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La conciliation des fondements théoriques du processus de planification opérationnel et du concept opérationnel systémique/ Reconciling the Theoretical Foundations of the Operational Planning Process and the Systemic Operational Design

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SUMMARY

The operational environment is complex. This all-simple statement takes on a whole new meaning when it is considered in the context of the general systems theory. Although recent, this theory helps warfare professionals understand the complex systems behind contemporary conflicts. Consequently, the general systems theory and its derivatives make it possible to take a fresh look at the way we analyse and resolve operational problems.

Based on these theories, the Systemic Operational Design (SOD) is a new alternative to traditional planning methods such as OPP. Compared with the CF traditional planning process, SOD boasts of being able to secure and maintain the initiative while allowing the commander to recognize and take advantage of emergent opportunities through a unique process of repeated design.

However, the theoretic foundation study of these two processes shows that they are in fact complementary. SOD enables the operational commander to define the problem and to design an effective campaign plan, given the complexity of the contemporary environment. The OPP, in turn, allows him to be efficient in planning and executing the tactical engagements.

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INTRODUCTION

> Only the layman thinks that he can see in the course of the campaign the consequent execution of an original idea with all the details thought out in advance and adhered to until the very end.[1]
>
> — Field Marshall Helmuth Graf von Moltke.

War! It has been often described through time, probably in the hope that a concrete definition allows for its limitation. However, war still exists. It moves borders, topples governments, and leaves open scars in its wake. As Sun Tzu said, "The art of war is of vital importance to the State. It is a matter of life and death, a road either to safety or to ruin. Hence it is a subject of inquiry which can on no account be neglected."[2] In the same train of thought, Clausewitz is adamant: "War is no pastime; it is no mere joy in daring and winning, no place for irresponsible enthusiasts."[3]

However, even the Art of war student or professional quickly recognizes its chaotic and unpredictable nature. Thomas Paine, an American revolutionary, wrote in 1787: "War involves a train of unforeseen and unsupported circumstances of which no human wisdom could calculate the end."[4] That is why the military command and planning have always been marked by what Clausewitz calls the fog of war. To face this complexity and this disruption, the operational art comes to the commanders' rescue.[5]

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[1]Moltke, Helmuth Graf von, *Moltke on the Art of War: selected writings*, edited by Daniel J. Hughes and translated by Daniel J. Hugues and Harry Bell (Novato: Presidio Press, 1993), p. 92.

[2]Sun Tzu, *L'art de la guerre*, edited and translated by Jean Lévi (Paris: Hachette Littératures, 2003), p. 53.

[3]Carl von Clausewitz, Helmuth Graf von, *On War*, edited and translated by Michael Howard and Peter Paret (Princeton: Princeton University Press, 1976), p. 86.

[4]Thomas Paine, *Prospects on the Rubicon* (London, UK: J. Debrett, 1787), p. 5; accessible at http://books.google.ca/books?id=EmoFAAAAQAAJ&dq=rubicon+paine&printsec=frontcover&source=bl&ots=bm9UtNoHyb&sig=pX7gcl9xT0cVzowyxsXYB2NddTY&hl=fr&sa=X&oi=book_result&resnum=1&ct=result#PPA5,M1; Internet; accessed on January 31, 2009.

[5]Department of National Defence, B-GJ-005-500/FP-000, *CF Operational Planning Process* (Ottawa, MDN Canada, 2008), pp. 1-3.

It is therefore to operationalize this art that the Canadian Forces (CF) institutionally trust in the CF Operational Planning Process (CFOPP or, in short, OPP). The process that relies on a scientific method allows the commander to conceptualize a campaign plan.[6] It is with notions such as the end state, the targets, the centre of gravity and the decisive points that the commander conceptualizes the way to solve the problem at hand.[7]

However, several recent authors have disparaged this process, calling it in turn linear, reductionist and determinist.[8] Colonel James Greer also maintains that the traditional Newtonian approach to operational conceptualization is limited in its usefulness. The complexity of military operations, intensified by the inherent need to operate in the whole war-peace spectrum, leads Greer to suggest researching new design methods.[9] Similarly, Lieutenant-Colonel Pierre Lessard proposes that the traditional operational design is probably the cause of many failures in the conflict resolution process, and that there is cause to question the validity of this process.[10]

Therefore, in answer to these questions, a new method of planning has recently emerged within the military discussion circles: the Systemic Operational Design (SOD). Based on the general theory, the SOD claims to be able to secure and maintain the initiative by allowing the commander to recognize and take advantage of emerging possibilities, through a unique process of iterative design.[11] With its novel theoretical concepts, the SOD is very promising.

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[6]*Ibid.,* pp. 2-5.

[7]Department of National Defence, B-GJ-005-300/FP-000, *Canadian Forces Operations* (Ottawa, MND Canada, 2004), pp. 3-1.

[8]Lieutenant-Colonel L. Craig Dalton, "Systemic Operational Design: Epistemological Bumpf or the Way Ahead for Operational Design?" (Fort Leavenworth: essay written for the Advanced Military Studies Course, United States Army Command and General Staff College, 2006), pp. 22.

[9]James K. Greer, "Operational Art for the Objective Force," *Military Review* 82, no. 5 (September/October 2002), pp. 26-27. Note that for the purpose of this essay, the terms design and conceptualization are used as synonyms.

[10]Pierre Lessard, "Campaign Design for Winning the War…and the Peace," *Parameters* 35, no. 2 (Summer 2005), pp. 36-37.

[11]Major Ketti Davison, "Systemic Operational Design: Gaining and Maintaining the Cognitive Initiative." (Fort Leavenworth: essay written for the Advanced Military Studies Course, United States Army Command and General Staff College, 2006), p. 1.

The emergence of SOD reopens the debate on the relevance of the traditional operational design for the CF. But does the OPP really no longer meet the CF's needs, given the complexity of the COE? If so, how would the SOD fit within the cognitive process of planning teams? The analysis of the theoretical foundations of these two processes, in parallel with a cursory study of the COE, allows the author to take a stance. The CF must in fact adopt the SOD as a design process, to facilitate the OPP application.

To prove the validity of this proposition, this paper will be divided into four chapters. The first chapter aims at showing that the contemporary environment is complex, and that the theory now exists to give way to a better understanding of this reality. Recognizing the complexity of the battlefield will guide the analysis towards the introduction of some notions derived from the study of systems such as the theory of complexity, chaos and the adaptive complex systems.

The second chapter dissects the CF Operational Planning Process to prove that this method is based on foundations inappropriate for a contemporary operational environment. The background for this chapter will be the detailed analysis of the process, and the classical elements of the operational design such as the end state, the lines of operations, and the centre of gravity. This study will lead to the conclusion that this process is linear and reductionist, diminishing for any commander the opportunities to find a lead for a viable solution to a complex problem.

The third chapter examines the SOD critically in order to identify its strengths and weaknesses. The general systems theory will be examined again, this time with a look at its relevance to the resolution of military problems. Then, using the theoretical roots of the SOD as a lead, it will be proven that the SOD draws its primary strength from its iterative character and its holistic vision.

The fourth chapter will propose a possible middle ground between the SOD and the planning process, based on the classical elements. From the previous chapter conclusions, it will

in fact be shown that the SOD would deal with the operational design function, while the OPP would help with the operational planning.

It is appropriate to mention, at this time, that this paper is based on the study of the theoretical foundations of processes and it will not dwell on the organizational impact of the introduction of a new doctrinal planning concept within CF. Besides, such an assumption would raise numerous questions: When and to what level should we train the staff officers? What is the impact of this new concept on allies, resources and staff structure? etc. The scope of these questions makes it impossible, within the extent of this research, to bring forth formal answers through coherent arguments.

It is therefore in leaving aside these questions that the next parts, beginning with the contemporary environment of operations and the basic notions of the systems theory, will be examined.

CHAPTER ONE:
THE CONTEMPORARY OPERATIONAL ENVIRONMENT: A COMPLEX SYSTEM

The complexity of war in the 21st Century poses a significant challenge to any military commander. In fact, contemporary military campaigns are inherently complex. They always need to achieve military aims that the superior strategists order, but with all the ambiguity brought on by the unconditional necessity of a political resolution.

But beyond the affirmation by which war as a complex phenomenon is an axiom, what can the military commander derive from this complexity? Are there tools available to him to better understand the environment in which he operates?

This chapter answers these questions by postulating that the systems theory and its derivatives are efficient analytical frameworks for understanding the contemporary operational environment (COE) and its components. At the end of this chapter, the reader will be able to visualize the COE through the systems approach.

The analysis of the COE and of the theoretical corpus emerging from the systems theory will therefore be divided into four parts. First, a quick review of different levels of war will allow for a somewhat limited scope of the question. Second, a description of the modern battlefield at the operational level will show the various facets of contemporary military complexity. Third, the systems theory and its application to the COE will be examined. Fourth, the notions of complexity, chaos and adaptive complex systems will be reviewed. Finally, the contribution of these notions to the understanding of contemporary war will be examined.

The objective of this chapter is therefore to highlight the attributes of the COE that allow the description of the complex system. After having dissected the COE, it will be easier to understand what process is best suited for the resolution of problems faced by the operational commander. The first step will initially approach the difference between the conflict levels.

Conflict levels

The complexity of war is very surely present at all levels. This paper, however, intends to analyse the incidence of this complexity at the operational level. The definition of this level and of its scope reveals the key of the pursuit of the central argument of this paper. To this end, a discussion defining the theoretical frameworks of the levels of war is mandatory. The next paragraphs demonstrate these differences.

The policy, the strategy, the operational art and the tactics are different, in both their scope and importance.[12] The scope and complexity of the objective sought by a specific level of war define its appellation. Generally speaking, the more important the objective is to a State, the higher is the level of war. Thus, there are three levels of war: strategic, operational, and tactical.

At one end of the spectrum, strategy goes alongside the national policy. This level is divided into two sub-levels: the national strategy (or grand strategy) and the military strategy.[13] According to NATO, "a successful national strategy sets out a path using all instruments of power to maintain political independence, achieve the long-term aims of the nation, and protect its vital interests."[14] In return, the strategic military commander has to develop the strategic military aims sought by this national strategy. However, the national policies are usually marked by inaccuracy and often suffer from vagueness. They can be represented by "broad generalities of peace, prosperity, cooperation, and goodwill unimpeachable as ideals but of little use in determining the specific objectives we are likely to pursue."[15] William Flavin also adds that "military forces will rarely receive political objectives that contain the clarity they desire."[16]

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[12]Milan Vego, *Joint Operational Warfare* (Newport, RI: Naval War College, 2000), pp. 1-35.

[13]*Ibid*, p. 11-18. Vego also refers to sublevels to represent strategy. According to him, the *national-strategic level of war* and the *theatre-strategic level of war* are the components of strategy.

[14]North Atlantic Treaty Organization, AJP-01, *Allied Joint Doctrine* (Belgium: NATO, 2007), pp. 3-1.

[15]Maxwell Taylor, *Precarious Security* (New York: W.W. Norton, 1976), pp. 17-18.

[16]William Flavin, "Planning for Conflict Termination and Post-Conflict Success," *Parameters* 33, no. 3 (Fall 2003), p. 97.

Normally, reaching military strategic goals requires military and non-military force generation with *campaign design.*[17] The operational level is therefore "one of planning, conduct and pursuit of campaigns and major operations to reach strategic targets within a theatre" [loose translation].[18] This level establishes a relationship between strategy and tactics. The origins and aims of the operational design are therefore inherently strategic, with all that the political and strategic vagueness can bring. The operational level is therefore used as a concrete bridge between the actions of the battlefield and the strategic goals. Its position between a rock and a hard place exacerbates the complexity of the problems to solve.

At the other end of the spectrum, there is the tactical level. That is the level where "battles and engagements are planned and executed to reach the military targets assigned to tactical units" [loose translation].[19] The tactical engagement is usually resolved by the methodical application of the force, thanks to manoeuvre and combat power.

All the levels of war are closely related; the actions may mutually influence each other. For example, in an asymmetric conflict, the levels of war are often difficult to differentiate because of the inherent complexity of the targets to reach. It is then that tactical actions, such as the attack of a village stronghold, can immediately affect the operational and strategic levels. It is in fact more difficult to isolate the key events, and the decisions associated with each perspective, in an irregular conflict than in any other conflict.[20] Moreover, the concept of the strategic corporal, and his inherent need to understand that his actions can have repercussions at all levels, illustrates this reality very well.[21]

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[17]Lessard, "Campaign Design…," pp. 36-37.

[18]B-GJ-005-300/FP-000, *Canadian Forces Operations*, pp. 1-5.

[19]*Ibid.*

[20]Major Gary P. Petrole, "Understanding the Operational Effect" (Fort Leavenworth: essay written for the Advanced Military Studies Course, United States Army Command and General Staff College, 1991), p. 8.

[21]For a discussion on the importance of the strategic Corporal and his implication in a complex world, see David S. Alberts and Richard E. Hayes, *Power to the Edge* (Washington, DC: CCRP Publications, 2004), pp. 65-68.

This paper will therefore focus on the operational level, that which "plans...grand operations with a view to reaching strategic targets" [loose translation].[22] It is from this perspective that the next notions, beginning with the complexity of the operational environment, will be analysed.

Description of the COE complexity

Kofi Annan, seventh United Nations Secretary-General, declared in 2000 that "globalization is really defining our era".[23] This new definition of the contemporary era brings its own ramifications that are important to global security. All aspects of life are touched by this interconnectedness, from culture, through science and the economy, to religion.[24] The phenomenon that emerges from this interconnectedness and its repercussions for the COE are extremely complex.[25]

It is when these phenomena, that are represented by the societal values, interests and identities, meet at the crossroads of the complex interconnectedness that the risk of violent collisions between people increases. This is demonstrated by Adam Curle in his work *To Tame the Hydra: Undermining the Culture of Violence:*

> ...the chief characteristic of this emerging world is…the interconnectedness of the destructive forces, the interwoven and increasingly interacting worldwide forces of economic, political and military power: *a global culture of violence*. This is fuelled at all levels, from individual to nation....[26]

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[22]B-GJ-005-300/FP-000, *Canadian Forces Operations*, pp. 2-6.

