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■ *Research Paper*

Conflict Theory, Complexity and Systems Approach†

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Since the end of the Cold War, we have been witnessing the emergence of new types of conflicts. These are progressively more complex, but are, still too often, conceptualised and approached simplistically, using a linear type of reasoning. Complexity is disregarded, and the need for systemic thinking is underestimated, not rarely leading to disastrous results. Feedbacks are most often ignored, and the complex dynamics which make a conflict to change over time, following often unpredictable paths, are rarely taken into account. A shift from a precomplexity mindset to a mindset founded in an understanding of complexity is necessary. In the paper, using concrete examples, we will try to show how a systems thinking approach is essential to analyse today's conflict, to prevent them, and to act so as to make them develop along non violent constructive paths rather than along violent destructive ones. Copyright © 2012 John Wiley & Sons, Ltd.

Keywords conflict theory; systemic models; critical systems thinking; complexity

INTRODUCTION

A conflict is a special kind of system whose complexity stems from many different and sometimes unrelated elements. On the one side, there are the parties involved in the conflict. If it is true that there are cases in which the parties are just two (or even one, in the case of a dilemma), most often the parties are many, with intricate relations between them. More importantly, there are often multiple and diverse objectives. Some may even be hidden, not defined once and for all, and may evolve over time. This is almost always the case in conflicts arising between different groups within a country or in international conflicts. These are the types of conflicts we will be dealing with in this paper. On the other side, each conflict does not arise in a vacuum, but in a context, local, regional, or international, a context that may be changing over time and has often unforeseen effects on the conflict's structure and parties. Another important fact that is too often disregarded is that a conflict does not end simply when violence is stopped or when a satisfactory compromise between the parties is signed. Ending a conflict in a real and stable way implies the construction of a lasting peace, which is something daunting and difficult to obtain (Bartolucci and Gallo, 2010).

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In spite of all this, too often when a conflict is analysed or when decisions about an actual or potential conflict are taken, the kind of reasoning that is followed is simplistic, linear, to say the least. Complexity is disregarded, let alone the need for systemic thinking. That is true both at a level of theoretical analysis and practical decision making, as it is shown by Pinzón and Midgley (2000) in their analysis of the theoretical frameworks which are used to evaluate the results of a conflict. This is something that has relevant practical consequences: in fact, the way a conflict is approached is shaped by the criteria used to evaluate its possible outcomes. Pinzón and Midgley illustrate, by means of a detailed analysis, how the evaluation framework that prevails in some areas of the conflict resolution literature, particularly in negotiation and mediation theory, is based on a reductionist and quite narrow conceptual paradigm, and propose a new framework on the basis of a systems approach.

Here, we will try to show how a systems approach is essential for a correct understanding of the characteristics and of the dynamics of a conflict and, as a consequence, for the decisions that are taken within a conflict. Without a systemic and holistic framework, decisions may worsen the conflict, resulting in increased and prolonged suffering for the involved populations, and the analysis may lead to poor and misleading understanding of the conflict's dynamics and perspectives. To make clear this last point, we present next two cases, which can be considered as typical. One has to do with the 2003 Iraq war, the second with an older conflict, operation 'Peace for Galilee', that is the Israeli invasion of Lebanon in 1982.

Iraq War

In 2003, the US and British forces invaded Iraq and, over a 3-week period, succeeded in overthrowing the regime of Saddam Hussein and occupying the whole country. Triumphantly, President Bush claimed that the invasion of Iraq had marked the arrival of a new era. The feeling of novelty brought by the American victory is well expressed by the emphatic words of Max Boot, an American political analyst. Shortly after the end of the military operations, he wrote in *Foreign Affairs*: 'That the USA and its allies won anyway and won so quickly must rank as one of the single achievements in military history. This 3-week campaign will be studied and debated by historians and military analysts for years to come' (Boot, 2003). Actually, not everybody shared such a feeling of enthusiasm. Kenneth N. Waltz, in a letter to the editor of *Foreign Affairs*, published on the September/October issue of the same year, is sharp in his judgement: 'Iraq entered its most recent war with its military strength at less than half of its 1991 level. Why then does Boot find it impressive that the USA and the UK won with about half the troops, in about half the time, and with about half the casualties of the first Gulf War? In 2001, Iraq's gross domestic product (GDP) was about $15 billion and its defence expenditure $1.5 billion. US GDP was about $10.2 trillion and its defence expenditure $322 billion. For a giant to defeat a pygmy hardly tests a country's military prowess or validates a "new way of war"' (Waltz, 2003). Waltz challenged the idea that the victory was something extraordinary and of great significance, but he did not contest the fact that a victory had been obtained. Now, after more than 9 years, we are in a better position to see how elusive that victory had been. In Figure 1, the monthly coalition military fatalities are plotted from the beginning of the war to the end of 2011.[1] It can be observed that, in spite of the early victory proclamation, fatalities have started to grow, hitting quite high values for several years. Only in December 2007 did they drop below the level of 40 per month. And in 2010, we still had between four and five deaths per month. The behavior of the civilian deaths is similar, but for the scale which is from 10 to 30 times higher. The civilian deaths due to gunfire, vehicle bombs and suicide attacks today, after the US troops withdrawal, are still of the order of hundreds per month.[2]

[1] The 'smoothed casualties' have been obtained by sliding window averaging, with a 5 months window.
[2] See the site *Iraq Body Count* (http://www.iraqbodycount.org/).

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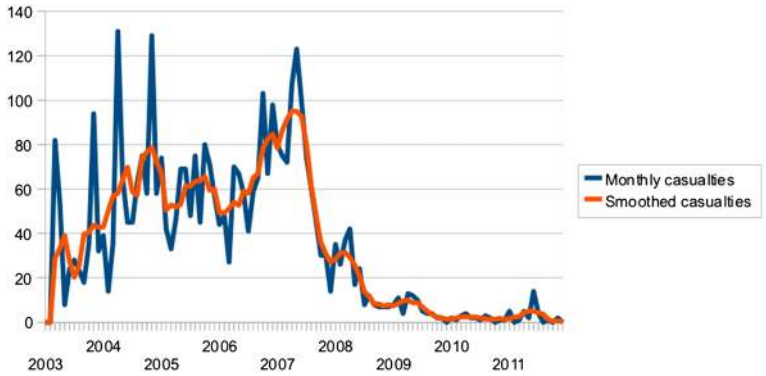

Figure 1 Monthly coalition military fatalities in Iraq from March 2003 to December 2011

Peace for Galilee

In 1982, the Israeli government wanted to get rid of the Palestinian Liberation Organization (PLO), whose headquarters were then in Lebanon. The main aim of Sharon, at the time Defence Minister of Israel, in launching the so called operation 'Peace for Galilee', a full scale invasion of Lebanon, was to destroy the PLO's military infrastructure in Lebanon and to undermine it as a political organization, so as to weaken its influence on the West Bank Palestinians.[3] The war was harsh, with heavy losses on both sides. At the end, it 'had cost Israel 660 deaths, had exacerbated its economic difficulties, subverted the national consensus on security, and tarnished Israel's image abroad' (Shlaim, 2001, p. 427). Actually, the PLO was dislodged from Beirut, but it did not take too much for it to reorganize in Tunis, and it was only a matter of a few years for the Palestinian front to become hot again with the start of the first *intifada*. Furthermore, a completely unforeseen effect materialized: the birth of a new and more formidable adversary, the nationalistic Islamist movement *Hizballah* (Party of God). With Iranian and Syrian support, 'Hitzballah steadily pushed Israel out of Lebanon, first to a security zone along the border in 1985, then completely out of Lebanon in 2000. After Israel withdrew, Hizballah remained a threat, supporting Palestinian fighters, launching rocket attacks, and kidnapping Israel soldiers—actions that led to war in 2006' (Byman, 2011, p. 9). This last war has been the only one waged by Israel after independence when the enemy, through the launch of rockets, was capable of striking targets deep inside the country. In addition to 121 soldiers, 43 Israeli civilians died in this war, whereas 1200, mainly civilians, had been the casualties on the Lebanese side. The shortcomings that have characterized Israel's counterterrorism operations, including a disregard for long-term planning and a failure to recognize the long-term political repercussions of counterterrorism tactics, are analysed in depth by Daniel Byman (2011).

