be seen, the experiences mentioned above are a quick glance on different sources and types of information sharing in terms of inter-agency cooperation; making viable the detection of models and parameters that can leverage future experiments in security and defense matters. Although inter-agency processes can be temporary or permanent, we could observe neither a hierarchical development model or a supranational instance development model as the types organized by Raza (2012). However, there is an effort of dealing a network structure from all those cases, as it is stated by the author's network decision model. The analysis of convergent models of governance in the cases, in terms of the learning process and problem-solving guidance, seems to be important evidence. While focused on the NATO experiences on driving coordination, the Raza (2012) network model can be observed out of a military alliance scope.

Thus, the analysis of what diverge and converge in different models of governance, on inter-agency cooperation was initiated considering some questions. Those questions mark what we consider the most important variables to be observed, as to permit comparison at the same pace. So, we name and number each experience accordingly, and structure variables based on the questions, as shown below.

Table 1: Cases Analysis

	Experience 1 World Cup	Experience 2 Olympic	Experience 3 MCDS
What is institutional Nature?	**Simulation**	**Simulation**	**International Summit**
What are they looking for/	**Homeland Security (Defense and Security)**	**Homeland Security (Defense and Security)**	**Maritime Counter Drug**
What are the procedures, processes and instances?	**Interagency/ International**	**Federative level**	**Federal Level**
Is there institutionalization?	**No**	**No**	**Yes, but low**
Who do they work for?	**Policy Academy (sponsor) Security Forces**	**Brazilian Navy (sponsor) Defense and Security Forces**	**US Coast Guard and Brazilian Federal Police Armed forces from American Countries, Embassy representatives from other counties**
What are their assets?	**Command and Control Institutionalization**	**Resources and Coordination from the Defense Ministry agencies**	**Exchanging and sharing of practices**

Chart 1: Lessons learned from the experiences

Experience 1	Experience 2	Experience 3
(-) Lack of shared protocols (-) Lack of shared terminology (-) difficulties in understanding the missions and roles of each defense/security force (+) initiatives like this can improve the practices of cooperation and coordination in between the parts in the strategic, operational and tactical level	(-) Lack of shared terminology (-) difficulties in understanding the missions and roles of each defense/security force (+) initiatives like this can improve the practices of cooperation and coordination among the parts within the strategic, operational and tactical level	(-) Lack of shared terminology among international agencies (+) initiatives like this can enhance trust among the partners (+) initiatives like this can improve the practices of cooperation and coordination among the parts in the strategic, operational and tactical level

It is possible to note in the three cases observed there were a lack of shared terminologies and/or protocols, which means the absence of policy-oriented documents and frameworks in different types of complex inter-agency scenarios (Bach, T., B. Niklasson and M. Painter, 2012).

At the other side, all the initiatives seem to represent the actors' confidence in making better processes to be incorporated in the long term. Likewise, recognizing that those initiatives are also international policy diffusion, from the typification that incurs from pressures for law enforcement against TOC - as observed in the Canada case from Beare and Naylor (1999) - practices are always particular (Adeleye 2011), and can benefit specific cases in policy developments such as in the Brazilian cases.

Malone and Crowston (1990) advocate that it is possible to design tools based on intuition and common sense. But, for them, there is a gap between the theories of cooperation and coordination and the advancement in building useful models to preparedness and institutional adaptation and change. Defending an interdisciplinary use of tools and theory, Malone and Crowston (1990) perceive the lack of cooperative frameworks as proportional to the absence of support, from the theory and practices to the tools developers. If coordination is about the ways to improve behaviors on behalf of cooperative functional schemes, designing the proper instruments may transform institutional adaptation and interaction in a more harmoniously process.

For this, one of the proposals is to make it possible to transform practices into theory through observation, detecting patterns to be registered and surpassed into norms and policies. Coordination theory is about it – the scheme to propose solutions and arrange processes into effective tools to guide them.

Coordinating may be used when actors have the same or conflicting goals but are even more effective where the long term is supposedly part of the goals. The Malone and Crowston (1990) proposition to the creation of coordination tools is associated with the tracking of common objects, which can be found by the observation of practices. Though efficient practices can be observed, there is the need for their observation objectively, as to provoke practice building policies. So, if the first step is observation and tracking common parameters, the next step would be representing norms creation to test them. Organizing the cooperative efforts and putting them into testing may be another step to observation.