[23]Crossette, Barbara, "UN: Globalization Tops Agenda for World Leaders," New York Times, Sep. 3, 2000 [online version]; accessible at http://www.corpwatch.org/article.php?id=589; Internet; accessed on Feb. 3, 2009.

[24]Kiras, James D. "Irregular Warfare: Terrorism and Insurgency," from *Strategy in the Contemporary World*, Colin Gray et al editors, 2nd Ed. (New York: Oxford University Press, 2007), p. 164.

[25]Eoyang, Glenda, and Yellowthunder, Lois, "Complexity Models and Conflict: A Case Study from Kosovo," thesis submitted during the Conference on Conflict and Complexity, September 2008 [online version], accessible at https://www.kent.ac.uk/politics/carc/research/papers/yellowthunder%20paper.doc; Internet; accessed on Feb. 3, 2009.

[26]Curle, Adam, *To Tame the Hydra: Undermining the Culture of Violence*, (Charlbury, UK: Jon Carpenter Publishing, 1999) pp. 103.

But how does this reality influence the war environment? Several recent authors have tried to define the effects of this globalization on the operational environment. From Robert Leonhard's book, *The Art of Maneuver,* through Martin Van Creveld and his work *The Transformation of War*, to Shimon Naveh's essay, *In Pursuit of Military Excellence,* the general attributes of new wars emerge. In contrast with the typical military confrontation between two states, they take it in turns to declare that the contemporary conflict is the preferred playground of non-state actors, transnational terrorist groups, and irregular armies.[27] And these actors are playing near populations from which they get their power and freedom of action.

The contemporary conflicts most certainly reflect what British General Rupert Smith called "the war amongst the people."[28] The battles occur in cities and villages, with the population acting in turn as partner, target or adversary. In addition to this war within the people, technology quickly disseminates the issues of battles directly into the world's great capitals, creating an all-new network of exchange of ideas and opinions.[29]

Such conflicts, in which the active participants are, at least in part, called irregulars, can hardly ever provide conclusive political results.[30] Therefore, the end of the conflict often becomes, within these parameters, the starting point of a long resolution process. And, quite often, it is at that time that the more complex security problems emerge. The asymmetrical war with its inherent complexity is a pillar of the contemporary operational environment.[31] The example of the current war in Iraq is obvious.

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[27]Van Creveld, Martin, *The Transformation of War* (New York: The Free Press, 1991), p. 226; Leonhard, Robert, *The Art of Maneuver* (Novato: Presidio Press, 1991), pp. 224-233; and Naveh, Shimon, *In Pursuit of Military Excellence: The Evolution of Operational Theory* (London, Portland: Frank Cass, 1997), pp. 86-88.

[28]Smith, Rupert, *The Utility of Force: The Art of War in the Modern World* (London: Penguin Books Ltd, 2005), pp. 17-18.

[29]Homer-Dixon, Thomas, *The Ingenuity Gap* (Toronto: Alfred A. Knopf Canada, 2000), p. 102.

[30]The United States Army, TRADOC Pamphlet 525-5-500, *Commander's Appreciation and Campaign Design Version 1.0* (Fort Monroe, VI: US Army, 2008), p. 4.

[31]Strategy Page, "The Contemporary Operational Environment," http://www.strategypage.com/articles/operationenduringfreedom/chap1.asp; Internet; accessed on February 4, 2009.

In fact, all had started so well. The most experienced, best equipped and best prepared troops had succeeded, after a lightning advance, to reach the core of the enemy. The national capital, Baghdad, was militarily conquered less than 20 days after crossing the departure line in Kuwait territory. According to the classical rules of war, Baghdad's capitulation probably should have meant the end of the war.[32] Moreover, President G.W. Bush was taken in when he declared his notorious "mission accomplished" on May 1st, 2003, on board USS Abraham Lincoln. But, in fact, this was only the beginning. A new enemy had emerged, an enemy that was taking root among the population. And it decided to hit when it wanted, where it wanted and with the means it wanted. It hit logistic columns, isolated convoys, humanitarian agencies and media representatives, all while hiding within the population. This type of enemy changes the rules of the game, by not confronting the military forces ready to face him. This new enemy recognizes that the only practical way for him to fight a really powerful enemy is to use those asymmetrical war tactics. But to succeed, this same enemy needs to be morally and technologically supported by both internal and external sources. This complexity is well summarized in the words of Edward Allen Smith when he identifies potential targets:

> In a[n irregular war], we can also point to the individual minds to be won, the family groups to be convinced, the clans, the factions, and tribal organizations to be brought over, the local communities to be enticed, and the nations to be won over.[33]

Although this description of war is probably representative of many eras, the reality is that these elements now influence the military operations' environment directly.[34] In fact, the

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[32]Kaldor, Mary, *New & Old War: Organized Violence in a Global Era*, 2nd Ed. (Stanford, CA: Stanford University Press, 2007), pp. 150-151.

[33]Smith, Edward Allen, *Complexity, Networking and Effect-Based Approaches to Operations* (Washington, DC: CCRP Publications, 2006), p. 51.

[34]Pfaff, Charles A., "Chaos, Complexity and the Battlefield," *Military Review* 80, no. 4 (July-August 2000) p. 83; http://web.ebscohost.com/ehost/detail?vid=3&hid=107&sid=c37bd753-cf68-47da-a545-a2a8d8489007%40sessionmgr109&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#db=aph&AN=3420275; Internet; accessed on January 29, 2009.

contemporary military operation commander now has to work with a level of complexity that was previously at a higher level.[35]

For example, the Canadian commander of the Joint Operational Force — Afghanistan (FOI-A) has to deal with an unbelievable number of individual elements, each one probably representing an independent system. The notion of system will be explained a little further. For the purpose of argumentation, let's consider that Brigadier-General Guy Laroche, commander of the JOF-A in 2007-2008, needed to synchronize to reach his assigned strategic aims. In addition to traditional military elements such as an infantry heavy battle group, an artillery battery and an Armoured Reconnaissance Squadron, General Laroche had units of a totally different scope under his command. The provincial reconstruction team is the perfect representation of this new reality: a multidisciplinary, multi-agency and government-wide organization that has been mandated to "rebuild" the Province of Kandahar.[36] To that should be added an element of liaison and operation mentoring whose task consists of training and instructing Afghan military and police units. Its sources of information and influence are also numerous. On the one hand, the Brigadier-General receives directions from Ottawa from a senior commander; on the other hand, he directs a development plan, along with the Governor of the Province of Kandahar. Moreover, in addition to being advised by the Canadian official in Kandahar, he also has to talk regularly with the Canadian Ambassador in Kabul to make sure his plans are accurate.[37]

In light of these examples, it is therefore easy to realize the complexity of the problems an operational force commander can face in the context of an asymmetric war as is the case with

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[35]TRADOC Pamphlet 525-5-500, *Commander's Appreciation...*, pp. 4-6.

[36]For a detailed description of the tasks of a provincial reconstruction team in Afghanistan, see Christoff, Joseph A., *Provincial Reconstruction Teams in Afghanistan and Iraq* (Washington, DC: United States Government Accountability Office, 2008) pp. 2-8**.**

[37]See the following site http://www.afghanistan.gc.ca/canada-afghanistan/kandahar/represent.aspx for a description of the Canadian Representative's functions in Kandahar.

Afghanistan or Iraq. The enemy, the multitude of actors involved, and the low probability of finding a quick solution represent a significant challenge for contemporary operational commanders. [38] It can therefore be seen that the war among people and the search for solutions constitute an extremely complex phenomenon, because of both the quantity and the nature of variables.[39]

That's why the military environment recently turned towards a promising field of study to analyse war: the general systems theory.

Introduction to the system theory

The number of elements and systems involved in a contemporary conflict is such that only an overall vision of the problem can be efficient. Therefore, it is clear for the contemporary military professional that the learning approach to war needs to be holistic or even metatheoretical.[40] This framework needs to make it possible to examine a set comprising several interconnected and dynamic factors. The general systems theory offers this opportunity.

This theory is based on a system analysis leading to the understanding of the whole. Proposed initially by the biologist Ludwig von Bertalanffy in the late '60s, this framework of thinking is an answer to the limits of the classic Newtonian approach.[41] In fact, the mechanical and reductionist attitude is often the first one blamed when it comes time to condemn this Newtonian approach.[42] As Bertalanffy said:

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[38]Tang, Shiping, "A Systemic Theory of the Security Environment," *The Journal of Strategic Studies* 27, no. 1 (March 2004), pp. 20-21.

[39]Checkland, Peter, *Soft Systems Methodology: A 30-Year Retrospective: Systems Thinking, Systems Practice* (New York: John Wiley, 2005), p. 265.

[40]Skyttner, Lars, "Systems Theory and the Science of Military Command and Control," *Kybernetes* 34, no. 7/8, p. 1245; http://proquest.umi.com; Internet; accessed on February 5, 2009.

[41]Lazlo, Ervin, *The Systems View of the World: A Holistic Vision for Our Time: Advances in Systems Theory, Complexity and the Human Sciences* (Cresskill, NJ: Hampton Press, 1996), p. 8.

[42]Ludwig von Bertalanffy, *General Systems Theory*, 2nd Ed. (New York: George Brazilier Inc, 1998), p. 12. The First Edition of this book dates back to 1968.

> In one way or another, we are forced to deal with complexities, with "wholes" or "systems," in all fields of knowledge. This implies a basic re-orientation in scientific thinking.[43]

The pillars of the general systems theory are based on the premise that systems, independently from their nature, share some characteristics and behaviours. Thus, this theory suggests that laws and generic properties can be postulated to better determine and understand the behaviours of systems in general.[44]

Although there are several ways of categorizing systems, certainly the most basic consists of establishing whether a system is open or not.[45] Open systems are those which, thanks to exchanges with the exterior, seek to replace lost energy in order to continue operating and living. In contrast, and in accordance with the second law of thermodynamics, closed systems are doomed to certain death, because they cannot secure energy from the exterior.[46]

Generally, Bertalanffy describes these systems as being "sets of elements standing in interrelation".[47] Perhaps more comprehensively, Robert Jervis says on the same subject:

> We are dealing with a system when (a) a set of units or elements are interconnected so that changes in some elements or their relations produce changes in other parts of the system and (b) the entire system exhibits properties and behaviors that are different from those of the parts.[48]

Open systems interact with their environment, while accomplishing an activity that has its own objective. Therefore, they can, from this dynamic interaction, acquire new properties thanks to the capability of emergence.[49] This capability of emergence is the driving force behind

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[43]*Ibid*., p. 5.

[44]Bertalanffy, *General Systems Theory*, pp. 32-33.

[45]*Ibid.*, p. 38, pp. 139-154.

[46]Waldrop, Mr. Mitchell, *Complexity: The Emerging Science at the Edge of Chaos* (New York: Touchstone Books, 1992), p. 33.

[47]Bertalanffy, *General Systems Theory*, p. 38.

[48]Jervis, Robert, "Complex Systems: The Role of Interaction," from *Complexity, Global Politics, and National Security*, David S. Alberts and Tom Czerwinski, Editors (Washington, DC: National Defense University, 1997), p. 1.

[49]Le Moigne, Jean-Louis, *La théorie du système général; théorie de la modélisation* (Paris: Presses universitaires de France, 1994), pp. 61-62.

the continuous evolution of the system. The emergence is in fact the new, unpredictable element which emerges from the arrangement of a system's components.

For example, the flavour of sugar cannot be found in the carbon, hydrogen and oxygen atoms that make it up.[50] Another example is water. If oxygen is added to fire, an even more powerful fire is produced. So, someone blowing on a fire can take advantage of this property. In the same vein, the combination of hydrogen and a heat source leads to certain combustion. The catastrophe of the Hindenburg Blimp in 1937 vouches for it. However, the addition of oxygen and hydrogen, the same two catalysts of a greater heat source, yields water. This new composition and its mitigating action on fire are totally unpredictable in analysing its elements separately.[51] The study of links between elements (H and O) is the only way that can lead to a potential conclusion (H_2O) with regard to an emerging property within a system (eg, fire extinction).

Therefore, this acknowledgement lets us postulate that it is impossible to understand the nature of systems simply by breaking them down.[52] A holitistic vision is obligatory; a vision that

will make it possible to understand that the whole is different from, or even greater than, the sum of its parts.[53]

But how is the systems theory important for the military student? First, the systems theory explains reasons for which an enemy will not accept defeat without first trying to adapt and change.[54] As was mentioned earlier, a *balanced* closed system that gains no new energy is doomed to die off. Conversely, an open system that is in constant interrelation with its environ-

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[50]Urry, John, *Global Complexity* (Malden, MA: Polity, 2003), p. 25.

[51]This example was given verbally by Lieutenant-Colonel Rob Dundon during the optional *Systemic Operational Design* course at the Canadian Forces College, Toronto, on January 19, 2009.

[52]Bertalanffy, *General Systems Theory*, p. 37.

[53]M'Pherson, P.K., *Systems Thinking*, vol. 1, Gerald Midley, Editor (London: Sage, 2003), p. 133.

[54]Sorrells, Lieutenant-Colonel W.T., et al., "Systemic Operational Design: An Introduction" (Fort Leavenworth: essay written for the Advanced Military Studies Course, United States Army Command and General Staff College, 2005), pp. 55-56.

ment will always seek to survive, with newly acquired energy. Moreover, in his monograph, Major Madelfia Abb shows how systems living on the verge of annihilation, such as insurgency movements, manage to survive and fight effectively. Major Abb also describes how a military system that is balanced (that learns nothing more and anticipates nothing more) is inefficient in combat.[55]

Secondly, the systems theory warns soldiers against the complexity of war and the fact that no formula can predict or guarantee victory. In addition, this theory can explain that links are possibly more important than the entities they bring together. Therefore, a holistic perspective is called for in the analysis of any open system.

But especially, the systems theory is a prerequisite to understanding the theory of complexity, which will now be explored.