[3] A second objective was to help Bashir Gemayel, the chief of the Phalange, one of the Maronite militias, to become Lebanon's President, so to arrive to a favourable peace treaty with Lebanon.

CONFLICT AS A COMPLEX SYSTEM

The two cases presented in the preceding section are typical examples of linear and mechanistic thinking. Conflict, instead, is a very complex system, with adaptive structures and evolutionary mechanisms. It is a system composed of interconnected parts that, as a whole, exhibits properties which cannot easily be understood only by dissecting and analysing the properties of the individual components. A deep understanding of conflicts requires, on the one side, a system thinking approach, and, on the other, the confluence of many social and scientific disciplines.

Key elements in system thinking, which make it very different from a linear type of reasoning, are as follows:

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- Boundaries definition.
- State and activity variables.
- Causal loops and feedbacks.
- Multiple interconnected subsystems.
- Delays.

All these elements, which are typical features of a system structure, are present in conflicts, and make them so difficult not only to solve but also to analyse. All these elements will be presented in detail, with reference to conflict modelling, following this section. Instead, the next two sections will deal with two characteristics of a system which derive from the structural elements described here. Finally, in the section on Modelling Conflicts as Systems, some challenges one cannot escape in conflict modelling are discussed.

System's Boundaries

'The boundary concept lies at the heart of system thinking: because of the fact that everything in the universe is directly or indirectly connected to everything else, where the boundaries placed in any analysis becomes crucial' (Midgley, 2000, pp. 128–29). In fact, systems are not the reality; they are rather social constructs, logical conceptual constructions, which are the result of the interaction between our culture, perspectives and objectives on the one side, and the reality on the other. It is us who define the system and its boundaries, that is, which variables are to be included in the system and which are not.[4] Considering the boundaries explicitly is a way to bring the context into the analysis, which is essential if we are to devise successful resolution strategies for a conflict. Unfortunately this is rarely done, as pointed out by Monty Marshall (1999, p. 5): 'Most conflict research and conflict management techniques assume some form of systemic closure to simplify the inquiry and isolate the problem events or processes from their general systemic context (i.e. focus on the opposition and discount external influences)'.

The Peace for Galilee case is a typical example of poorly chosen boundaries. The boundaries drawn by Ariel Sharon included only the Israeli army/government and the Palestinian leadership, which are the main institutional actors. He did not fully appreciate how strongly rooted in the Palestinian population the nationalist feelings and the consensus toward the PLO were, and how articulated and strong the Palestinian resistance was. Moreover, the complexity and the extreme fragmentation of the Lebanese society were completely disregarded and so were the subtleties of its politics. But also, the full implications of the war on the Israeli society were underestimated.[5]

The choice of the boundaries shapes a conflict and has deep effects on how we tackle it. Boundaries have many dimensions:

- *Physical*—Land is the most typical case, but there are also several kinds of resources, such as oil, water, minerals, access to the sea and others.
- *Temporal*—This dimension is, for example, linked to the question: How far do we have to go back in defining the conflict? The answer to such a question can determine the way the conflict is shaped. For instance, in the Israeli-Palestinian conflict, we may consider the conflict as having started with the 6-day war (1967), or with the independence declaration of Israel (15 May 1948), or even before. The choice has deep consequences, among others, with respect to the refugee issue.
- *Symbolic*—For instance, the symbolic value of Kosovo for Serbians. Kosovo region has been at the centre of the Serbian empire until the mid-14th century, and still, Serbians regard it as the birthplace of their nation. Without reference to the symbolic aspects, it is impossible to fully understand the Kosovo conflict between 1998 and 1999.
- *Ethical*—Some aspects in a conflict have ethical implications that cannot be disregarded. The ethical implications of the boundary choice are well illustrated by Pinzón and Midgley (2000) with reference to the Colombian guerrilla conflict.

[4] Variables, which are left outside of the system, are either not relevant with respect to our objectives and to our understanding of the system, or are considered as constants, that is, they influence the system's dynamics, but are not influenced by them.

[5] The deep scars left in it by the war are the object of the film *Waltz with Bashir*.

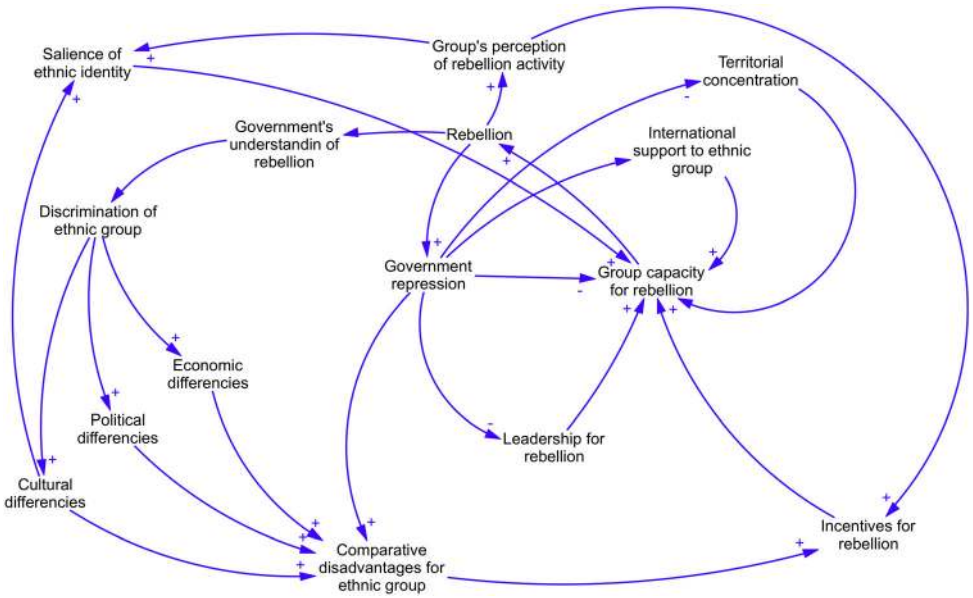

Figure 2 The dynamics of ethnoterrorism (Ackam and Asal, 2005)

State and Activity Variables

It is well known that after the end of the Cold War, there has been an increase in the number of ethnopolitical conflicts. The *Minorities at Risk* (MAR) project, initiated by Gurr in 1986 (Gurr, 1994, 2000), examines and documents the status of ethnic and religious minority groups in all the countries of the world over the contemporary period since 1946. The number of minority groups that the project has studied has been growing during the years: from 227 in 1990 to 284 in 2003. One of the objectives of this analysis has been to develop a theoretical framework of the causes of ethnopolitical conflicts to explain these social phenomena through causal mechanisms. A system dynamics model based on Gurr's work (Ackam and Asal, 2005) is given in Figure 2.