Reaching the ABM studies, we found it a useful manner to continue the practices observations and lessons learned through a different lens. Using Malone and Crowston's (1990) process proposition, for underlying coordination, permits us to transfer the 4 grounds/steps to coordination into a scheme of observation. Next, contrasting those results to modeling behavior by AMB, may correct and qualify the motivations better, whether they are natural or rationally manifested. So, if the grounds/steps are (1) actors and objects definition, (2) their interaction through communication, (3) the groups behavior and decision-making, and (4) coordination as to order, synchronizing and assigning activities, there is the frame to apply it to ABM.

Considering the inter-agency cooperation for security as a particular social system, MAIA was proposed as to permit institutional analysis under ABM (Ghorbani, Bots, Dignum, Dijkema, 2013). Emergence is a very important concept using ABM because the main belief is that one cannot consider, in the case of absorbing practices in inter-agency, without simulating. The emergent properties are the core elements to achieve coordination in the level expected, as above mentioned. So, building simulations to enable testing practices, as in the cases used in the paper, can be one of the ways to the emergence of patterns. ABM, then, can be a second possible choice to observe patterns that are not governed by the individuals, but as a result of their interaction.

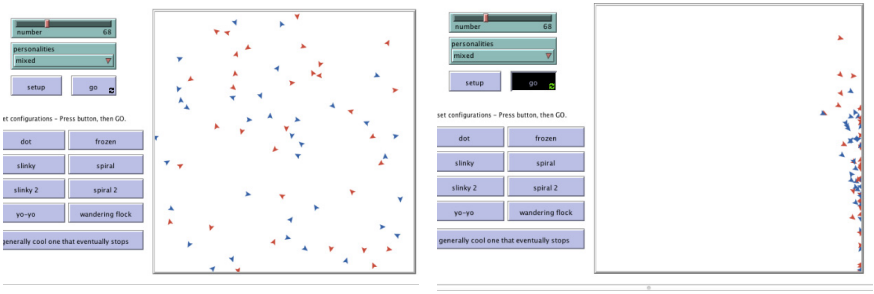
Comparing the coordination scheme, above cited, to the steps used by Ghorbani et al. (2013) to qualify Institutional Analysis Development framework (IAD) at its application to ABM. There it is: the initial phase of underlying social systems structure; capturing the operational environment; and, catching interaction. Those phases are part of the main goal which is returning to the system to permit it to evolve (institutional change). The difference in aggregating IAD is that aspects of the social contexts may be included in the analysis and will therefore be considered for the outcome and feedback.

Thus, those schemes seem to be absolutely compatible between them, moving into a circle of institutional change. Policy diffusion is, then, the result of the feedbacks and signs of progress. For modeling ABM based on MAIA, actors (as agents) may have introduced properties, personal values, information, intrinsic behaviors. Those characteristics make ABM more complex and more achievable, when the decision-

making process is made of social properties that can be defined but are naturally hidden or out of observance.

One of the principal agent-based models is called the *Cowards and Heroes* model. Picking up the model to introduce ABM to the cases here presented, we advocate that looking for the *Cowards and Heroes* model may permit to evolve conceptual frameworks adapted to what Ghorbani et al (2013) proposed, in respect to the cases here observed: inter-agency processes, practices observation, decision-making and policy diffusion in security matters. Originally developed under the *NetLogo* project, from the Santa Fe Institute (Wilensky 1999), the *Cowards and Heroes* model is about the way choices provoke movements among individuals and produces collective repercussions. Those choices are basically devoted to avoiding the enemy; using the friend as a barrier or protecting the friend against the enemy. Identifying each other as friend or enemies is also about the concept of defining perceptions and its results to the collective behavior.

Figure1 and 2: NetLogo Heroes and Cowards



In the three cases mentioned, there are actors defining and choosing better partners because the processes are more intuitive than policy oriented. Also, practices can enhance trust, such as in the case of bilateral relations between different countries (experience 3). In the *Cowards and Heroes* model, there is a kind of stabilization when there is a limit, like a wall, comparable to a temporary or limited inter-agency framework. Last, continuity in simulation provokes better achievements that, in the long term, could be considered as stable.