Theories of complexity, chaos, and complex adaptive systems

The notion of complexity is key to understanding the contemporary operational environment. However, this complexity is not a new concept. The nonlinear phenomena, keystones of complexity, have always been part of human interactions and especially of military operations.[56] In fact, it can be easily suggested that the ability to manage this complexity is the prerogative of great military leaders and strategists. Moreover, American Lieutenant-General Richard Chilcoat, president of the National Defense University, wrote in 1998 that the ability to excel in the nonlinear environments would be among the essential competencies of the 21st Century combatant and statesman.[57] Heinz Pagels mentioned that "the nations and people who master the new

[55]Abb, Major Madelfia A., "A Living Military System on the Verge of Annihilation" (Fort Leavenworth: essay written for the Advanced Military Studies Course, United States Army Command and General Staff College, 2000), pp. 30-31.

[56]Smith, *Complexity, Networking.…*, pp. 34.

[57]Chilcoat, Lieutenant-General Richard A., "Foreword," in *Coping with the Bounds: A Neo-Clausewitzean Primer*, Thomas J. Czerwinski, Editor (Washington, DC: Department of Defense Command and Control Research Program, 2008) p. iv.

sciences of complexity will become the economic, cultural, and political superpowers of the next century."[58]

What is new, however, is the emerging theoretical corpus that surrounds the notion of complexity. Therefore, the next paragraphs will explore in more detail this theory and its military application.

The theory of complexity is based on the nonlinear aspect of the systems that make it up. Basically mathematical in nature, the "linear" descriptive is characteristic of a system of equations whose variables can be reported one after the other on a straight line.[59] Therefore, for a system to be called linear, it must meet three conditions.[60] The first one is proportionality, which indicates that any change in the outputs of a system is proportional to the input of this same system. These systems then show what is referred to, in economics, as returns to scale: a small cause produces a small effect and, inversely, a large cause generates a great change.[61] The second condition, linearity, called additivity or superposition, is at the base of the analysis process of these types of systems. The central concept is that the whole is equal to the sum of its parts. Therefore, this characteristic allows the analyst to break down the problem into several parts that can be reassembled, once resolved, to get a solution to the original problem. The third condition, and probably the most fundamental, is evolution of the system. In fact, the latter will always depend on the same chain of cause-effect. That is why, if the vectors of change that apply to a system remain consistent, from one iteration to another, the outcome will be the same.

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[58]Czerwinski, Thomas J., *Coping with the Bounds: A Neo-Clausewitzean Primer* (Washington, DC: Department of Defense Command and Control Research Program, 2008), p. i.

[59]*Le Petit Robert*, June 2000 Ed., word "linéaire" (literal translation of "linear" definition).

[60]Beyerchen, Alan, "Clausewitz, Nonlinearity and Unpredictability of War," *International Security* 17, no. 3 (Winter 1992-1993), p. 62; http://www.jstor.org; Internet; accessed on January 21, 2009, and Smith, *Complexity, Networking…*, p. 40.

[61]Ammer, Christine and Ammer, Dean S., "Returns to scale," from *Dictionary of Business and Economics,* revised Edition (1986).

Complicated / Linear	Complex / Nonlinear
Whole equal to the sum of the parts	Whole not equal to the sum of the parts
Outputs proportionate to inputs	Outputs not always proportionate to inputs
Predictable chains of causes and effects	Chains of causes and effects not predictable

Figure 1.1 — Linear versus non-linear systems

Source: Edward Allen Smith, *Complexity, Networking and Effect-Based Approache to Operations* (Washington, DC: CCRP Publications, 2006), p. 40.

This theory of linearity, developed by Isaac Newton 200 years ago, always took on the non-linear reality of the world. Although this reality has always been present, it is only recently that it finally got the scientists' attention.[62] Fritjof Capra, a systems physicist, describes to what degree the world is defined by non-linearity: "Nonlinear phenomena dominate much more of the inanimate world than we had first thought and they are an essential aspect of the network pattern of living systems."[63]

As opposed to linear systems, these non-linear and omnipresent systems thus disobey the laws of proportionality and additivity.[64] When no prediction can be made if a change occurs to the causative agent, the responses of these complex systems to various stimuli are disjointed. The stimulus can generate an unpredictable or unexpected answer, no answer, or even a median answer.[65]

The example frequently used to illustrate this reality is a pile of sand. If a grain of sand is added to the top of a pile of sand, no mathematical or other rule can help predict what will happen. Will the pile grow vertically or will there be a slide? If the pile collapses, which part will remain in place and which part will be moving?[66]

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[62]Kellert, Stephen F., *In the Wake of Chaos* (Chicago: University of Chicago Press, 1993), p. 137.

[63]Capra, Fritjof, *The Web of Life: A New Scientific Understanding of Living Systems* (New York: Anchor Books, 1996), p. 123.

[64]Beyerchen, "Clausewitz, Nonlinearity…," pp. 62-63.

[65]Homer-Dixon, *The Ingenuity...*, pp. 113-114.

[66]Russ, Marion, *The Edge of Organization* (Thousand Oaks, CA: Sage Publications, 1999), p. 15.

In the same vein, the complex systems do not exhibit any consistency in the addition of their elements. It is not that the sum is greater than the addition of its parts; but rather that the effects created by a system are different from the basic elements.[67] Just as the American political scientist Kenneth Waltz says: "Because of the prevalence of interconnections, we cannot understand systems by summing the characteristics of the parts or the bilateral relations between pairs of them."[68]

A specific field of study amplifies the theory of complexity concerning the non-linearity of systems: the theory of chaos. Unfortunately, the limits of this essay do not allow detailed explanation of the important ramifications of the theory of chaos.[69] It is important, however, to mention that this theory, sister of complexity, examines in detail how, given a predetermined set of rules, unpredictable but foreseeable effects can afflict systems. These systems can be considered dynamic, when they evolve with time and are excessively sensitive to initial conditions. The result of this sensitivity, which appears as an exponential manifestation of original conditions, seems uncertain. This happens despite the fact that these systems are determined, which means that their future dynamism is completely defined by the existence of their initial conditions.[70]

A classic example is the butterfly effect, discovered accidentally by Edward Lorenz in 1961. This idea refers to the change that the fluttering of a butterfly's wings can create in the atmosphere, which can cause a tornado in remote time and space. The fluttering represents a small change in the initial conditions of the system, but it sets off a chain of events that can produce a tornado. Although the butterfly is not responsible for the tornado, the fluttering of its

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[67]Urry, *Global Complexity*, p. 24. Also see Atkinson, Simon Reay, and Moffat, James, *The Agile Organization: From Informal Networks to Complex Effects and Agility* (Washington, DC: CCRP Publications, 2006), pp. 34-35.

[68]Waltz, Kenneth, *Theory of International Politics* (Reading, MA: Addison-Wesley, 1979), p. 64.

[69]An excellent introduction to this subject is Chapter 2 of the book by Urry, *Global Complexity*, pp. 17-38.

[70]Urry, *Global Complexity*, pp. 21-23.

wings is an initial condition to the completion of the meteorological phenomenon of the deed.[71]

Another important concept resulting from the complexity of systems is that of adaptive complex systems. This kind of system is in fact what Major Madelfia Abb describes when she discusses systems that adapt to survive. Adaptive complex systems are characterized by four elements. First, these systems consist of a set of agents that can act independently. Second, their non-linear interconnections create a system. Third, their ability to change their routine in order to take advantage of a situation (emergence ability) makes them complex systems. Finally, their ability to collaboratively manage problems across time creates adaptive complex systems.[72]

The key to these systems lies in the last two characteristics that are their abilities to manage acquired information and to take advantage of it.[73] These abilities allow the system to understand its position and to recognize rivals and potential opportunities in order to take advantage of them. This behaviour does not allow this kind of system to be analysed in a reductionist manner. By exploring the properties of isolated adaptive complex systems, reductionism loses sight of inherent dynamics.

Complexity, chaos, and complex adaptive systems within COE

These three notions — complexity, chaos and adaptive complex systems — add several fundamental ideas of the conceptual frame allowing a better understanding of the complex environment of military operations[74].

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[71]Lorenz, Edward, "Deterministic Nonperiodic Flow," *Journal of the Atmospheric Sciences* 20 (1963), pp. 130-141, quoted in Homer-Dixon, *The Ingenuity...*, pp. 124-125.

[72]Roseneau, James N., "Complexity Theory and World Affairs," from *Complexity, Global Politics, and National Security*, Alberts, David S., and Czerwinski, Thomas J., Editors (Washington, DC: National Defense University, 1997) [online book]; accessible at http://permanent.access.gpo.gov/websites/nduedu/www.ndu.edu/inss/books/books%20-%201998/Complexity,%20Global%20Politics%20and%20Nat'l%20Sec%20-%20Sept%2098/ch04.html; Internet; accessed on February 15, 2009.

[73]Ilachinski, Andrew, *Land Warfare and Complexity, Part 1: Mathematical Background and Technical Source-book* (Alexandria, VA: Center for Naval Analysis, 1996), p. 12.

[74]Abb, "A Living Military System…," pp. 5-10.

The first notion is that the interactions between the actors within a security environment will involve so many variables that no definite behaviour, from any of these actors, can be considered.[75] Colin Gray refers to this notion when he declares that "…nonlinearity [is the] condition structurally characteristic of strategy and war that denies authority to the rules of proportionality and additivity.[76] This is the direct product of the acknowledgement that there cannot be a clearly defined link of cause to effect in an environment qualified as complex, due to the nature of interactions.[77]

The second notion is that adaptive complex actors of the operational environment such as the State, non-state players, armies, and the population will continue to influence each other within their environment.[78] An evolution can only follow; which, in turn, and in accordance with

the emergence phenomena, will change the environment. This iteration, then, can be only the starting-off point of a new change. An actor who proposes a solution, such as an army that disembarks into a nation with ideas of pacification, will therefore create a new situation, by its very presence. And each attempt at a resolution will lead to a new problem. The title of a recent article by American journalist Stephen Kinzer, on the American strategy in Afghanistan, offers a great example of this perverse effect: *More troops mean more war.*[79]

The third and likely most important notion is that the elements working at the operational level of war meet the theoretical criteria of the systems, chaos and complexity.[80] Through a

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[75]Also see Newell, Clayton R., *The Framework of Operational Warfare* (London: Routledge, 1991), pp. 6-9 for a description of the implication of chaos within COE.

[76]Gray, Colin S., *Strategy for Chaos: Revolutions in Military Affairs and the Evidence of History* (Portland: Frank Cass Publishers, 2002), p. 1.

[77]Davison, Major Ketti, "From Tactical Planning to Operational Design," *Military Review* 88, no. 5 (September-October 2008), p. 35.

[78]Smith, *Complexity, Networking…*, p. 44.

[79]Kinzer, Stephen, "More troops mean more war," *International Herald Tribune*, October 17, 2008; [online version] accessible at http://www.iht.com/articles/2008/10/17/opinion/edkinzer.php; Internet; accessed on December 12, 2008.

better understanding of the systems, science now makes it possible to consider the development of paths to logical and realistic solutions to the supervision of operational problems. Military commanders, in turn, have to take advantage of opportunities that this new theoretical field provides. As Major Ketti Davison said, "the recent evolution of military thought has closely followed the evolution of systems theory. As the understanding of systems continues to evolve, so must military thought."[81]

Conclusion

These conclusions summarize, therefore, the essence of the initial argument introduced at the beginning of this chapter. In fact, systems theory and its derivatives are an effective analytical framework for understanding the COE and its components. And because understanding the COE and its implications is the first step in the creation of a coherent problem resolution process at the operational level, all the elements are now in place to approach the second chapter.[82] The CF doctrine resolution process, the OPP, will now be examined.

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[80]Naveh, *In Pursuit of...*, p. 3.
[81]Davison, "From Tactical Planning...," p. 33.

[82]Booth, Colonel Brad, "Winning in Afghanistan: A NATO Operational Design" (Fort Leavenworth: thesis written for the Master of Strategic Studies, United States Army War College, 2008), p. 6.

CHAPTER TWO: THE OPP AND THE CONTEMPORARY OPERATIONAL ENVIRONMENT

> The current elements of operational design might no longer be sufficient to enable the effective planning and execution of campaigns and major operations across the full spectrum of operations.[83]
>
> — Colonel James K. Greer

The complexity of the COE is the backdrop with which operational commanders have to deal. The problems they have to face are complex and evolutive, and their resolution requires a special approach. To guide commanders and their staff in seeking a solution to potential operational problems, the CF trust the OPP.

The study of the COE characteristics and theoretical concepts relative to the systems theory allows a glance at the traditional CF planning process. Is the OPP always effective? What are its limits in the search for paths to solutions?

This chapter thus proposes a study of the OPP and the classical elements of the operational art to show the limits to resolution of complex problems. It is to this end that a discussion will first take place of the basic terms associated with the operational art. The ability of the OPP to conceptualize a campaign will then be examined. Lastly, an analysis of the classical elements of operational design will end this chapter.

At this time, it is appropriate to mention that the American forces use a process similar to that of the CF, called the *Joint Operational Planning Process* or *JOPP*.[84] The OPP is in fact so comparable to this American method that the applicable principles are interchangeable. The analysis that follows will therefore be based as much as possible on the attributes of the OPP, but some arguments will invariably be based on the JOPP principles.

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[83]Greer, "Operational Art…," p. 25.

[84]The JOPP, the American Forces operational planning tool, is mostly based on the United States Army *Military Decision Making Process* (or *MDMP*). See Kem, Jack D., *Campaign Planning: Tools of the trade*, 2nd Ed. (Fort Leavenworth, KS: Army Command and General Staff College, 2006), pp. 1-12, for a more in-depth comparison of the two processes.

Campaign operational art and design

A preliminary clarification on the operational art and its meaning is called for. Roughly, operational art relates to the ingenuity of a commander in the design and execution of a campaign. Pragmatically, operational art is the ability of a commander and his staff, through the design, organization and conduct of campaigns, to employ military forces with a view to reaching the strategic targets in a theatre of war or operations.[85] It is due to this cognitive process, among other factors, that the ends, ways and means are integrated into a coherent structure and present at all levels of war.