Analysing this model, we see a certain number of loops describing the main dynamics in an ethnic conflict.[6] For instance, the rebellion may lead the Government to try to understand the roots of the ethnic group's grievances and to act in order to lower the discrimination, trying for instance to reduce the economic differences. That in turn reduces the comparative disadvantage of the group and hence the incentives for rebellion. Note that there is a difference between a variable such as 'rebellion' and a variable such as 'economic differences'. The former has to do with an activity, which can be performed or not, whereas the latter has to do with a structural aspect of the situation, something that does not correspond to a specific action performed by one of the actors, and hence something that cannot be set to zero just by a decision. A decision can instead be taken to stop the conflict, at least in principle. The former is what we call an *activity variable*, whereas the latter is a *state variable*.[7] Another example of state variable in the ethnoterrorism model is the 'salience of ethnic identity', although it is a state variable, it is different from 'economic differences', in the sense that it does not represent something concrete and easily measurable, but refers to the attitudes and the deep feelings of the people involved. State variables are those that define the structural

[6] In the model, the standard notations used in system dynamics models have been used. An arrow with a '+' sign from variable *A* to variable *B* means that a variation in the value of *A* induces a variation in the same direction in the value of *B*. On the contrary, a '−' sign indicates that a variation in the value of *A* induces in the value of *B* a variation in the opposite direction.

[7] Sometimes, activity variables are called *flows*, and state variables are called *stocks* or *levels*.

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aspects of the conflict. Analysing such structure, we can understand which state variables need to be changed to get to a sustainable solution of the conflict, and in which direction the change is needed. But, the only way to obtain the change is through the activity variables.

There are interesting analogies with one of the classical and most known conflict paradigms, that is Galtung's *ABC* triangle, depicted in Figure 3, where *A* stands for *Attitudes*, *B* for *Behaviour* and *C* for *Contradiction* (Galtung, 1996). According to the *ABC* triangle, a conflict is defined by three main elements, the contradiction, which is the concrete object of the conflict, the behavior of the different actors, and their deep feelings, the attitudes. A conflict cannot be solved, or better transformed to become constructive instead of destructive, unless we tackle all the three components at the same time. It is interesting to see that, in our systemic paradigm, attitudes are essentially state variables (e.g. 'salience of ethnic identity' in our example), whereas behaviors are essentially activities (e.g. 'rebellion'). Less direct is the interpretation of the third component, contradiction; usually, it refers to something that can be represented as a set of state variables ('economic differences' in Ackam & Asal's model is one of the components of the contradiction).

The systems paradigm and the *ABC* one are clearly different, the former being dynamic whereas the latter is quite static, but they are complementary. The *ABC* paradigm may provide the broad framework within which the conflict is analysed, the boundaries are chosen, the main variables and the relations among them are defined, and eventually, the model is built.

Causal Loops and Feedbacks

Causal loops and feedback are typical of complex systems and are at the basis of the difficulty to devise the right actions to bring a conflict to a solution. For instance, in the model of Figure 2, we can find different such loops. As an example, 'rebellion' of ethnic groups brings the government to respond with repressive actions, but those same

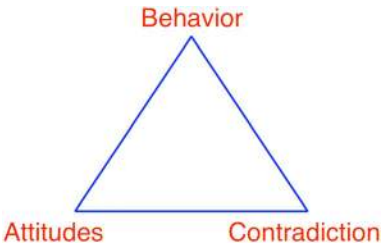

Figure 3 Galtung's ABC paradigm

repressive actions have the effect of exacerbating the 'comparative disadvantage of ethnic groups', which in turn props up the 'incentives for rebellion' and, through the 'group capacity for rebellion', the rebellion is strengthened. There are also negative feedback cycles: as examples, the repression and hitting the leadership of the minorities may reduce their capacity of planning and implementing effective actions against the government.[8] If this negative cycle is dominant then the repression will be successful (at least in the short term); otherwise, it will fuel the violence.

An interesting analysis of the repression–rebellion cycle is contained in a paper by Kress and Szechtman (2009). Their model, based on a set of differential equations, is focused on the role of intelligence in counterinsurgency operations. In insurgency situations, governmental forces are confronted by relatively small guerrilla groups dispersed in the general population. For effective counterinsurgency operations, good intelligence is required. In fact, poor intelligence not only makes easy for the rebels to escape unharmed and continue violent actions, but collateral damage caused to the population from poor targeting may generate resentment against the government and create popular support for the insurgency. Here, the cycle derives from the fact that intelligence effectiveness can be considered an increasing function of the strength of the governmental forces deployed, but also of the size of the insurgency forces: the more the insurgents are, the easier it is to get information about them and to locate them. A high effectiveness of

[8] This has been, for instance, the case of the 1936–1939 Arab revolt in Palestine. The result of the British repression was that 'the community in Palestine remained in effect leaderless. The British had effectively destroyed the nationalist notables' (Pappe, 2004, p. 107).

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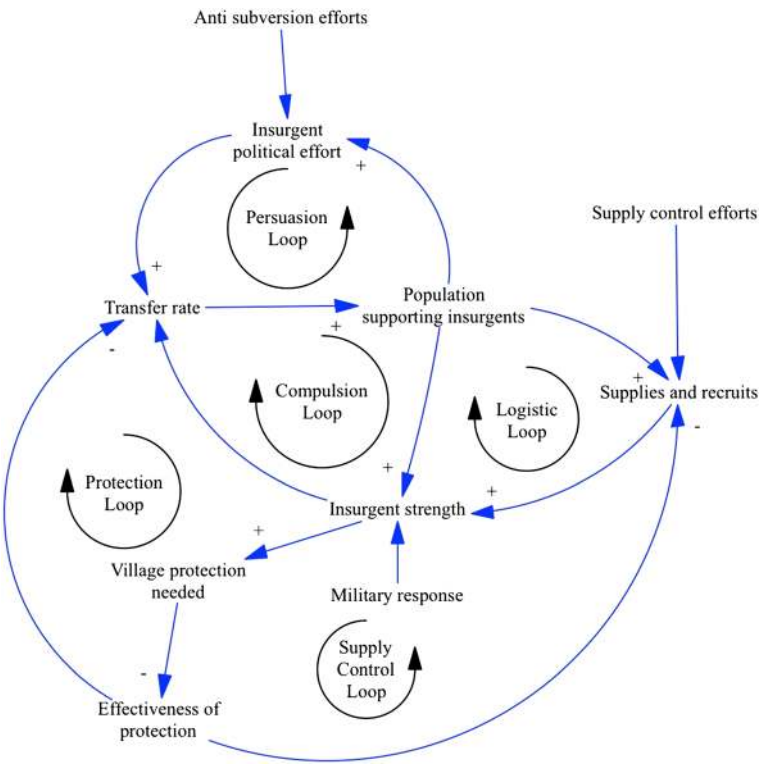

Figure 4 Government response in Coyle's insurgency model

the intelligence implies higher insurgent losses, and hence, a reduction in the insurgency forces. This, in turn, makes it more difficult to get reliable information on them. Eventually, the effect is an increase in the civil losses due to counterinsurgency operations, an increase in popular support for the insurgents and more new recruits for them. The authors conclude that it is almost impossible to eradicate insurgency by force only; soft actions such as civil support and psychological operations that affect the attitude of the population may be needed too.

Completely different is the insurgency warfare model developed by Coyle (1985). A portion of this model is represented in Figure 4.

Here, reference is made to a widely used tactic in counterinsurgency operations in peasant areas, consisting in assuring military protection to the villages and/or gathering the peasants in large protected villages, with the stated objective to protect them, but also of controlling them and severing possible collaborations with the insurgents.[9] According to Coyle, the model suggests that the effective loops for the Government are those of Protection and Supply Control. Weakening the insurgents via military actions makes the village protection more effective, hence reducing the transfer of allegiance (Transfer rate) of the population from the Government to the insurgents (Protection Loop). Similarly, a more effective protection reduces the insurgents' ability to obtain supplies and new recruits, so further weakening them (Supply Control Loop). A key role is played in the model by the link from 'Insurgent strength' to 'Transfer rate'. Its sign can be either positive or negative, depending on several factors. For instance, a widely shared perception of the goodness of the insurgents' cause may make the sign positive, so that an increase in their strength has the effect to increase the transfer of allegiance to the insurgents. On the contrary, the recourse to terrorism and a brutal behavior may weaken the

[9] Tactics of this type have been widely used in Asia and in Latin America.