On the other hand, one important component that could push back the model-observation in the inter-agency cases is that of the common objective, which is not always clear for agents in cooperation. So, the better

practices and rules are internalized, the less the *Cowards and Heroes* would be applicable because of the dual behavior considered. However, at the same time, it is not possible to consider cooperative games without defeat.

Nevertheless, there are other created models that can serve to transfer knowledge to the inter-agency social system. This can be done using some of the types already used in ABM like the network models; to observe policy diffusion, and spatial models, to observe behaviors and consequences in the ground. According to Prof. William Rand, from North Carolina State University, there are elements demanded from the designers of the simulations, which are based on the complexity of the agent's decision-making process, the amount of computational power you can access, and the number of details in the environment (Rand 2018). Those elements, therefore, may condition the modeling of an interagency case, as the three mentioned experiments in what they reveal have an unexplored environment rationally organized to predict tendencies.

So, even considering inter-agency cooperation, coordination is dependent on trust, the individual view of the processes, behaviors, perceptions. As a result, if individuals are not always rational, they have bounded rationality which is an important basic premise that configures also the uses of ABM, as part of this way of understanding economic and human behaviors (Arthur 1994). The ABM use proposed seems to be appropriate to the inter-agency institutional development, as its set on the belief that simple rules create complexity and complex patterns can organize themselves without a coordinator, representing a collective manifest of individuals' choices. This is about comprehending institutions limits and learning how to deal with constraints and variables that are individual or collectively pushed. There reside the adaptive complex systems (Arthur 1994) and the inter-agency case relations.

FINAL REMARKS

This paper is part of research on how inter-agency experiences of governance in defense and security can enhance the knowledge and models on behalf of public policies. We believe that the most present characteristic of insecurity problems affecting the theme is the nature of the inter-agency relations that limits policies over the sector. In which, it is of utmost importance that the different levels of government and agencies can deal with each other with progressively fewer gaps.

If those experiences on inter-agency cooperation in security can leverage the types of managerial tools at the disposal of agents, nevertheless, it can continuously be overshadowing the less significant of its achievements, as they are not visible. Moreover, from the bottom side of the demands, the regimes configured by inter-agency cooperation may have an interesting impact – considering their structural differences – and can be sensed on the various gains derived from the refining of the processes in between institutions. Whether movements for the creation of routines or emergency focused, the regimes imbalance is not more important than their achievements on the importance of process, protocols, and communications in different parts of the government and outside of it.

So, if the first argument of the paper is about the observation on what those architectures smear, some processes of coordinating agencies responsibilities in terms of their legal, financial, material and human apparatus models, the second argument is about them adding to security and public policies permanently. Regimes diversity has markedly been a way to thrive difficulties and guarantee that objectives can be feasible, even when limited. As observed here, the more thematic and rationed onto focused ranges, the better it can impact in small proportions, making viable spreading to agencies, forces and other scopes of the security managing structures.

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POLICY DIFFUSION POR MEIO DE SIMULAÇÕES DE DEFESA E SEGURANÇA E OS USOS DA MODELAGEM BASEADA EM AGENTES

RESUMO

Este artigo trata de três elementos: simulações de cooperação entre agências com profissionais de segurança e defesa como atores; difusão de políticas como forma de ganhos inovadores e incrementais, utilizando práticas e observação de comportamentos; e modelagem baseada em agentes como uma ferramenta para aprimorar o desempenho, observando tendências e adquirindo mais visibilidade dos processos e práticas imbuídos. Para isso, a primeira parte do artigo está focada nos usos da literatura que expressa os comportamentos do processo de tomada de decisão como parte fundamental do processo de institucionalização em termos de cooperação. A institucionalização adaptativa é o elemento central dessa abordagem; em que acreditamos que a difusão de políticas pode derivar progressivamente e de maneira incremental. Em segundo lugar, apresentaremos os casos de simulação entre agências com os quais trabalhamos como parte de um esforço interinstitucional; pesquisar esses laços e propor novas formas de arranjos e possibilidades de aumentar a eficiência dinâmica do setor, observando os casos e os exercícios escolhidos na modelagem baseada em agentes (ABM).

Palavras-chave: Simulações. Modelagem baseada em agentes. Processo decisório.

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