More precisely, operational commanders and their staff must interpret strategic directions to then develop an appreciation that directly influences the design and subsequent planning for the tactical execution.[86] That is why the commander's ability to exploit the cognitive dimension, develop and maintain an in-depth knowledge of the operational environment, and constantly visualize the conditions required to reach the strategic targets represents the core of the operational art.[87]

This operational art occupies the thoughts of commanders and planners, and guides their actions when they undertake the design of war at the operational level. It follows that it is important, in the use of military forces, that the ends, the ways and the means they have available are closely related and work in an extremely fluid environment, at all levels of war.[88]

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[85]B-GJ-005-500/FP-000, *The planning process…*, pp. 1-3.

[86]Vance, Colonel J.H., "Tactics without Strategy or Why the Canadian Forces Do not Campaign," in *Operational Art: Canadian Perspectives: context and concepts*, Allan English et al., Editors (Winnipeg: Canadian Defence Academy Press, 2005), p. 272.

[87]Delacruz, Major Victor J., "Systemic Operational Design: Enhancing the Joint Operation Planning Process" (Fort Leavenworth: essay written for the Advanced Military Studies Course, United States Army Command and General Staff College, 2007), p. 4.

[88]Macaulay, Major D.A., "Campaign Design: One Framework for a Volatile, Uncertain, Chaotic and Ambiguous Environment?" (Toronto: essay written for the Advanced Military Studies Course, Canadian Forces College, 2008), p. 30.

The practical representation of the operational art, in words and pictures, is the campaign plan. The operations, engagements and battles are orchestrated from this operational conceptualization to reach the strategic targets. Developed with the help of the OPP, which will now be examined, the campaign plan supports commanders and their staff in their mission.

An OPP analysis

The OPP is a coordinated process that determines the best method to accomplish the operational tasks assigned and to plan future actions. This planning process is designed to optimize, in an environment imbued with Clausewitzian fog, decision-making from steps calling for logic and analysis.[89] It consists in developing and comparing potential courses of action, selecting the best course of action, and producing a plan.[90] In fact, the OPP represents what Henry Minzberg calls "a formalized procedure to produce an articulated result in the form of an integrated systems of decisions."[91]

Within the OPP, operational art influences and guides commanders and their staff when they interpret the strategic directions for developing coherent campaigns and plans. As shown in Figure 2.1, the OPP includes five steps: the Initiation, the Orientation, the Course of Action Development, the Plan Development, and the Plan Review.

Therefore, the OPP is discussed further below, not in its entirety, but in what connects it to the operational art. In fact, only the first two stages can be considered fundamental in the execution of the operational art, while the three subsequent steps are related to the detailed planning of an operation.

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[89]Duggan, William, "Coup D'œil: Strategic Intuition in Army Planning," *United States Army Strategic Studies Institute*, November 2005 [online journal], p. 7, accessible at http://www.strategicstudiesinstitute.army.mil/pubs/display.cfm?pubID=631; Internet; accessed on November 28, 2008. Duggan refers, though, to the *Military Decision Making Process* (MDMP), which is the American equivalent of the CFOPP.

[90]B-GJ-005-500/FP-000, *The Planning Process…*, pp. 3-1.

[91] Mintzberg, Henry, *The Rise and Fall of Strategic Planning: Reconceiving Roles for Planning, Plans, Planners* (New York: Free Press, 1994), p. 12.

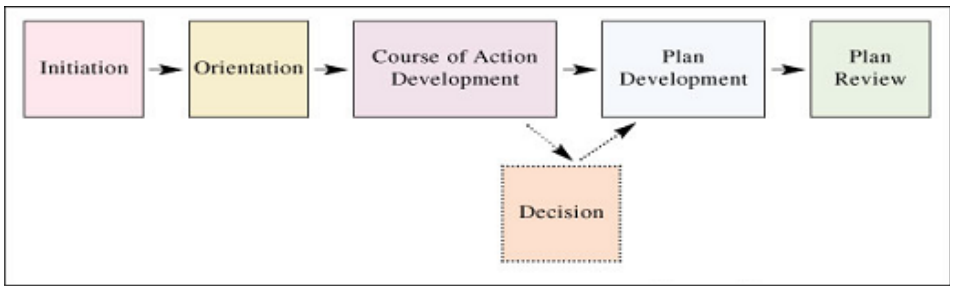

Figure 2.1 – The CF Operational Planning Process

Source: Bryant, David J., "Can We Streamline Operational Planning," *Canadian Military Journal*, vol. 7, no. 4, winter 2006-2007 [online journal], p. 84; accessible at http://www.journal.forces.gc.ca/vo7/no4/bryant-eng.asp; Internet; accessed on February 20, 2009.

The first stage of the OPP is the initiation.[92] The initiation starts with receiving a strategic direction that transforms into a draft of the task to accomplish. However, as we saw in the first chapter, these directions are often obscure and lack precision. This direction must, at least, provide a clear vision of the strategic aims and targets associated with the potential military operation. It is at this stage that the commander discusses the strategic direction with his sponsor to present his staff with a coherent vision of the operation.[93]

The second stage of the OPP is the orientation. In operational design, it is no doubt the most important time of the process. It is at this stage that most of the operational design is done and a draft campaign plan made. The mission analysis is the keystone of this step.

This mission analysis has two aims: establishing the nature of the problem and confirming the anticipated results. This in-depth analysis requires from the commander and his staff the execution of a detailed research of all the factors influencing the problem. The success of this step clearly depends on the command team's ability to collect the relevant information, on its analysis to develop situational awareness and, finally, on its synthesis to understand the specific situation in relation with the operational environment. To this end, the CF warns the operators:

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[92]B-GJ-005-500/FP-000, *The Planning Process…*, p. 4-2.

[93]The word 'sponsor' is used to represent all the senior stakeholders, and not only the hierarchical commander who can influence the operational commander.

"All missions must be analysed in the context of their relationship to the system of systems that will exist in the theatre of operations."[94] The mission analysis is done according to an exact method that will be discussed in the next paragraphs.

The first step of the mission analysis is the review of the situation. The aim of this step, which is a key component of the operational design, consists in identifying the problem. In fact, it must necessarily be examined thoroughly and well understood before an attempt to resolve it. The strategic global scene and the enemy are then the focal points.[95] The fact that Canadian doctrine does not recommend any special direction or procedure for the definition of the problem is noteworthy. In the absence of directions, most planning groups use structured brainstorming to understand the problem.

The second step is the study of the directions issued at the senior level. In addition to the planning assumption statement, and the inventory of constraints and restrictions, an analysis of the senior commander's intent first takes place. Finally, the deductions used to project the desired end state are drawn and the operational targets leading to the accomplishment of the mission are fixed.

The third step is analysis of assigned and implied tasks, and identification of critical tasks. The result of this exercise is the mission statement, which represents the campaign's ultimate measure of success.

The fourth step is the study of the tasked commander's own forces. The analysis of strengths and weaknesses inherent in the available resources; of critical, vulnerable and required assets; and of the centre of gravity, will make it possible to set the foundations for the next step, which is the design of the campaign plan.

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[94]B-GJ-005-500/FP-000, *The Planning Process…*, p. 4-2.

[95]The *Intelligence Preparation of the Battlefield – IPB*) is a by-product of the OPP that makes it possible to assess the enemy.

An OPP critique

However, a study of these four first steps is necessary before studying the campaign plan. The approach suggested by the OPP is in effect reductionist and linear, by this very fact prevent ing the commander from having a good vision of the system.

To begin with, applying the scientific method would require the staff to take each bit of information, to analyse it carefully, and then to list the associated causal deductions. It would be impossible to come to a global understanding of the system with this method, as illustrated by the metaphor of the three blind men.

Three blind men examine an elephant, but without knowing it is a pachyderm. The first blind man touches the elephant's legs and concludes it is a tree. The second one touches the tail and assumes it is a rope. The third one feels its trunk and concludes he is in front of a snake. Just as these blind men concentrate on different parts, it is therefore logical for them to describe the same subject differently.[96]

In the same train of thought, one of the weaknesses of this mechanical approach is that it does not account for the emerging properties of a system. These properties are the characteristics that the system possesses, but the causes of which cannot be found among the individual elements of the system. Therefore, the analysts cannot understand, or even find, these essential traits of a system through reductionist mechanics. As Major Davison said:

> Analysts cannot understand emergent properties by examining the system's separate parts, so predicting which emergent structures will arise from interacting parts in an open system that exhibits novelty and complexity is not feasible for all practical purposes.[97]

Moreover, the step-by-step approach to the OPP can compromise the development of a satisfactory solution. Obviously, this approach, of beginning with analysis of the system, is relatively logical in the sense that we need to understand a problem before finding a solution.

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[96]Marion, *The Edge...*, p. 9.

[97]Davison, "From Tactical Planning...," p. 35.

However, this logic fails in the case of problems in which the end state is poorly defined, such as the obscure strategic targets described in the first chapter.[98] As Gary Klein, a psychologist specializing in decision-making, has said:

> We can run into trouble with this model by following the linear sequence of steps too strictly. For example, you would not want to start generating courses of action until you had a fairly good idea of what the problem was; however, for many common problems we will not be able to reach a good definition because they are ill-defined. We cannot begin with a definition since there is none.[99]

Finally, one must realize that the organization that tries to resolve a problem *is part* of the problem and the potential solution. Corollary to this affirmation, it is illogical to think one understands the problem if the suggested solution is not included in the analysis. In the case of the OPP, this step comes only at a much later stage, when all the understanding work is completed.

Despite their pitfalls, these first steps are the path that takes planners to the operational design of a campaign plan. The time has now come to examine this plan and its foundations.

Campaign plan and traditional components of operational design

As aforementioned, the campaign plan is the practical expression of the operational art. Figure 2.2, drawn from a campaign of the Second World War, is a great example of a campaign plan's graphic representation. This graphic representation, like the one presented below, can also take the shape of text. Despite this suggested example, Canadian doctrine stipulates that there is no standard format for the representation of a campaign plan. What is clear, however, is that the campaign plan needs to be based on the classical elements of operational design.[100]

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[98]Anderson, James H., "End States Pitfalls: A Strategic Perspective," *Military* Review 77, no. 5 (September/ October 1997), p. 93. These ill-structured or *wicked* problems will be discussed in detail in Chapter Four.

[99]Klein, Gary A., *Sources of Power: How People Make Decisions* (Cambridge, MA: The MIT Press, 1998), pp. 127-128.

[100]B-GJ-005-500/FP-000, *The Planning Process…*, pp. 2-7.

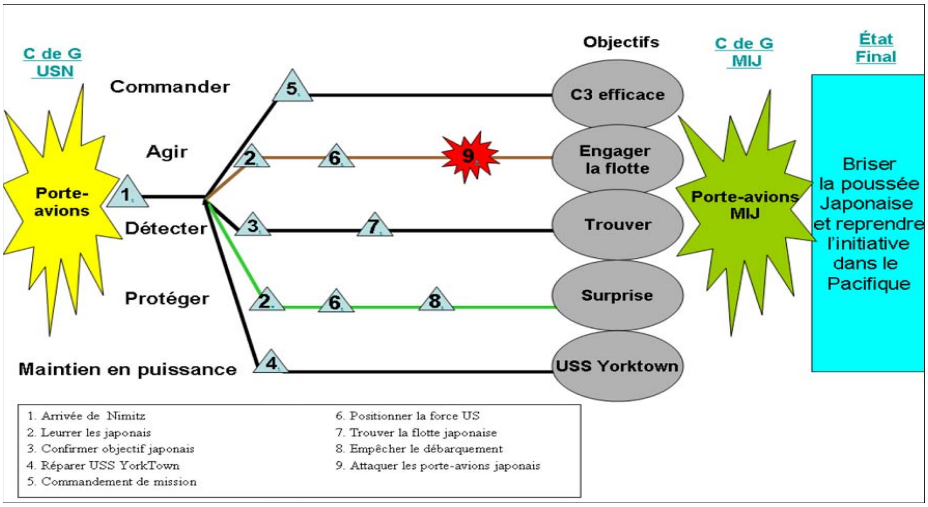

Figure 2.2 — Sample graphic representation of a campaign plan

The operational design, which is the basic framework establishing the pillars of the plan at the operational level, includes 13 elements. The list of these elements represents a grouping of concepts that can be useful to the commander and his staff when they consider the distribution of their resources in time and space, and accomplishment of a common mission. These concepts are recognized by both Canada and its major allies, including the Americans.

It is therefore fitting to note that according to the JP-5-0 American *Joint Operational Planning Process*, the key of the operational design's success involves understanding the strategic direction, the identification of the enemy's strengths and weaknesses, and the development of an operational concept which will achieve the strategic targets.[101] To this end, Figure 2.3, taken from American doctrine but modified by the author to reflect the Canadian vision, well illustrates the function of these *design elements* in the process of operational design.

All these elements are unique and should be considered individually. However, only the most relevant classical elements of a campaign plan development will be examined for this essay. Moreover, they will be divided into two categories. The first group includes the following guiding elements: end state, transition conditions, targets, and lines of operations. These

[101]Joint Chiefs of Staff, Joint Publication 5-0, *Joint Operation Planning* (Washington, DC: JCS, 2006), p. IV-2.

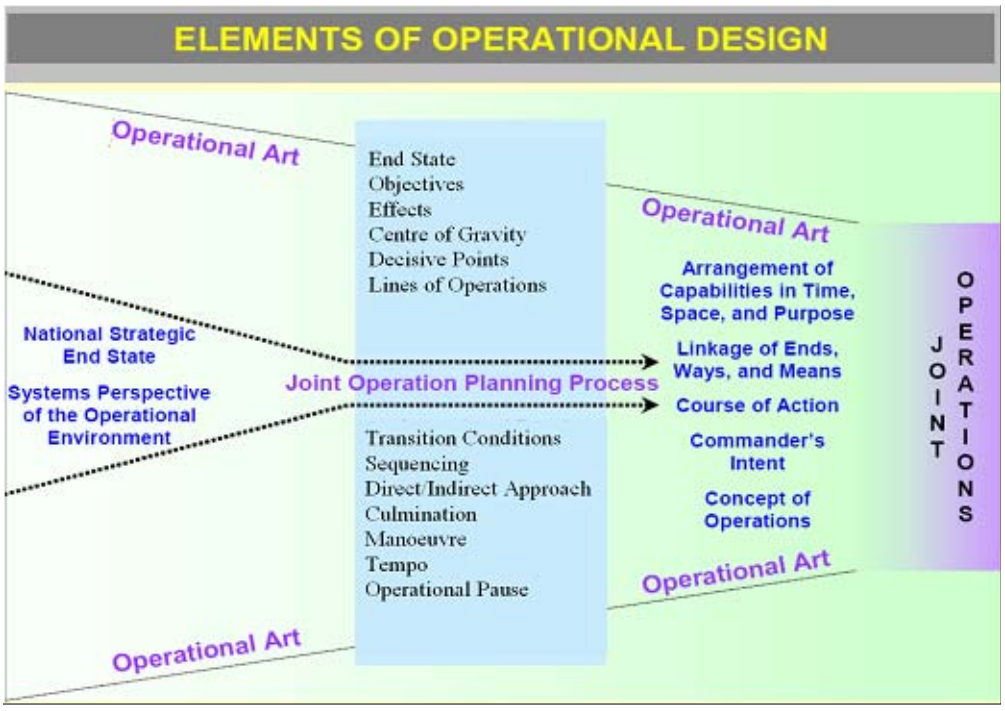

Figure 2.3 — The elements of operational design and their relationships with the operational art and the OPP.