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insurgents' appeal, making the sign negative. According to the sign of this link, the Compulsion and the Logistic loops may be either reinforcing or decaying.

Another self-reinforcing cycle in repression policies has been studied by Kaplan *et al*. (2006), with reference to the Israeli–Palestinian conflict. Self-reinforcing loops are also described by Gallo and Marzano (2009) in the context of the analysis of structurally asymmetric conflicts, with applications to the Israeli–Palestinian case.

Multiple and Multiply-Interconnected Components

Systems are made of subsystems and, at the same time, they are subsystems of larger and more complex systems. The problem is that too often, when facing a conflict or a situation of instability, which can develop into an armed conflict, the complexity is disregarded, at least until the situation is so deteriorated that sustainable peace has became almost unattainable.

The recent Afghanistan war is a typical case. 'By 1 May 2003, the combination of the success in Afghanistan and the apparent military victory in Iraq meant that President Bush could deliver his "Mission Accomplished" speech on the flight deck of the USS Abraham Lincoln. ... [T]here was a confidence in Washington that the Afghan War was over, that the Taliban would not re-emerge and that European allies would bear the brunt of reconstruction and development' (Rogers, 2011). An important result that the victory would have made reachable 'was that by maintaining a substantial military presence in Iraq and Afghanistan, and controlling the Persian Gulf and Arabian Sea through the US Navy's Fifth Fleet, Iran would be thoroughly constrained. Given that Iran was seen as the most serious of all threats to US interests in the region, this would be a hugely positive outcome' (Rogers, 2011). Today, after 9 years from that day, the war is still going on, and the perspectives after the eventual withdraw of the US soldiers are far from clear. The reality proved to be far more complex that it was expected.

At the end of 2009, a study commissioned by the Pentagon went public. It contained a System Dynamics model of the nation building effort in Afghanistan. The diagram synthesizing the model is the one in Figure 5. Comments have been more disparate. Some said that the reason why the Americans are not winning is because they are too busy at drawing fancy pictures such as this one. Other praised the fact that System Dynamics is being used in an effort to grasp the complexity of the situation, and surely, the graph shows how everything is connected to everything else, and makes evident how difficult and elusive a military victory may be.[10] That the model be really sound and useful in practice is another matter, and it is hard to say with the information at our disposal. What we can say is that, it appears to fail the simplicity test. We must never forget that the 'whole purpose [of a model] is to simplify reality as a tool for thought and that is lost if it is too big' (Coyle, 2004, p. 34). This is possibly more important in qualitative than in quantitative modelling. As stated by Wolstenholme (1999), 'One of the major problems is that of how to produce simple, balanced and elegant models at an appropriate level of aggregation in time and space to be useful. There is always a tendency to produce models, which are too detailed and complex and to insufficiently validate them against the mental models of their creators.'

Delays

Delays are a feature that makes the behavior of complex systems so difficult to predict, in addition to the intricate pattern of relations and nonlinearities. 'Delays are pervasive. It takes time to measure and report information. It takes time to make decisions. And it takes time for decisions to affect the state of a system' (Sterman, 2000, p. 411). Delays may lead to counterintuitive behaviors or to striking differences between short-term and long-term behaviors.

Two main types of delays are usually considered in the literature on dynamic systems, *material*

[10] 'When we understand that slide, we'll have won the war,' General McChrystal dryly remarked, accordingly to the New York Times, when he was shown the Power Point containing the diagram.

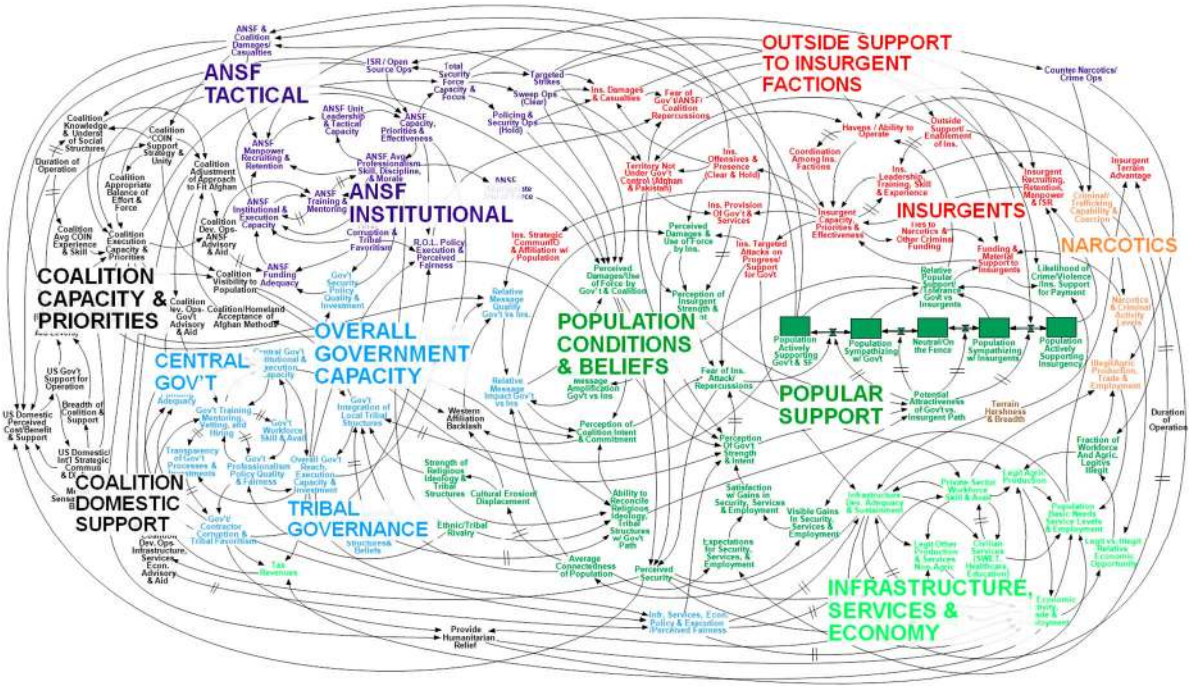

Figure 5 A dynamic systems model of the Afghanistan conflict (The New York Times, April 26, 2010, retrieved from http://www.nytimes.com/2010/04/27/world/27powerpoint.html?_r=1)

delays and *information delays*. The former refers to flows of material objects. Take for instance the time needed to deploy a UN peacekeeping force on the ground once the decision has been taken. The participating states' contingents must be assembled, and thereafter transported to the site of the intervention. All these take time, sometimes more than expected, with negative consequences on the mission's effectiveness. More challenging is the latter type of delay. It has to do not with physical objects, but rather with communication, perceptions and attitudes. It takes time, for instance, for the information coming from a crisis area to reach the first page of the newspapers or the headlines of the television news. And it takes longer time for the governments to reach an agreement on a possible humanitarian intervention and for the build-up of the public opinion's consensus for it. Information delays may play a fundamental role in situations in which many parties are present, operating independently one from the other. The lack of a timely knowledge of the others' actions and hence of a correct assessment of their intentions, may lead some of the actors to take decision leading to catastrophic ends. This may explain at least in part the dynamics that lead to the outbreak of World War I.

An interesting example of the role of delays can be found in the system dynamics model proposed by Choucri *et al*. (2007) to assess the stability of a state, that is, its capability to avoid that dissident actions develop into violent rebellions and in its own destabilization. Among the key variables in the model are the resilience of the state and the effectiveness and strength of anti-regime messages. The resilience is a function of different parameters, such as economic performance, regime legitimacy, political capacity and social capacity. The effectiveness and strength of anti-regime messaging depends on parameters both subjective (perceived strength of their content) and objective (availability of social networks and free media). The government may think to weaken the dissident groups by enforcing a tight control on the media and on the internet based social networks. This policy may work in the short term. But at the same time, it curbs civil liberties, and, as a consequence, it

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reduces the very legitimacy of the government in the perception of the population. Because it involves a change in attitudes and perceptions, this process takes time. So, its effects will be manifest with some delay. In the long run, the strength of the dissident groups may be bolstered rather than reduced. In system dynamics terminology, the process through which the reduction in civil liberties leads to a growing awareness of illegitimacy within the population can be modelled by an exponential delay function.

Peace processes based on confidence building measures are another typical case where delays play a fundamental role. One cannot expect the effects of confidence building measures to be seen immediately, nor that violence from the different parties ends or is reduced in a linear monotonic way. Delays are present because what have to change are not only the behaviors but also and mainly the attitudes of the parties, and attitudes change quite slowly. One has also to consider that, in a conflict, behaviors and attitudes of a large number of people are involved, not only of few leaders. Misperception of the delays may make one of the parties (or possibly both) to end the process claiming that it has not produced the expected results and blaming the failure on the bad faith of the other.

EMERGENT PROPERTIES

One of the effects of complexity is that a system may present properties that are not easily derived from the analysis of its parts taken in themselves, but from the interactions among all its parts. *Emergent properties* have to do with the system considered as a whole: 'An emergent property is one that results from the interaction of a system as a whole rather than from one or two of its parts in isolation' (Midgley, 2000, p. 40).

Emergent properties arise at different levels, from macro to micro. Sometimes, we are not able to know the structure of the system directly, but through the analysis of its emergent properties, we can derive some useful information on it. An interesting example has been provided by Alvarez-Ramirez *et al*. (2010). They analysed the fatalities data in the Iraq War trying to derive from them an idea of the structure of the different insurgent groups. The idea is that the fatalities pattern over time derives from the way the insurgency is structured.

The main assumption is that a truly random behavior implies that there is not a strongly organized insurgency. Rather, insurgency groups are scattered, loosely connected and poorly coordinated in their actions. On the contrary, a trend-reinforcing behavior[11] implies the presence of a well structured resistance. Paradoxically, this last case, although in the immediate, much more harmful, is preferable. In fact, a well structured resistance is more easily countered and dismantled, whereas a loosely organized resistance is less harmful in the immediate, but it can endure over time resulting at the end to be more dangerous.

For their analysis of the time series of the casualties, the authors make use of the *Hurst exponent*, H, which is an index of long-range dependence used to analyse time series. In quantitative terms, there are three distinguishable cases:

- $0 < H < 0.5$: time series with negative autocorrelation, that is, an increase of values will probably be followed by a decrease and vice versa, leading to wide oscillations;
- $0.5 < H < 1$: time series with long-term positive autocorrelation, that is, a sequence of increasing (decreasing) values in the series will probably be followed by an increasing (decreasing) value, leading to a trend-reinforcing behavior;
- $H = 0.5$: indicates that the time series values represent a true random walk (e.g. the time series has no memory of previous values).

Analysing the data of the Iraq war fatalities (both military and civilian) using the Hurst exponent, the authors found that five regimes or phases in the evolution of the war could be identified. After a first regime, characterized by an almost

[11] This is the case when the time series presents a long term memory, that is, when there is a positive correlation between an event and the set of the preceding events. This implies that if the time series values have been increasing (decreasing) for some time, then chances are that they will continue to increase (decrease) in the future. This property is called *persistence*. On the contrary, when the correlation is negative then when the value goes up we expect it to go down in the next future. In this case we talk of *anti-persistence*, a behavior characterized by wider oscillations than those expected in a pure random walk.

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constant and relatively high value of H, typical of a conventional confrontation, a second regime occurred in the last months of 2004, with the dynamics of civilian fatalities evolving toward uncorrelated behavior, and the dynamics of military ones showing increased correlations. This is interpreted as a situation in which the different insurgency groups acted in an erratic and poorly coordinated manner. The third regime, in the first two quarters of 2005, with increasing and converging correlations of civilian and military fatalities, has been interpreted as the rapid emergence of a well-organized, although non-centralized, insurgency structure. The fourth regime, from mid-2005 to mid-2007, showed an important correlation decrement for the military fatalities (although not for the civil ones). 'This was related to the clash of two antagonist war structures, namely the traditional centralized Coalition Army and a non-centralized insurgent army. Finally, the fifth regime, from mid-2007 to date, is characterized by stable fatality dynamics converging to uncorrelated behavior' (Alvarez-Ramirez *et al*., 2010).

Their conclusion is that the insurgency structure is quite decentralized, with a degree of organisation and coordination among the different groups varying over time, with phases characterized by a high level of coordination and phases in which the groups act in a poorly coordinated manner. The conjecture derived from the analysis of the data is that the insurgency cells, in each phase, can be represented as the nodes of a *scale-free network*, where the edges represent the links between them. A scale-free network is a network in which the probability, $P(k)$, (a node has a degree k, that is connected to k other nodes) decays when k increases according to a power law, that is $P(k) \sim k^{-\gamma}$ (Barabási and Albert, 1999), where γ is a positive coefficient which, in most of the studied cases,[12] has been found to be in the range between 2 and 4. In a typical scale-free network, there is a set of high-degree vertices forming the core of the network, with progressively lower-degree nodes making up the regions between the core and the periphery. Although the core nodes are not too few (much more than in purely random graphs), such networks are fault tolerant, as random removal of even a large fraction of nodes impacts the overall connectedness very little. That does not mean that targeted attacks cannot destroy easily the connectedness, but they require a highly effective intelligence, which is something quite difficult to obtain in the presence of an insurgency, whose loose structure resembles a scale-free network.

Different types of confrontations/wars in which one of the parts' organization has the structure of a loosely connected network have been studied by Arquilla and Ronfeldt (2001). A typical case is the one of Al Qaida, whose network structure makes it particularly elusive and difficult to defeat.

OVERSHOOTING AND COLLAPSE

The behavior of a system may present quite different patterns. In fairly high-stability systems, key variables change continuously over time, adjusting slowly in response to the overall dynamics of the system, with patterns that may be of either increasing, or decreasing, or in some cases oscillatory type.

Oscillatory behaviors are usually the results of threshold phenomena or *overshooting*. An overshooting occurs when a system goes beyond its limits. In stable systems, as a result of overshooting, corrective actions are taken, mainly due to the many feedback loops the system contains, and the system, possibly after some oscillations goes back to its equilibrium state. In some cases, we may have a kind of stable oscillatory behavior, with oscillations around the equilibrium value.[13]

However, overshooting does not always lead to oscillations, possibly dampened. In some cases, it leads to persistent instability or to a possible collapse of the whole system. Actually, in conflict analysis, we are interested in those conditions that make a system break down,

[12] Typical cases of scale-free networks that can be found in the literature are the Internet web and the web of citation among scientific publications.

[13] An equilibrium may be either dynamic or stationary. In the former case, the variable either increases or decreases, whereas in the latter, it remains approximately stable.

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losing its stability, that is, we are interested in threshold phenomena. An example, at least according to some interpretations, is the 1967 Six Days War. 'Nasser did not intend to go to war. [...] His threat [the closure of the Tiran Straits] was a political move to prove to fellow Arabs—the Jordanians, Saudis and Syrians—that he was still the champion of pan-Arabism and the most radical Middle East leader. It was an exercise in brinkmanship that *went over the brink* (emphasis added)' (Bregman and El-Tahri, 1998, p. 60). 'Threshold phenomena such as violence are difficult to study because they represent "breaks" in system rather than uniformities. Violence, whether between persons or organisations, occurs when the "strain" of a system is too great for its "strength". The metaphor here is that violence is like what happens when we break a piece of chalk. Strength and strain, however, especially in social systems, are so interwoven historically that it is very difficult to separate them' (Boulding, 1977).