Source: Joint Publication 5-0, *Joint Operation Planning*, pp. IV-6., with the author's modifications.

elements guide the commanders' and the staffs' thoughts in addition to linking the strategic end to the tactical means. The second group includes the following system elements: centre of gravity, effects, and decisive points. These elements refer to the major entities of a system, those that give it endurance.

Guiding components of the OPP

The end state is the cornerstone of the campaign plan. It is the beacon, the light that guides all other actions. This end state must necessarily be clearly considered and described to ensure success of the campaign.[102] According to Canadian doctrine, the end state is always defined by the government. More precisely, the end state is "the set of conditions that describe the achievement of policy goals."[103] This concept is intimately connected to the transition conditions.

[102]B-GJ-005-500/FP-000, *The Planning Process…*, p. 2-7.

[103]*Ibid.*, p. 4-5.

"Transition conditions" is the new term used by Canadian doctrine to recall the set of required conditions or effects that define a transition in the way CF uses operations, the mission of the operational force, or its structure.[104] These conditions usually appear towards the end of a mission (hence its relationship with the end state) or when it undergoes major changes.

The targets are clearly defined, decisive and reachable aims towards which all operations are directed.[105] While traditionally, strategic targets include the economical, social and political dimensions, operational targets usually aim at the destruction or neutralization of the enemy. The aim selection requires strict meticulousness; those aims need to be reachable and realistic. Otherwise, reaching the wrong aims could prove very costly for the operational commander.[106] The targets reflect the aims, create the conditions, and influence the means, and are the foundations of an effective campaign plan.

The lines of operations make it possible to interconnect decisive points (which will be examined later on) and establish a critical process leading to the enemy's centre of gravity. Moreover, the line of operation makes it possible to progressively address the events in a logical order. These lines are useful tools to communicate the vision of a commander's campaign plan and intent.

Before addressing the system elements group, a critique of the guiding elements is needed.

A critique of guiding elements

The relevance of the end state cannot be underestimated within the OPP. Its definition requires the crystallization of their vision from the military and political authorities to provide the appropriate directions for the conduct of the campaign. However, it is possible for the end state to be excessively deterministic, independently from its accuracy, which can lead to irration-

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[104]*Ibid.*, p. 2-2.

[105]*Ibid.*, p. 4-5.

[106]Vego, *Joint Operational Warfare*, p. 471.

al and inappropriate decisions.[107] In addition, the end state is more or less the intended solution to a problem. And, just as we saw earlier in the discussion on the OPP, the original conditions for understanding the problem often reduce the possibilities of finding a satisfactory solution, hence the impossibility of finding a just and certain end state.

Moreover, we need to understand the nature of the end state, the transition conditions, the targets and the lines of operations. Those are not really exact reference points but often imaginative interpretations of the location where a commander wants to lead a system. The means with which operational art is equipped are really only an attempt at lifting the fog that prevails on the battlefield, at the risk of losing sight of the true nature of the system. As Colonel Pierre Lessard said, "the more objectives and end-states are allowed to proliferate, the more they add filters, distance, and possibly obfuscation between operations and policy [hence the heart of the system]."[108]

Finally, as we saw in the first chapter, the COE is characterized by the absence of linearity. The definition of a system in such an environment makes it almost impossible to predict what action will generate the intended effect.[109] Therefore, in a non-linear environment, there is no guarantee that these targets are those that lead to the accomplishment of strategic aims. Therefore, the campaign plan is guided by elements that are only the interpretations of steps set out on a line, in a non-linear environment.

Clausewitz is also critical of those who tried to bring such principles to the art of war. According to him, those theorists (including Jomini, the father of the lines of operations) fail in their attempt to isolate the individual factors present in the war.[110] As Clausewitz himself said:

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[107]Brennan, Lieutenant-Colonel S.A., "Endstates: The Facts and Fiction" (Toronto: essay written for the Advanced Military Studies Course, Canadian Forces College, 2006), pp. 26-28.

[108]Lessard, "Campaign Design…," p. 41.

[109]Beyerchen, "Clausewitz, Nonlinearity…," pp. 62-63.

[110]Baron Jomini, a Swiss-born member of the French Army, was one of the first military men to have studied war scientifically. See Shy, John, "Jomini," in *Makers of Modern Strategy: From Machiavelli to the Nuclear Age*, Peter Paret, Ed. (Princeton: Princeton University Press, 1986), pp. 143-144 and Creveld, *The Transformation...*, pp. 96-97.

> As we have seen, the conduct of war branches out in almost all directions and has no definite limits; while any system, any model, has the finite nature of a synthesis [in the sense of synthetic or man-made]. An irreconcilable conflict exists between this type of theory and actual practice.... [These attempts] aim at fixed values; but in war everything is uncertain, and calculations have to be made with variable quantities. They direct the inquiry exclusively toward physical quantities, whereas all military action is entwined with psychological forces and effects. They consider only unilateral action, whereas war consists of continuous interaction of opposites.[111]

If these guiding elements channel the thoughts, the system elements themselves are the nerve centre of the systems. The system notions of centre of gravity, effects, and decisive points will now be examined with a fine-toothed comb.

Systemic components of the OPP

The centre of gravity of a system includes a set of "characteristics, abilities or geographic situation from which a nation, alliance, or military force derives its freedom of action, its power or will to fight [loose translation]."[112] The centres of gravity are capital in the operational

design. In fact, it is through their neutralization that the end state is reached. The appropriate identification of the centre of gravity is therefore probably the most important task of an operational commander and his staff. The centres of gravity are not necessarily static; they can change during a redefinition of the desired end state, of the mission, of the targets and adversaries.[113]

The effects that result in imposed actions within a system are of a physical or behavioural nature. These effects are used to link the military targets to the specific tasks, making it possible for both the commander and his personnel to envision the conditions required to reach the targets.

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[111]Clausewitz, *On War*, p. 89.

[112]B-GJ-005-300/FP-000, *Canadian Forces Operations*, p. 3-1.

[113]Strange, Joe, and Iron, Colonel Richard, "Understanding Centers of Gravity and Critical Vulnerabilities, Part 2 — The CG-CC-CR-CV Construct: A Useful Tool to Understand and Analyze the Relationship between Centers of Gravity and their Critical Vulnerabilities"; [online article] accessible at http://www.au.af.mil/au/awc/awcgate/usmc/cog2.pdf; Internet; accessed on March 16, 2008.

While the target description directs a form of action, the effects represent the expected results. The effects also help the commander determine and assess the target hits.

Decisive points are critical events that pave the way to the end state. These are geographical areas, key episodes, critical factors or functions that will allow the commander to gain a marked advantage over an adversary.[114] During a campaign, the success of a battle or operation represents a significant step in reaching the end state. The representation of these moments on the lines of operation allows the commander to see the progress achieved and to adjust the target, if needed. The ability to identify decisive points and prioritize them is a critical part of operational design. In fact, there will always be more decisive points to attack, retain, and capture in the COE than there are resources available.

These system elements are the foundation of the operational art. However, they tie the planners' hands when the time comes to conceptualize an operation.[115] The centre of gravity is most certainly the first to be questioned, as the following argument will prove.

Although Canadian doctrine warns commanders against the risks of reaching too many conclusions regarding the centre of gravity, nonetheless, according to the OPP, this concept is central to the planning of a campaign.[116] As evidence, Colonel Dale Eikmeier, of the US Army, does not hesitate to write that "the essence of a campaign plan is a focussed effort against an enemy's center of gravity while protecting one's own."[117] The American Forces even maintain

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[114]Joint Publication 5-0, *Joint Operation Planning*, p. IV-16.

[115]Greer, "Operational Art…," pp. 22-23.

[116]As mentioned in B-GJ-005-500/FP-000, *The Planning Process…*, p. 2-1, "recent writings on the topic of centre of gravity have suggested that Western militaries have taken Clausewitz's concept of the Centre of Gravity too far. What was intended as an abstract analytical concept was never intended to be the singular focus of campaigning. As such, it has been suggested that the unifying focus of any campaign should be the evolving end state, goals and objectives and if a clear, useful centre of gravity is present then it should be included in the operational art."

[117]Eikmeier, Colonel Dale, "Center of Gravity Analysis," *Military Review* 84, no. 7 (July-August 2004), p. 2.

that "one of the most important tasks confronting JFC's staff in the operational design process is the identification of friendly and adversary Center of Gravity.[118] It is probably for all these reasons that the centre of gravity is the most discussed notion within a planning group, on which the attention is most focused.

But it would be presumptuous to suppose that all systems have a centre of gravity. In a contemporary environment, the validity of a concept, with the premise that there must be enough connectivity between the elements of an enemy to form a unified structure, can easily be questioned.[119] Clausewitz himself puts a damper on the pertinence of the centre of gravity in complex systems (emphasis in italics):

> However, just as in the world of inanimate bodies where the effect on a center of gravity has its proportions and its limits determined by the interdependence of the parts, *the same is true in war*.[120]

To continue in the same vein, we can easily declare that most of the enemies a contemporary commander faces are the representation of a complex adaptive system.[121] As we have seen in the first chapter, these open systems will always adapt to their environment, bringing *de facto* a constant change of centre of gravity. In addition, as long as they receive energy, they will continue to evolve to avoid extinction.[122] It is therefore utopian to think of basing a campaign plan on a centre of gravity; its changing and adaptive nature makes it a really mediocre element on which to build.

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[118]Joint Publication 5-0, *Joint Operation Planning*, p. IV-8.

[119]Echeverria II, Antulio J., *Clausewitz's Center of Gravity: Changing our Warfighting Doctrine — Again!*, SSI Monographs (Carlisle: Strategic Studies Institute, US Army War College, 2002), p. 16.

[120]Clausewitz, *On War*, p. 486.

[121]Klicullen, Lieutenant-Colonel David, "Countering Global Insurgency," *Small Wars Jounal*, 2004; [online journal] accessible at http://smallwarsjournal.com/documents/kilcullen.pdf; Internet; accessed on February 26, 2009.

[122]Holland, John H., *Hidden Order: How Adaptation Builds Complexity* (Reading, MA: Addison-Wesley Publishing Company Inc., 1995), p. 23.

The example of the insurgency war comes to mind when, among these asymmetric groups, it is difficult to find an exact point from which they get their freedom of action. The following question emerges from this conclusion: Can a complex adaptive system have a centre of gravity? Therefore, this question challenges the validity of having, as the planning central point, the notion of centre of gravity among the basic elements of the operational art.

Is the notion of effects so problematic, despite the importance it is given by the OPP? In fact, being able to determine precisely the effects that will produce the expected results probably represent the peak of the operational art for a supporter of the classical elements of operational design. If the end state is clear for a commander and he knows what effects will let him reach his targets, victory is assured. However, the premise of this hypothesis is that his knowledge of the environment needs to be perfect.

And that is when the logic associated with effects ends. It is unreasonable to ask a commander to know the COE to the degree of being able to predict all of the effects of all his actions.[123] As was proven in the previous chapter, the COE presents all the characteristics of a non-linear system. If this statement is acknowledged, it becomes obvious that it is impossible for a commander to predict the effects of his actions. The analogy with the pile of sand in the first chapter remains appropriate: can a commander predict what will happen if he adds a grain of sand to a knoll of sand? The answer is no. The same goes for actions happening on a complex battlefield. The unique certainty is that a change will happen within the system. The linear vision that proposes the concept of effect is therefore of limited use in the contemporary operational design. In Edward Allen Smith's words, "this messy reality [of complexity] is clearly at odds with the linear mechanical view of military operations that seems to pervade long-range

[123]Davison, "From Tactical Planning...," p. 35.

military planning."[124]

Finally, the same logic applies to decisive points. In a non-linear environment, is it possible to hope that a commander could astutely decide transition points needed to reach an end state — without forgetting, obviously, that this end state is ambiguous by definition?[125]

Another angle of approach that is critical to decisive points — the markers that measure success — is that of the historian Martin Van Creveld.

In his book *Command in War*, Van Creveld successfully describes what happens when linearity meets non-linearity in a complex environment. He maintains that the Americans' will to align the actions on the battlefield in accordance with a linear and reductionistic vision is probably responsible for their defeat. During the Vietnam War, in a non-linear environment, the Americans based the assessment of their campaign plan mostly on the use of statistics. They were using these statistics to decide if they had reached a decisive point and if they could proceed to the next operation. Yet, the statistics are more or less weak representations of reality, which inevitably leads to a distorted picture of the truth. This partial illustration, in turn, is the basis of the commander's decisions.[126] The same problems exist with other performance measurements such as surveys, empirical evidence, etc. Van Creveld expresses this by the following: "the relevance of any given set of figures to this or that particular event at this or that particular place may well be next to zero."[127]

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[124]Smith, *Complexity, Networking…*, p. 56.

[125]Mandel, Robert, *The Meaning of Military Victory* (Boulder: Lynne Rienner Publisher, 2006), p. 6.

[126]Iklé, Fred Charles, *Every War Must End*, revised Edition (New York: Columbia University Press, 1991), pp. 18-19.

[127]Van Creveld, Martin, *Command in War* (Cambridge, MA: Harvard University Press, 1985), pp. 253–254. For a philosophical approach to the interpretation of facts, the reader can refer to John Ralston Saul's book, *On Equilibrium* (Toronto: Penguins Books Ltd, 2001), p. 296.

It is therefore logical to infer that the decisive points can lead to the failure of the campaign plan, hence their limited use in the creation of a contemporary operational plan.

Conclusion

In the light of the previous conclusions, it can be suggested that the OPP and the classical elements of the operational design can be harmful to the creation of a campaign that takes into account the complex nature of the contemporary environment. The OPP, with its failing initial steps, certainly does not help the commander understand the problem properly. As for the classical elements, they are drawn from a linear and reductionistic thought, which is clearly the opposite of what the COE really is.

However, it would be unjustified to blame it all on the OPP and on the classical elements. In fact, it is interesting to note that the OPP, for the CF, has dual functions: campaign design and major operations planning. The difference? One relates to the need for design, while the other is associated with the planning. But before going any further in explaining these differences, a discussion on a new approach to design, the SOD, is appropriate.

CHAPTER THREE: SYSTEMIC OPERATIONAL DESIGN

> A new view of the world is taking shape in the minds of advanced scientific thinkers the world over, and it offers the best hope of understanding and controlling the processes that affect the lives of us all. Let us not delay, then, in doing our best to come to a clear understanding of it.[128]
>
> — Ervin Laszlo

The OPP is challenged by the contemporary environment. The problems that the CF doctrine process faces are complex, numerous and evolutive. As we have seen previously, the OPP probably lacks the solidity in its theoretical foundations to efficiently help commanders establish campaign plans.

On the other hand, the SOD is a new approach that relies on notions of complexity. But to what degree would this method be able to represent a source of inspiration for operational commanders?

This chapter shows that, in fact, the SOD can assist the commander in his operational art. To support this thesis, the argumentation that follows will be divided into three parts: The approach to the SOD will be examined in the context of complex problems; the system elements of the process will be reviewed and finally, the method will be briefly explained and analysed.

SOD approach in relation to problems

The SOD is a method of military planning created by Brigadier-General (Reserve) Shimon Naveh and his colleagues at the Operational Theory Research Institute in the late ’90s. After turning to the scientific domain, emerging from systems theory and complexity, to understand the evolution of the operational art, they developed the SOD. The methodology of the SOD then entered Western military circles by way of the US School of Advanced Military Studies of Fort Leavenworth, where Brigadier-General (Reserve) Naveh is a visiting professor.

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[128]Laszlo, Ervin, *The Systems View of the World: A Holistic Vision for Our Time*, 2nd Ed. (Cresskill, NJ: Hampton Press, 1996), p. viii.

Therefore, this institution is, for now, the main source of documents on SOD. These documents form the foundation of this chapter.

The SOD is unique in many ways. The aspect that is probably the most remarkable is that the supporter of SOD never considers strategic directions as complete or perfect. Contrary to traditional methods, where the process begins with acceptance of strategic directions as the starting point of the analysis, SOD accepts the fact that the strategic sponsor ignores the intended final result.[129] Thus, SOD, in contrast to the OPP, begins with the premise that operational conceptualization deals with the approach to problem definition rather than on the approach to problem resolution.

This system method inherently recognizes that the operational art must first and foremost set the problem in an expanded context. And it is only after having worked out the problem in its geopolitical environment that the operational conceptualization can start. It is essential that the practitioner of operational art communicate with his sponsor to understand exactly what he wants.[130] In turn, the operational conceptualization results will make it possible to inform the planning processes that will lead to tactical execution.

Therefore, for the user of the SOD, there is a vast difference between design and planning. According to the father of the SOD, Shimon Naveh, the cognitive gap that separates the two functions is wide and cannot be bridged by the same process, as the traditional methods of planning now do.[131] Naveh uses a series of metaphors to distinguish the two: design is synonymous with

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[129]Sorrells, et al, "Systemic Operational Design: An Introduction," p. 15.

[130]See Newell, *The Framework...*, pp. 53-56, for a discussion on the importance of dialogue between strategic and operational levels.

[131]Groen, Major Jelte R., "Systemic Operational Design: Improving Operational Planning for the Netherlands Armed Forces" (Fort Leavenworth: essay written for the Advanced Military Studies Course, United States Army Command and General Staff College, 2006), p. 20.

learning, while planning is synonymous with action; design defines the problems, while planning resolves them; design creates new models, while planning uses existing models; design is holistic, but incomplete and vague, while planning is complete, but partially holistic; finally, design is an open and limitless mode of thought, while planning is a closed mode of thought.

These concepts are easily understandable thanks to an example of urban development. This metaphor, picked up many times by several sources from the US School of Advanced Military Studies, shows the relationship between the urban designer and the municipal council.[132]

The municipal council is the sponsor and financier of an urban housing development. The council has a general idea of the targets they want to reach and a vision of the project. This vision includes abstract notions such as the desire of minimizing environmental impact and creating a friendly atmosphere. The targets can also represent concrete ideas such as the construction of a school in a particular location.

It is the designer's role to transform these ideas and these concepts into a coherent and functional design. Thanks to his specialized skills, he is able to integrate all the necessary elements to submit a design to his sponsor. This process requires the urban designer to take into account the existing environment of the project as well as new relationships created by the housing development. Moreover, the designer will probably have to compromise once the project goes from the abstract to the concrete stage. For example, respecting the requirement to minimize ecological impact can cause a change in the location of the school if the suggested location is vital to the ecosystem.[133]

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[132]For the best examples, see Davison, "Systemic Operational Design: Gaining…", pp. 31-32; and Sorrells et al, "Systemic Operational Design: An Introduction", pp. 15-17.

[133]Sorrells et al, "Systemic Operational Design: An Introduction", p. 16.

Therefore, it goes without saying that the urban designer cannot fulfil his role unless he tackles the problem within the parameters imposed by the current and future environmental context. Therefore, this requires an expanded vision of the city's development plans, while taking into account the ongoing project. To complicate matters further, the city continues to change and evolve at the demographic, economical and environmental levels (which are the attributes of an open system). The long-term vision can be provided only by the municipal council. The sponsor and the designer must therefore be in continuous communication as issues emerge. The mutual understanding of these issues can then lead to a clarification, prioritization or a change in the targets and the vision.

Therefore, the end state is an urban design that emerges through constant interaction between the urban designer and the municipal council. This forced discourse, generated by the need to apply an abstract concept to the physical environment, is in fact the creative medium that allowed optimal design to emerge on its own.[134]

Once the design meets the objectives and the given vision (both of which could have been modified along the way), it is handed over to the urban engineer. The urban engineer then plans the execution of the project. He is the professional responsible for the translation of the design into a construction plan that will be executed by the contractors. It should be noted that a discourse, although less substantial, must settle itself between the urban designer and the engineer.[135]

Similarities with the military reality are numerous. The municipal council is the strategic sponsor and the urban designer is the operational artist who is responsible for the campaign; the

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[134]Dixon, Major Robert G., "System Thinking for Integrated Operations: Introducing a Systemic Approach to Operational Art for Disaster Relief" (Fort Leavenworth: essay written for the Advanced Military Studies Course, United States Army Command and General Staff College, 2006), p. 39.

[135]Davison, "Systemic Operational Design: Gaining…," p. 32.

engineer is the one who must plan the operations. The fact that each design is unique must also be taken into account, because for the designer the situation is always new and changing. At the military operational level, each problem is new, so that the tactical execution is often only a variation on the same theme (offensive, defence, and manoeuvres of transition).[136] This relationship between the levels of war and the types of problems relating to them will be examined in more detail in the fourth chapter.

Therefore, in light of the previous example, it is clear that the resolution of a complex problem should first and foremost go through a design phase. It is to this end that the SOD offers itself as an investigative tool allowing a commander to rationalize a complex situation, to understand the stakes, and to share a vision of a given situation.

Systemic thought enables the SOD to perform in a complex environment by providing a framework within which theoretical models can be built, relationships between the elements of a system can be examined, and behavioural models can be developed. Understanding the logic of the system and its structure makes it possible to identify the leverage points and to decide on action which will influence this system.[137]

The analysis will now proceed with a closer look at these systemic elements, the notions that let the SOD work in a complex environment. Note that the identification of these systems' components is adapted from Lieutenant-Colonel W. Sorrells's and his team's research study.[138]

SOD systemic components

The first derivative of the systems theory is the ability of the SOD to delimit a problem. As shown previously, the SOD avoids the application of a generic or dogmatic model to an

[136]Groen, "Systemic Operational Design: Improving Operational Planning...," p. 28.

[137]The leverage points are those that can provide a marked advantage if the right pressure is exerted, in spite of their importance and location.

[138]Sorrells, et al, "Systemic Operational Design: An Introduction," pp. 15-22.

operational enigma. Recognizing that the limits of an open system will always be hypothetical in accordance with the needs of the observer, the SOD first requires that the campaign designer define the system.[139] Particularly, this is a creative process that requires consideration of the components that take into account the aim sought by the strategic sponsor. However, it is easy to consider too many components and get swamped by details. Only the components that influence the system should be considered. For example, although the international market can influence the analysis of a problem, only those aspects of the market with a direct link will be studied in detail. This could mean concentrating on the regional economy and on the influence of major economic players.[140] Hence, the limits of the problem are set by the campaign designer. But he recognizes simultaneously that these beacons are hypothetical, and that they allow him to define the problem.

Thus, this method produces a system's artificial construction, allowing the operational designer by this very fact to consider all the elements relevant to the problem. The designer's cognitive ability to draw a virtual map of interrelated elements is the only limit to this approach.

The second product of the system theory is the ability of the SOD to recognize and analyse the tensions between the different components of a system. This is possible thanks to the exploration of the relationships among a system's components. The study of these relationships is based on the concept that open systems are inherently dynamic and complex. The system's components are in fact systems themselves, with their own synergy and aim. It is thus thanks to this conceptual backdrop that the SOD accepts the fact that, depending on the circumstances, the components will act in a specific manner. But in turn, again depending on the circumstances, the actions of its components will necessarily be different. Subsequently, the SOD is not trying to be

[139]Delacruz, "Systemic Operational Design: Enhancing…," p. 27.

[140]Sorrells, et al, "Systemic Operational Design: An Introduction," p. 17.

predictive, but rather to develop an understanding of the factors and characteristics of a system that influence the actions of entities.

Tensions, the links present among different components, can be the result of a positive or negative relationship. If two components are complementary, the tension is positive, and vice versa. The SOD therefore proposes to examine these tensions as a potential source of friction and to see how they can be exploited to the advantage of the designer. An example of this friction can be the desire of a terrorist group to perpetrate illegal acts to promote its cause while this aim is counterproductive to its need to remain discreet in order to ensure its survival.[141]

The aim in exploring tensions is to establish an understanding of the system's logic. In other words, this approach makes it possible to identify the emergent sources of power within a system and the driving forces of an adaptive complex system. In the end, besides helping to better understand the problem, the study of links also allows the exploitation of the tensions and differences that could alter a system's logic.

The third concept is continuous learning, as can be seen in the previous notions'emphasis on the study of systems. The supporter of SOD will readily admit that the framework in which he works is hypothetical. In this sense, and at least a bit similarly to the traditional planning processes, this artificial environment must be constantly tested, validated and re-evaluated.[142] But besides accepting that these hypotheses can change when new facts become available, SOD recognizes that emerging factors will change the understanding of the system. Just like the systems theory that describes the latter as entities in constant upheaval, the frame of study always transforms. The corollary is therefore that the logic of the system will change constantly. The

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[141]Sorrells, et al, "Systemic Operational Design: An Introduction," p. 18.

[142]Note that the OPP also recognizes the need to always check the hypotheses to confirm their plausibility and relevance. To this end, see B-GJ-005-500/FP-000, *The Planning Process…*, pp. 4-5. There is, however, a major difference between the usefulness of the hypotheses in the PPO and the SOD. In the OPP, a hypothesis replaces a fact to help with the planning; in the SOD, the frame of reference is hypothetical.

changes to a system, potentially created by the mere involvement of the actor seeking to influence it, can therefore fundamentally change its character. Therefore, the SOD requires constant checking of the logic used as the frame of study.

The fourth notion is the iterative approach to the SOD process. The concept of emergence and the need for continuous learning lead directly to a different approach in the conduct of a campaign. In contrast to the traditional method that seeks to impose a predetermined line of conduct to reach an end state, the SOD agrees that it is impossible to set such a stage.[143] In fact, as seen previously, the complex systems that compose the COE are evolutive; they do not stop changing according to the transfers of energy in their environment. To compensate for this lack of linearity, the SOD thus proposes an iterative approach.

In accordance with its theoretical foundations, the SOD admits that the integration of energy within a system can create important changes. This natural alteration, and its relationship with the aim sought by the sponsor, need to be considered even before proceeding to the operations planning. In fact, that the end state may no longer be appropriate or attainable is not excluded.

The SOD tries to resolve this problem by taking the cognitive initiative thanks to the strategic raid. The strategic raid is the way a new and controlled energy is breathed into a system to learn a little more about it. The analogy with the laboratory study of a phenomenon helps to understand this notion. A scientist who examines a phenomenon in a laboratory first recreates the conditions that exist in nature. Therefore, he generates a hypothetical frame, similar to reality. Then, to check the exactness of his model, he will change the variables one at a time with precise actions (injection of medicine, various stimuli, etc). The changes that will happen through changing a variable will allow the scientist to better understand the system. In turn, this better understanding will allow him to more relevantly choose the next action he needs to take to

[143]Pierre Lessard argues in this direction: "Acknowledging the inherent difficulties — and even incoherence — of strategy leads us to a new campaign design model, one in which the fluctuating conditions of the desired new order become a constantly reappraised focal point." See Lessard, "Campaign Design…," p. 43.

pursue improving his knowledge of the system. The strategic raid is therefore the instrument available to the campaign designer to improve his knowledge of a system in relation to the COE.