Consider now the conflicts that often arise within a given society. In all societies, there are strains, which may arise both from internal and external factors.[14] Most often, there is equilibrium between the strains and the *resilience* or adaptation capability of the society. Problems arise when the strains overshoot the limits beyond which the society is unable to adapt, or the speed of strain growth outpaces the adaptation capability. If that happens, the society may enter into a phase of instability and eventually may collapse. Situations of this type have been studied by Wils *et al*. (1998) by means of a system dynamics model based on the 'Lateral Pressure' theory of Choucri and North (1975). An overview of the model is given in Figure 6. The main idea is that 'the roots of conflicts can be traced to a constellation of needs and wants of populations, given levels of technology and availability of natural resources. If resources are limited relative to population demands and technology levels, the country will expand its behavior outside national boundaries' (Wils *et al*., 1998). Here, we will focus on the portion of the model dealing with domestic instability and conflicts, which is described in Figure 7.[15] According to the model, resource scarcity and a low level of technology, in the presence of a population growth, may lead to increasing levels of social stress, which, over a given threshold, may result in instability and possibly in the onset of domestic conflict.

In the model, the variable 'internal pressure' represents the stress the society suffers. The internal pressure is modelled as an increasing function of the population and a decreasing function of both the available resources and the technology level of the country. Technology may be seen as a substitute for resources, and hence, when both are scarce, it becomes increasingly difficult for the society to cope with the demands of a growing population. In the figure, two main cycles are described. One refers to the adaptation processes by which a society is able to cope with the stress (due the population growth or to the resources' depletion), reducing its value. A second cycle is relative to the fact that the stress may increase the potential for conflict, eventually leading to domestic violence. The effect of a conflict is again to reduce the stress. The first process is crucial: if adaptation is too slow to balance the stress growth, then the potential for conflict may increase until the conflict threshold is exceeded with the onset of a violent conflict. Violence has the effect to discharge the stress, but that requires time, and may lead also to a situation of protracted instability.

The model has been implemented[16] and run on two groups of countries. The first group consists of African countries, which have experienced domestic conflicts, high rates of population growth and low levels of technology. The second includes some of the wealthier countries in Europe and North America. The results are mixed, with a various degree of consistency with the historical records. In particular for the African countries, the simulation results suggest that a high level of internal tension may be a sufficient, but not necessary, cause for conflict. In fact, other

[14] Take for instance today's economic crisis and how it affects not only the living conditions in many European countries, but also the attitudes and perceptions about the immigrants of large sectors of the populations.

[15] Delays are not indicated in the figure.

[16] Some problems concerning the quantification of the main variables used in the model will be discussed in the next section.

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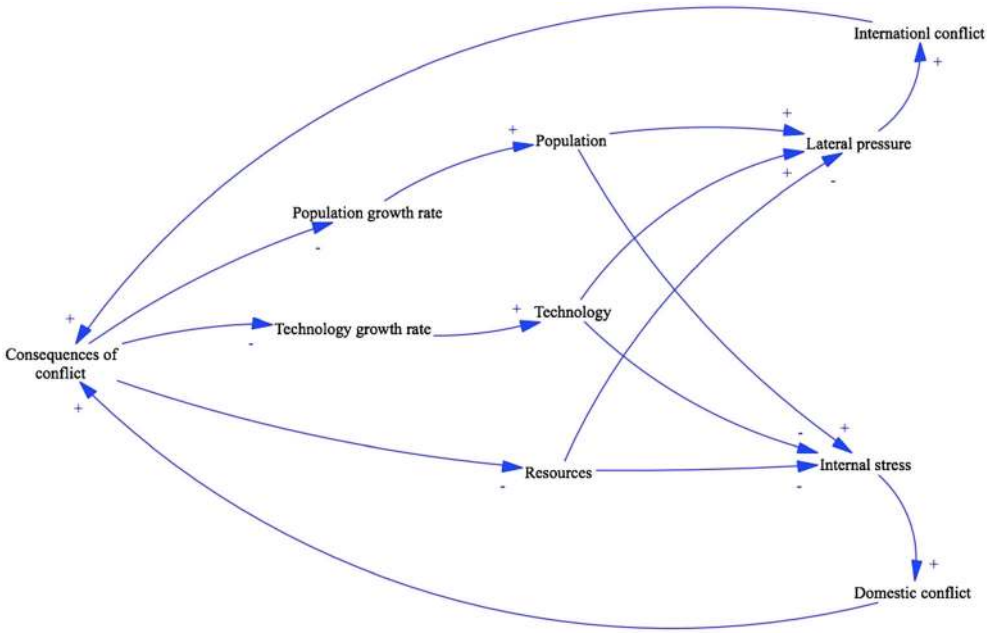

Figure 6 The lateral pressure model

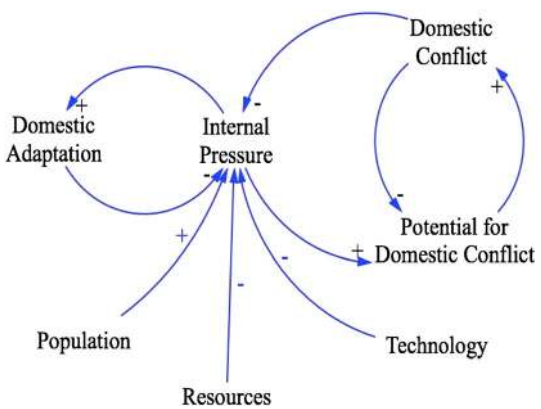

Figure 7 Domestic conflict model

factors, not included in the model, may lead to conflicts also in the presence of low levels of internal tension.

An important question concerns the conditions that make a society more resilient and more capable to adapt quickly enough to internal pressures. The model we have just described focuses mainly on the interplay of population, resources and technology. '[A]s population density relative to resource base rises, societies need to change their technological and social base, in general towards higher levels of complexity and sophistication—by devising intensified agricultural methods, industries, class differentiation, and such. High levels of population density and high levels of technology can result in internally stable societies, if access to resources is assumed; conversely, low population density requires only low levels of technology for stability' (Wils *et al*., 1998). Thus, to avoid instability, an increase in the population density requires either a correspondent increase in the available resources, or an increase in the society technological level. In general, it is quite difficult for the resources to follow population growth: as noted by Homer-Dixon (1999, p. 42), 'societies must be able to more social and technical ingenuity to adapt to rising resource scarcity'. This capability to adapt to social changes is represented by the variable *Domestic Adaptation*. The outbreak of a violent domestic conflict may be the result either of the society incapability to implement the needed changes or to delays, which make it difficult for technology change to keep pace with resource scarcity.

The presence of institutions and mechanisms that allow for non-violent solutions of the

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Table 1 Social, political and economic indicators for Tunisia and Egypt

Country	Median age	Unemployment rate	Gini index	Spending on food (%)	Level of democracy[a]	Internet users (%)
Tunisia	29.7	14.0	40.0	35.8	2.8	34.0
Egypt	24.0	9.7	34.4	38.3	3.1	21.2

[a]Source: the Economist Intelligence Unit's 'Democracy Index 2010' (Scale of 1 to 10).

conflicts is fundamental to the stability of a society. This point has been investigated by Hegre *et al*. (2001). Making use of quantitative analysis, they show that countries with a low level of democracy (they call such countries semidemocracies) are less apt to absorb the social strains, and more prone to the outbreak of violent civil conflicts. 'Semidemocracies are partly open, yet somewhat repressive, a combination that invites protest, rebellion, and other forms of civil violence. Repression leads to grievances that induce groups to take action, and openness allows for them to organise and engage in activities against the regime. Such institutional contradictions imply a level of political incoherence, which is linked to civil conflict' (Hegre *et al*., 2001). They claim that, on the contrary, institutionally consistent democracies and stark autocracies are equally unlikely to experience civil war.

The recent uprising in North African countries, known under the name of Arab Spring, provides an interesting example of instability leading to regime collapse. Without the pretence to provide a complete explanation of the North African events, we will try to present some elements, which, at least in part, may explain such events as a threshold phenomenon. In 2001, the British magazine *The Economist* published an interesting paper by Wade (2001), an economist at the London School of Economics. Wade starts pointing to the fact that 'new evidence suggests that global inequality is worsening rapidly. There are good reasons to worry about that trend, quite apart from what it implies about the extent of world poverty.' According to Wade's analysis, the widening income gap in the world system may be inherently destabilising: 'The result is a lot of unemployed and angry young people, to whom new information technologies have given the means to threaten the stability of the societies they live in and even to threaten social stability in countries of the wealthy zone.'

In the analysis, there are some key elements that play an important role: inequalities, unemployment, age, and new information technologies. In Table 1, some data relative to Tunisia and Egypt are given (Blow, 2011). These data depict societies with a population very young,[17] with a high unemployment rate,[18] a high level of inequalities[19] and a very high cost of food.[20] Many young people, frustrated by unemployment and lack of perspectives, angry because of the inequalities, with a potential for mobilisation, are strengthened by the access to modern information technologies. It is not a case that the North African uprisings have been called the 'facebook revolutions'. The situation these countries experienced is not far from the one anticipated by Wade. In addition, both the Tunisian and the Egyptian regimes did lack strong legitimacy. In a sense, we may say that they were typical cases of semidemocracies; autocratic, but at the same time allowing some liberties and with a relatively lively civil society. Completely different is the case of Libya, a strongly autocratic country without a significant civil society, and the low penetration of internet confirms this fact. It is not a case that whereas in Tunisia and Egypt, a nonviolent popular uprising was able to grow in strength and eventually topple the dictators, in Libya, only through an external military intervention has the regime been ousted.

[17] Consider that the median age is close to 45 in Germany, around 40 in UK and close to 37 in the USA.
[18] The unemployment among young people is usually much higher than the average value.
[19] The Gini index is the most used inequality index; it goes from 0 to 100, and higher values correspond to higher inequalities.
[20] Consider that the average spending on food for a US household is about 7%.

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The analysis of these cases suggests a way to revise and enhance the internal pressure model. The new model is the one in Figure 8.

Here, instead of using directly the variable 'resources', we introduce two variables: 'unemployment' and 'inequalities, which in a sense include some of the information provided by 'resources'. In fact, in a situation of resource scarcity not compensated by a high level of technology, inequality and unemployment are usually quite high. In addition, inequality includes also the sense of injustice, which derives from an uneven wealth distribution, which is one of the most relevant drivers for rebellion. The variable 'median age' is important because a large number of young people, unemployed and without perspectives, represent, as we have seen in 2011 in many countries, both rich and poor, a strong potential for rebellion.[21] In this model, technology plays a different role than in the preceding one. Here, we have singled out the information technologies, which have two effects. On the one hand, they widen the horizons of the people's knowledge, making more striking and frustrating the distance between the expectations and the grim day by day life. On the other hand, they provide tool to diffuse information, to organise demonstration and to mobilise large portion of the population.

Democracy level and *GDP per Capita* play an important role in the country's resilience, that is, its capacity to provide adaptation mechanisms. Democracy provides mechanisms for dissidents to express themselves and to try to change peacefully the society, whereas high levels of GDP allow for wealth redistribution through social welfare measures. This last is the way Saudi Arabia rulers have tried to avoid the contagion from the 'Arab spring' to reach their country.

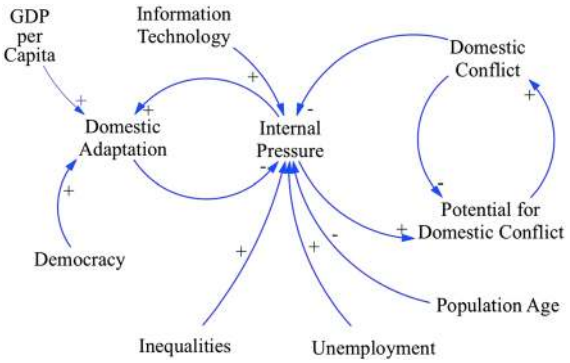

Figure 8 Revised domestic conflict model

MODELLING CONFLICTS AS SYSTEMS

As we have pointed out in the Introduction, the complexity of conflicts stems from many different and sometimes unrelated elements. Usually, a conflict involves many parties, with complex relations between them, and with multiple and diverse objectives, some even hidden. The same parties, which, if we take a snapshot of the conflict at a given point in time, appear to be fixed, given once and for all, evolve and change over time as a consequence of the complex pattern of internal and external relations. Jackson and Nexon (1999) criticise the substantialist approach which is quite common in the International Relation theories, in which it is presumed 'that entities precede interaction, or that entities are already entities before they enter into social relation with other entities. The most common of these presupposed entities is "the state" [...] Other scholars begin with "the individual" or "the ethnic group", but the basic ontological move is exactly the same—units come first, then, like billiard balls in a table, they are put into motion'. In today's world, in which interstate wars are almost completely replaced by intrastate ones, conflict's actors are not given once and for all, but change, split or recompose, giving rise continuously to new ones. To describe this new situation, the term 'neo-medievalism' has been introduced. It can be defined 'as a system of "overlapping authorities and criss-crossing loyalties," which eliminate the absolute authority claimed and exercised by sovereign states. [...] Traces of neo-medievalism can be seen in transnational organisations (both military and economic), which command some loyalty, terrorist groups that "privatise" international violence, the regional integration and disintegration of states, and the spread of information technology' (Winn, 2004, p. 3). Examples can be seen in the

[21] After the Middle East Arab countries, it has been the case of Greece, Spain, UK, Israel, Chile and USA.

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disintegration of former Yugoslavia with the bloody ethnic wars that followed, and in the endemic civil war, which characterises the Democratic Republic of the Congo.

This complexity makes particularly difficult and challenging the task of conceiving and constructing models of real-life conflicts. We identify here three challenges, which make hard and problematic the task of modelling conflicts: the ever changing and evolutionary characteristic of conflicts, the elusiveness of quantification, and the personal involvement of those who seek to analyse—or intervene in—a conflict.

The *evolutionary nature of conflicts* should make us particularly cautious when using our (mental) models to analyse (or to take decisions about) them. Reality checks are always needed to be sure that the model we have constructed, or just the model we have in our mind, is still adequate to represent the conflict's reality. In mathematics, Taylor series expansion can be used to get a good linear approximation of a nonlinear function around a given point, but only provided we do not move too far away from that point. Similarly, the best model we can build today of a conflict may provide good insights about the conflict's evolution in the near future, but its validity cannot be pushed too far ahead in time. The evolution over time of a conflict is quite unpredictable not only because of the necessarily limited number of variables and relations we can include in a model but also because of the stochastic nature of the behavior of human agents. Even if in some cases statistical regularities can be found, predictability remains elusive. Sometimes the very actions we take, based on our model, make the conflict change in such ways that a new updated model is needed. An example is provided by the Israeli–Palestinian conflict. After the 1967 war, the conflict has been seen mainly as a border struggle, and Israel's settlement policy could be interpreted as a way to make sure that strategically and economically, relevant portions of West Bank remained within Israel's borders once a final agreement were to be reached. In fact, as stated by Menachem Klein (2010, p. 4), 'the quantity of Israeli operations created a qualitative change. Israeli settlement expansion and security operations since 2000 have stripped political negotiations of nearly any value and have returned the Israeli–Palestinian conflict to its original status—it is once again primarily an ethnic, rather than a territorial, conflict'. And an ethnic conflict calls for solution strategies quite different from those applicable in border conflicts.