Therefore, in light of these observations, it is clear that the notions of systems theory are at the core of SOD, just as the pillars of the operational art (centre of gravity, etc.) are at the basis of the OPP. The main difference, however, lies in the fact that the theoretical foundations of SOD are better adapted to the complex reality of the modern battlefield. The next paragraphs detail how these systemic notions are applied thanks to SOD.

The systemic process

The SOD is conducted by a small group of people, including the commander, called a design team. The SOD comprises seven fields of structured discourse, as illustrated in Figure 3.1. Discourse is the metaphor used to represent exchanges of opinion on a given field and the resultant understanding.[144]

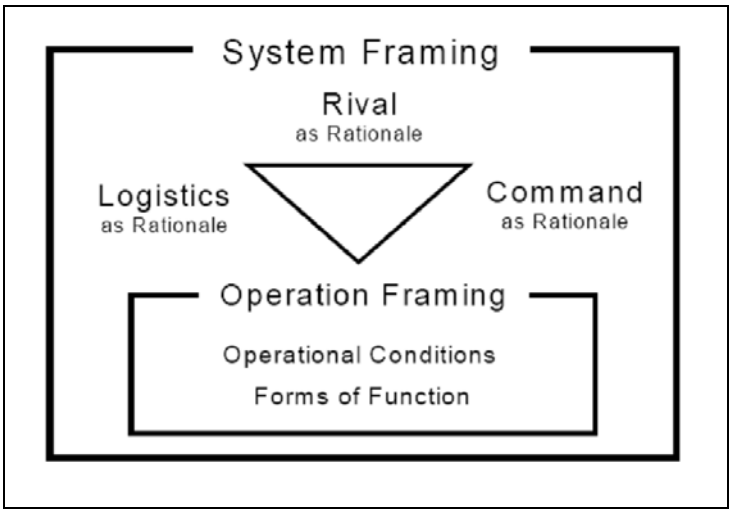

Figure 3.1 — Graphic Representation of the SOD

Although this diagram visually represents one field above another, the process does not

[144]Peter Senge defines discourse as a sophisticated dialogue whose goal is to assess the reasoning of all, and, by the same token, to enhance the understanding of the subject at a higher level than anyone involved in the discourse. See Senge, Peter, *The Fith Discipline: The Art and Practice of the Learning Organization* (New York: Doubleday-Currency, 2006), p. 223. For the place of discourse within a military planning team, see Delacruz's work, "Systemic Operational Design: Enhancing...," pp. 28-29.

dictate a sequence in which discussion must be undertaken. For example, when a certain degree of knowledge is reached in a field, the design team can decide to return to a previous field if the emerging factors are interconnected. This natural ability of the SOD to cognitively manoeuvre between discussions is in fact the concrete expression of what John Dewey explains:

> An increase in the store of meanings makes us conscious of the new problems, while only through translation of the new perplexities into what is already familiar or plain do we understand or solve these problems.[145]

System Framing is the discourse that allows for the rationalization of strategic directives in establishing the frontiers of the system. An important part of this rationalization is the conceptualization of the tension between the system as it was before and the one presently under consideration. In other words, what changed and how did it affect the system? The answers to this question will help put the system in perspective, making it possible, by the same token, to better define the problem. The limits of this system are arbitrary and subject to change during these discourses. This requires the designers to identify the obstacles to learning, including potential bias and the actions of rivals.[146]

Two reports will be produced from this discourse. The first is a diagram that represents the hypothetical system with its components and its existing relationships. The second is a transcript of the discourse, whose aim is to complete the diagram, underscoring the important facts that emerged during the supervision period of the system.[147]

The discourse on the supervision of the system is greatly influenced by the three other rational discourses that are part of its environment: rivals, command, and logistics.

The discourse surrounding the subject of rivals as rationale aims at identifying the components of the system that oppose the directional tendency deired by the strategic sponsor.

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[145]John Dewey, *How We Think* (Mineola, NY: Dover Publications, 1997), p. 120.

[146]Delacruz, "Systemic Operational Design: Enhancing...", pp. 30-31.

[147]Dalton, "Systemic Operational Design: Epistemological Bumpf…", p. 38.

This discourse leads to a definition of the system's components through understanding of the form and logic of rival elements. It is important to note that in the study of these complex systems, a rival can well be the combination of disparate and uncoordinated agents such as the enemy, agencies, poorly formulated strategies, enemy and friendly populations, etc Discourse on rivals also examines the logic, motives and behaviour of rivals to understand the morphology of the system. Moreover, it investigates the nature of relationships between the components of the system, without forgetting that which links the system under consideration to the one the design team is part of.

The design team also examines the relationships between the rival components from both internal and external perspectives to identify potential tensions between these different components. The resulting holistic understanding then becomes the start of operations planning aimed at taking advantage of those gaps in the cohesion of the system.[148]

Command as Rationale is the discourse that allows instruction of the design team in the tensions that exist between the actual command structure and the one eventually required for the campaign plan or operational design. The success of this discourse lies on the capacity to assess how the actual command and control structure can be operationally efficient, with regard to combat actions as well as learning. In addition to describing the difficulties and challenges posed by the hypotheses, the targets and the end state previously established by the strategic sponsor, designers have to find ways to use them to their advantage.[149]

Logistics is at the core of another discourse that influences the framework of the system.

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[148]Bernard, Major Barrett M., "Systemic Operational Design: Bringing Efficiency to the Operational Level of War" (Fort Leavenworth: essay written for the Advanced Military Studies Course, United States Army Command and General Staff College, 2007), p. 19.

[149]Bell, Major Christopher J., "Is Systemic Operational Design Capable of Reducing Significantly Bias in Operational Level Planning Caused by Military Organizational Culture?" (Fort Leavenworth: essay written for the Advanced Military Studies Course, United States Army Command and General Staff College, 2006), pp. 51-53.

In fact, Logistics as Rationale follows the same logic as the previous discourse on command. This discourse makes it possible to understand the tension that can exist between the logistics system as it exists and the one that could be necessary to the operational design during creation. The logistics system, once conceptualized, provides a framework that informs and limits the operational design.[150]

The last three concepts thus constitute the points of an isosceles triangle that provides the backdrop on which the system's framework rests. The understanding provided by the study of tensions inside the triangle then informs the next discourse on the supervision of operations.

Operation Framing

Operation Framing marks the transition between strategic logic and operational action, or between the definition of a problem and its resolution. In fact, this discourse conceptualizes operations that exploit the differences and tensions within the system, to model it at the strategic sponsor's convenience. Finally, it establishes the specific shape that the operational commander will use. Operation Framing also sets the conditions required for learning about the tensions that exist between the end state intended by the strategic sponsor and what is really possible.[151] In fact, much as system framing draws its limits from several subsystems, the concluding conditions simply become systemic instructions that provide one of the frameworks for learning.

Operation Framing is based on two different but very tightly linked discourses: Operational Effects and Forms of Function.

The rationale for discourse on operational effects derives from the exchange on Operation Framing. The function of this discourse is to identify the conditions inside the system's logic

[150]McGlade, Major Patrick E., "Effects-Based Operations Versus Systemic Operational Design: Is there a difference?" (Wright-Patterson Air Force Base: essay written for the Operational Analysis Master's programme, Air Force Institute of Technology, 2006), p. 13.

[151]Sorrells, et al, "Systemic Operational Design: An Introduction," p. 26.

which, once reached, will allow the transformation of the system in the direction intended by the sponsor. It is therefore by understanding the tensions among rivals, command and logistics that the designers can understand the effects required to harness the tensions previously identified. All this combines to create a system that allows for learning because of the existing tensions among the rational elements, the final conditions required by the sponsor, and the suggested application of force. The result is the creation of original ideas that will be potentially applied following a redefinition of the frame of reference.

The Forms of Function constitute the discourse that gives substance to the plan generated by the SOD. This discourse establishes, among other things, the form and structure of each operation. It is during this discourse that the planners actively engage in the discussion and develop the plans required to support the intended evolution of the system. The result of this dialogue must absolutely reflect the reasoning and logic behind the concept that links strategy and tactical activity. This discourse is the point where the conceptual rationale is translated into physical tasks.

It is important to note that this discourse, just like all others, influences the framing of the system and of operations. Therefore, this iterative aspect shows the importance to the SOD of including the impact of its own actions in the study of a system.

Consequently, all these discourses form the pillars of an iterative process that is destined to be repeated each time a new circumstance emerges. A continuous cycle of understanding, design, planning, action and learning thus develops. With a unique conceptual approach, the SOD allows for the development of a concept based on the understanding and logic of a system and not on guiding and determinist principles.[152] In fact, the SOD attempts to discover the true nature of a system while keeping in mind the evolutive aspect of complex adaptive systems.

[152]Dixon, “System Thinking for Integrated Operations...”, p. 50.

Conclusion

Following the reading of the components of the SOD, it is clear that it is a method destined to establish a logical bridge between strategy and tactical actions within a complex environment. The SOD is thus an instrument for the contemporary operational commander. Its primary goal is to translate strategic instructions into design for the operational level which, by default, is complex. This is realized into a holistic perspective and a systemic view of the system in question.

It can therefore be said, in light of the previous conclusions, that the SOD is an efficient method, at least in theory, of contributing to the resolution of a complex problem. And just as design is the first step in solving complex problems, the next step in accepting the SOD as the method for campaign design is minimal.[153] But before readily accepting this conclusion, would it be possible for the two systems to coexist? The next chapter examines this opportunity.

[153]Schon, Donald A., *Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning in the Professions* (San Francisco: Jossey-Bass Inc., 1987), p. 42.

CHAPTER FOUR: OPP AND SOD: OPPORTUNITIES FOR RECONCILIATION

> If I were given one hour to save the planet, I would spend 59 minutes defining the problem and one minute resolving it.
>
> — Albert Einstein

Actually, the SOD is a concept that fuels many debates in academic and military circles.[154] Its innovative and even refreshing approach makes it possible in effect to tackle operational design from a new angle. However, it would be utopian to pretend that the SOD entails the rejection of a proven method such as the OPP. What ways might there be to reconcile the two approaches?

To answer this question, this chapter will again discuss the notion of complexity, but this time detailing the types of complex problems that exist. The reader will then understand that the SOD is effective in problem setting or formulation, while the OPP's niche is in problem solving.

To prove this statement, the argumentation of this chapter will be divided into three parts. In the first, different types of operational problems will be considered. The second will examine the best process to use depending on the circumstances, and the third part will explain how the SOD can be effective in contributing to the resolution of complex problems. Finally, a proposal of reconciliation between the SOD and the OPP will be suggested.

Operational problem categorization

It is possible to categorize problems by their degree of complexity. Three categories are usually recognized: Well-Structured Problem or Puzzle, Medium-Structured or Structurally Complex Problem, and Ill-Structured or Wicked Problem.[155]

A well-structured problem is one in which all the information needed is available and a

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[154]See, for example, Milan Vego's articles and essays, "Systems versus Classical Approach to Warfare," *Joint Force Quarterly* 52 (1st Quarter of 2009), pp. 43-46; and Robert Leonhard's "From Operational Art to Grand Strategy," in *Rethinking the Principles of War*, McIvor, Anthony D., Editor (Maryland: US Naval Institute Press, 2005), pp. 210-212.

[155]TRADOC Pamphlet 525-5-500, *Commander's Appreciation...*, p. 9.

verifiable solution can be found.[156] These types of problems are not necessarily simple. In fact, they can be technically very difficult to resolve, but because they are well structured and anchored to strong reference points, the identification of a solution acceptable to all is done quickly. In this category, for example, we can find the ballistic solutions needed to equip a howitzer.

A medium-structured problem is one in which some information is available and routine solutions are generally inadequate. The example of the solution to a current tactical problem, such as the defensive positioning of an infantry battalion, comes to mind. Although some manuals describe how the battalion should defend itself, there is no unique perfect solution. The professionals agree, however, on the structure of the problem (conducting a defensive operation, for example), on the appropriate tasks and end state. They are likely to disagree, however, on the application of the general principles regarding a specific piece of land and an intelligent enemy.[157]

An ill-structured problem has little information, and no verifiable solution is available. It is a type of problem "highly resistant to solution."[158] The characteristics of ill-structured problems can be summarized by the following list:

1. There is no definitive formulation of a wicked problem;
2. Wicked problems have no stopping rule;
3. Solutions to wicked problems are not true-or-false, but good-or-bad;
4. There is no immediate and no ultimate test of a solution to a wicked problem;
5. Every solution to a wicked problem is a "one-shot operation"; because there is no opportunity to learn by trial-and-error, every attempt counts significantly;
6. Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan;

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[156]This type of well-structured, often called *tame*, problem is the opposite of the ill-structured or wicked problem. For a summary, see Conklin, Jeff, "Wicked Problems & Social Complexity", in *Dialogue Mapping: Building Shared Understanding of Wicked Problems* (Napa, CA: CogNexus Institute, 2008) [online book] accessible at http://cognexus.org/wpf/wickedproblems.pdf; Internet, accessed on March 1st, 2009.

[157]TRADOC Pamphlet 525-5-500, …, pp. 8.

[158]Australia, Australian Public Service Commission, *Tackling Wicked Problems*, (Barton, Australia: Commonwealth of Australia, 2007) [online book] pp. 3; accessible at http://www.apsc.gov.au/publications07/wickedproblems.pdf; Internet; accessed on February 12, 2008.

7. Every wicked problem is essentially unique;
8. Every wicked problem can be considered to be a symptom of another problem;
9. The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution; and
10. The planner has no right to be wrong.[159]

The design of a campaign plan is an excellent example of an ill-structured problem. Thus, Afghanistan represents an ill-structured (*wicked)* problem that has already been discussed in the first chapter. In Canada and in the United States, the ongoing debate about their military presence in Afghan territory only reinforces this thesis. What, exactly, is the problem to solve? Is it the Taliban? Corruption? Or opium traffic? Professionals disagree even on the definition of the problem. It would be ridiculous, then, to believe that these same experts would come to an agreement on the development of a solution. Those ill-structured problems cannot be defined, far less resolved through a linear approach.[160]

This categorization enables us to make an analogy with conflict levels and their generally associated problems, as seen previously. It can in fact be concluded that, *generally*, well- and medium-structured problems are found at the tactical level. Ill-structured problems can be found mostly at the operational and strategic levels.[161] This point of view naturally brings the analysis of this paper to the next part, which will discuss the study of the most appropriate method of resolution of complex problems.