The problems connected with the *elusiveness of quantification* in many real life problems have been discussed within the system dynamics community for quite some time. The discipline of system dynamics (which is at the base of most of the models discussed so far in the paper) 'has long been based on the building of fully specified quantitative models of strategic problems in all manner of domains. Such models were, and are, seen as the essential means by which insights might be generated into policies to improve system behavior' (Coyle, 2000). Although quantification remains a cornerstone in system dynamics, the idea that qualitative models may be an effective tool to analyse and understand complex problems and issues, and to develop robust strategies for dealing with them, has been on the fore since the early 1980s (Wolstenholme, 1983, 1999; Coyle, 1998, 2000).[22] The quantitative versus qualitative issue is of particular relevance in conflict modelling. With reference to a model of the Angolan conflict he had developed, Coyle (2000) states that 'Given the number of uncertainties and their immensity, not to mention the plethora of competing parties and interests, it is hard to avoid concluding that quantification' would not even be plausible nonsense; worse, 'it would be verging on science fiction'. Something like that can possibly be said for each of the system dynamics models mentioned in this paper. Based on these, and also on other models not referred to here, we claim that rigorous qualitative modelling can provide useful insights in the dynamics of real life conflicts, and may be of great help in decision making, but more, that in most cases, qualitative modelling is the only meaningful option when dealing with conflicts.

An interesting exception among the models cited in this article is the lateral pressure model

[22] A page dedicated to Qualitative System Dynamics can be found in the website of Jay Forrester (http://jayfor.site.aplus.net/qualsd/index.html).

presented by Wils *et al*. (1998). It is a model that the authors have quantified and run on real world data, obtaining meaningful results. Nevertheless, also this model does not escape the quantification difficulty. For instance, the variable 'technology' present in the model is very hard to operationalise and in any case almost impossible to quantify. The authors try to go around this problem by using GDP as a proxy, but that introduces in the model an implicit and unwanted loop. In fact, in the model, technology influences the GNP, which is strongly correlated to GDP, and for countries, such as Rwanda, one of the model test beds, almost coincides with it. Easier to define, but not less difficult to quantify is the variable 'natural resources'. The authors stress that their use of resource availability 'refers to a multi-faceted notion—it consists of land area, quality of land, mineral and fossil-fuel reserves, water quantity and quality, and many other aspects. [...] Unfortunately, of these variables, only total land and the value of mineral reserves were found in consistent form among global data sources'. At the end, considering also the difficulty of combining these two variables, they decided to use one single variable, the total land available for agriculture, as a proxy for natural resources. That implies, for instance, disregarding the combined effects on the quality of the land of climate changes, population growth and overexploitation, something not irrelevant as shown among others by Diamond (2004). In spite of this rather strong simplification, as the authors state, the 'study has provided some useful insights as to the leverage points in the system of society demands, resources, and conflicts that might lead to a more peaceful future'.

A third option between fully qualitative and quantitative models is represented, among others, by the rebellion–repression model of Kress and Szechtman (2009), which combines intelligence, attrition and popular support for the insurgency. By means of a mathematically rigorous analytical study of the differential equations involved, considering different scenarios and different possible values of the main parameters, they show 'why it is almost impossible to eradicate insurgency by force only', concluding that 'soft actions such as civil support and psychological operations, that affect the attitude of the population, may be needed too. This conclusion is quite general and robust; it does not depend on the specific parameters of a particular insurgency situation, but on general assumptions regarding their characteristics.' The works of Muncaster and Zinnes (1982, 1990), Zinnes and Muncaster (1984) and of Blank *et al*. (2008) go along a similar direction, from a methodological point of view. This type of approach can be traced back to the seminal work of Richardson (1935, 1993).

The challenge posed by the *personal involvement* of those who seek to analyse a conflict, is something the system thinking community has been aware of since the early times. We know very well that systems are not the reality. They are social constructs, logical conceptual constructions, which depend on our culture and perspectives. This is particularly true in the case of conflicts, where our political and ethical beliefs, and sometimes our deep feelings, enter into the picture, and may have a profound effect on the type of model we build, on the boundaries we choose, on the master variables we select, and on the overall model's structure. Take for instance the already cited paper by Pinzón and Midgley (2000). In this paper, the authors are concerned with the problem of evaluating the results of different approaches to conflict modelling. They discuss the philosophical and ethical implications of alternative approaches to conflict analysis, stressing the importance of the holistic/systemic paradigm, which they apply to the Colombian civil war. With reference to this conflict, they show how reductionist approaches, concentrating only on the active actors on the two sides (Government, guerrilla organisation, ...), quite often disregard the population, that is the people who most suffer from the conflict, and how that rises relevant ethical question. The approach of Ellis (2004) is completely different and quite reductionist. His system dynamics model of Colombian civil war is mainly focused on the interactions among the guerrilla organisations, the criminal organisations, the economic base of the Colombian society and its Government. Not only in his model is there no room for the population and for the social roots of the armed insurgents, but his approach is strictly framed within the mainstream western

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'security discourse'. Drug cartels, terrorist cells and insurgent groups are placed in a single basket without really differentiating among them, their activity is seen as a kind of 'geopolitical virus' which may 'destabilise the region and undercut the basis for US global power', and reference is made to the 'activity of anti-US Islamic groups', a must in post 09/11 security discourse, even when talking of Latin America.

While in Pinzón and Midgley's approach a wide perspective is adopted in which individuals are seen not only in themselves, 'but also as members of a community, a culture, an epoch and, in general, the contexts in which our lives go by', and 'Ethics, which implies concern for the other', is taken as a basic element, in Ellis' there is apparently no place for the people and communities involved in the conflict, nor for ethical considerations. The only concern is the geopolitical effects of the conflict. We can find similar contrasts in the other studies of systemic models of insurgency, repression and guerrilla warfare. Some of them are mainly focused on the tactical aspects of counter insurgency warfare (Coyle, 1985, 2000). Others are concerned with the complex dynamics which in a society lead to the birth and growth of rebellion activities (Gurr, 1994, 2000; Ackam and Asal, 2005). That reflects the different objectives of the models, but also, more generally, the different cultural, political and ethical perspectives of the authors.

CONCLUSIONS

Conflicts are very complex and defy the linear type of thinking, which is too often used in their analysis and, no less relevant, when decisions about them are taken. This is particularly true today when conflicts are very often *intra*state rather than *inter*state (see Ramsbotham *et al*. (2005)), and when the state power is losing ground to other powers both at supranational/transnational level and at regional/local level.

In this paper, by means of several examples, we have tried to show how important the role of systems thinking and modelling may be in conflict analysis. Models are learning tools, which may effectively help in taking decisions about conflicts and in operating to prevent the onset of violence or to reduce it when the conflict has already started.

We have spent some time on the concept of emergent property of a system, using an interesting example from the Iraq war. The conditions that make a system unstable and eventually collapse have also been discussed with reference to domestic conflicts. On this last topic, on the basis of the experience of the 2011 North Africa uprisings, a possible extension and enhancement of the classical Internal Pressure model has been briefly sketched. This extension, which is at a very preliminary stage, constitutes the object of future research. In the last section, some issues that make conflict modelling especially critical and problematic are discussed. They relate to the evolutionary characteristics of conflicts, the relative merits of qualitative and quantitative models, and the problematic neutrality of the modeller.

We have tried to apply several standard system thinking tools to the analysis of conflicts. But at the same time, through the different examples presented, we have shown the peculiarities that make conflicts somehow different from other systems. This raises some interesting and challenging questions. For instance, most of the system 'archetypes' used as modelling tools are derived from management. Are there 'archetypes' more capable of capturing the peculiarities of conflicts? The answer to such a question might be the object of further research.

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