The right processes for the right problems

It is interesting to suppose that tactical questions or limited-scope operations are medium-structured problems as shown, in Table 4.1, by examples of structure, development and execution

[159]Rittel, Horst W. J., and Webber, Melvin M., "Dilemmas in a General Theory of Planning," *Policy Sciences* Vol. 4, no. 2, (June 1973): pp. 161-166; http:///www.jstor.org; Internet; accessed on February 12, 2009.

[160]*Ibid., pp.* 155-169. This statement is in fact the main argument of Rittel's and Webber's article.

[161]TRADOC Pamphlet 525-5-500, *Commander's Appreciation*…, p. 10.

of medium-structured problems. In fact, although professionals can disagree over the best solution for these types of problems, it is recognized that there can be several good solutions. The desired end state can lead to reaching a consensus, and the iteration of the process may be needed to reach the right solution.

Table 4-1 — Types of problems and solution strategies

	Well-Structured "Puzzle"	**Medium-Structured "Structurally Complex Problem"**	**Ill-Structured "Wicked Problem"**
Problem Structuring	The problem is self-evident. Structuring is trivial.	Professionals easily agree on its structure.	Professionals will have difficulty agreeing on problem structure and will have to agree on a shared starting hypothesis.
Solution Development	There is only one right solution. It may be difficult to find.	There may be more than one "right" answer. Professionals may disagree on the best solution. Desired end state can be agreed on.	Professionals will disagree on: • How the problem can be solved. • The most desirable end state. • Whether it can be attained.
Execution of Solution	Success requires learning to perfect technique.	Success requires learning to perfect technique and adjust solution.	Success requires learning to perfect technique, adjust solution, and refine problem framing.
Adaptive Iteration	No. adaptive iteration required.	Adaptive iteration is required to find the best solution.	Adaptive iteration is required both to refine problem structure and to find the best solution.

Source: TRADOC Pamphlet 525-5-500, *Commander's Appreciation*…, p. 9.

The OPP provides a good tool to respond to medium-structured problems. In fact, the OPP is based on the hypothesis that the senior level has correctly defined the problem. From this hypothesis follows the belief that the desired end state is necessarily the right one, just as the tasks related to the resolution process are right. Generally, professionals agree on the nature of the problem (mission analysis), the desired solution (end state) and the best means (courses of action) to get there. If ever the solution is not the right one, a fragmentary order engages a branch plan. This iteration makes it possible to try a new course of action to reach the original solution. This way of doing things is totally acceptable in the case of medium-structured problems. Thus, the OPP boasts the attributes required to achieve the tasks related to well- and medium-structured problems.

Operational challenges are ill-structured or "wicked" problems. In fact, professionals find it difficult to agree on the structure of the problem, the approach to resolve it, the desired end state, and even its solution. Success requires a certain learning, not only to perfect the techniques used and pinpoint the end state, but especially to better define the framework of the problem. American professors Horst Rittel and Melvin Webber wrote in 1973 about this:

> ...one of the most intractable problems is that of defining problems (of knowing what distinguishes an observed condition from a desired condition) and of locating problems (finding where in the complex causal networks the trouble really lies).[162]

Thus, to resolve these problems, we need to continually redefine the intended aim in parallel with the creation and assessment of courses of action.[163] The SOD encourages this exercise.

SOD, a tool to resolve a complex problem

As seen in the previous chapter, the SOD is first and foremost a tool for the commander at the operational level. As this level is particularly complex, the primary goal of the SOD is to create a design of strategic instructions from a holistic perspective and a systemic vision of the system in question. Thus, an operation is first conceptualized from the initial understanding of a given system. Then, a detailed plan is developed and, finally, an operation is launched. The execution of this operation energizes the system, which makes it possible to learn a bit more about it and, at the same time, to transform it for the strategic sponsor.

Because of imperfect knowledge of the system at this stage of conflict, experienced both by the commander at the operational level and his superior, the SOD user deems it unlikely that this first shock leads to success. However, a new operation can be developed with the newly acquired knowledge, leading once again to a better understanding of the system. This iterative process is repeated each time a new circumstance emerges. So, a continuous cycle of under-

[162]Rittel and Webber, "Dilemmas...," p. 160.

[163]Klein, *Sources of Power...*, p. 122.

standing, conception, planning, action and learning develops. This iterative method, shown in Table 4.1, thus proves that the SOD is the inherently developed tool for complex problems.

The key to all this process rests on the assertion that an individual, or his team, will never completely understand a complex system. A situation, or rather the perception of this situation, is never permanent.[164] That is why the SOD is meant to be the constant quest for a better understanding of a given system, in order to facilitate the planning of an operation at each iteration of the process. This approach tends to confirm, once more, that the SOD is an effective process to help resolve complex problems.

Therefore, in the light of the previous conclusions, it is clear that the OPP and the SOD are two fundamentally different systems. But, how can these two systems complement each other? The next part will answer that question.

How the SOD and the OPP can be reconciled within the CF

It has been proven, at least in theory, that the SOD is an effective method for resolving a complex problem. If the reader agrees with the argument developed in the first chapter that the COE meets the definition of a complex problem, then the step to take toward accepting the SOD as a method of campaign design is minimal.

Basically, the SOD makes it possible to better understand a problem. Be it invading a country or restoring peace in a host nation, the SOD allows the operational commander to have an expanded vision of the problem, to analyse interactions, and to exploit emerging conditions.

Because operational commanders face complex and ill-structured problems, their command teams must necessarily pore over the design process before taking the steps of planning and execution. It is to this end that the author of this essay recommends that operational commanders man their staff with a design team. This small multidisciplinary team, trained in sys-

[164]Dietrich Doerner, *The Logic of Failure* (New York: Henry Holt and Company, 1996), p. 98.

tems theory, would be responsible for operational design. A campaign plan whose actions would then be planned by Regular Staff J5 and J35 would result. Figure 4.1 shows the different functions that the design and planning teams would have to accomplish.

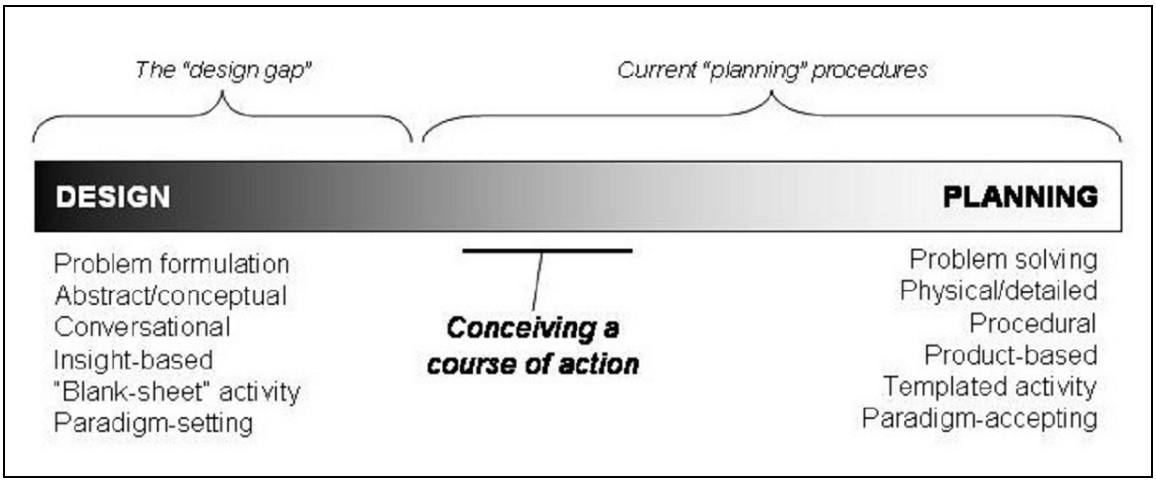

Figure 4.1 — The Design-Planning Continuum

Source: Schmidt, John F., "A Systemic Concept for an Operational Design", (Air University: Essay written for the Course of Advanced Military Studies, United States Air Force, 2007) p. 7.

The process followed by the design team and based on the SOD would essentially be a rational process that would allow coherent formulation of a problem so that the solution would emerge on its own. This design would happen through a constant exchange among the different sponsors; the image of the problem and its potential solution would appear gradually by the iterative process. During the operational design, the design team would think systemically and would imagine the problem as an adaptive system that evolves due to its exchanges with the environment. These models would then be tested through the induction of energy into the system; this would then allow a better understanding of the problem, just like the scientist in his lab. The results of the actions would then be analysed to see if they match expectations and, if applicable, a new concept would be developed. The design, according to the method suggested by the SOD, would then find itself at the base of the evaluation and adaptation of operations within the COE.

And it is then that the OPP would take its place. Once the problem is better structured, thanks to the SOD and the resulting operational design, the OPP would contribute to the planning

of tactical engagements.

Conclusion

In conclusion, the complex problems operational commanders face will probably always be ill-structured. Strategic commanders will never be able to precisely define an end state, the planners will be unable to agree on the best way to resolve a problem, and the elements of a problem will probably always change. Operational planners must be furnished with a systemic design process that will allow them to correctly assess the nature of the conflict in order to optimize the subsequent campaign design.[165] The SOD is this tool, and the bridge it builds between the strategic and tactical levels is one of *design*.

Once defined, the problem can be resolved and it is then that cohabitation of the two processes becomes possible. Then, as its name implies, the OPP plans the operations along with the operational design. Consequently, the SOD finds the right action to take and the OPP finds the right way of doing it.

CONCLUSION

The operational environment is complex. This simple assertion takes on an all new scope when it is considered through the general systems theory. Although very recent, this theory helps war professionals understand highly complex systems behind contemporary conflicts. Therefore, general systems theory and its by-products make it possible to take a new look at the way we analyse and resolve operational problems.

It is probably because of this new vision that a debate is breaking out in the military circles. If the OPP no longer meets CF's needs, what would be the SOD's place in the cognitive process of the planning teams?

The answer to this question, and the thesis of this paper, is that the SOD must in fact

[165]Booth, "Winning in Afghanistan...," p. 18.

assist the OPP and not replace it. This paper has developed the argument that the SOD is a design tool, while the OPP is a planning tool. Their cohabitation is therefore logical and natural. The OPP takes its place in putting into operation the actions suggested during the process of campaign design by the SOD, bringing *ipso facto* the two processes to interconnect.

The SOD fills an important gap in the current CF doctrinaire method: design. In fact, although the doctrine describes thirteen pillars which should support the operational art, it leaves the military commander on his own to develop a coherent campaign design. He must then resort to a linear and reductionist tool, the OPP, to help him in the development of a design.

But the OPP is suitable for resolving well-structured problems, those usually found at the tactical and not the operational level. In accordance with its Cartesian origins, it deals relatively well with the physical realities of the tactical domain and the threats relating to a rigid and mechanical doctrine. This reductionist process is inadequate, however, at the operational planning level in the complex contemporary environment. It lacks the level of design, which allows for the intuitive and creative analysis of a system to arrive at a definition of a framework of operations. This is the level making it possible to ensure that the very important tactical actions are the right ones to execute. The SOD makes it possible to reach that level.

The foundations of the SOD, based on systems theory, allow operational commanders to exploit the opportunities created by a complex environment. Its iterative approach allows for the development of a model that adapts to complex systems, while generating a design that enables the planner to orchestrate operations that make sense.

Although different, these processes belong to the same family of processes for resolving operational problems. Hence, the two methods must be reconciled to maximize their respective strengths. The SOD allows the operational commander to define the problem and create an

effective campaign plan, given the complexity of the COE. On the other hand, the OPP allows him to be efficient in the planning and execution of tactical engagements.

The conclusion of this essay is nonetheless theoretical. In order to validate this new relationship, only the brutal reality of the battlefield can provide the final answers. But at least Sun Tzu's advice will have been followed. The art of war, pillar of a state's survival, will have been studied once more. In the spirit of the systemic vision, this essay is therefore part of a discussion which needs to be endless. It is the only way to keep a cognitive edge over the problems posed by the COE.

APPENDIX

Content of a campaign plan

Source: Department of National Defence, B-GJ-005-500/FP-000, *The CF Operational Planning Process* (Ottawa, DND Canada, 2008), p. 2A-1.

1. SITUATION

Political Orientation

— Aims
— Targets
— End state
— Constraints

Strategic Orientation

— DCOS's Intent
— Targets
— Transition conditions
— Assessment of friendly forces', allies' and host nations' strengths and weaknesses
— Theatre of operations/Joint operations area
— Hypotheses
— Key tasks
— Disposition or allocation of Forces
— Supporting Commanders and Gaining Commanders

Enemy Forces

— Military Strategic Intent
— Assets
— Deployment itself
— Operational Intent (including decisive points, lines of operation, targets and likely final result)
— Important strengths and weaknesses (identified critical vulnerabilities highlighted)

Friendly Forces

— Deployment
— Availability and status
— Other campaigns that will have repercussions on them

Hypotheses

— Alliance's/Coalition's political will
— Intentions of the enemy and likely reaction of friendly forces
— Likely reaction of third parties
— Deployment of friendly forces' reinforcements

2. MISSION

3. EXECUTION

Commander's Intent Statement

— Operational concept and goal
— Targets and transition conditions
— Centres of gravity (if applicable): friends', enemies', allies'
— Decisive points
— Constraints and restrictions (vested)
— Risk assessment

Concept of Operations

— Way the campaign will be led to accomplish the intention
— Lines of operations
— Sequencing and allocation related to the intended effect
— Main effort (globally and for each phase)
— Culminating points and operational pauses
— Deception

Tasks

— By phases, indicating the supporting/gaining commands

Mission Planning Directive

— Joint Forces Canadian Maritime Component Commander
— Joint Forces Canadian Land Component Commander
— Joint Forces Canadian Air Component Commander
— Other components

Coordination Instructions

— G Day
— D Day
— Other significant landmarks
— Rules of engagement
— Public Affairs
— Targeting

4. TACTICAL/LOGISTICS SUPPORT CONCEPT

— Main points, critical problems linked to the logistics concept, movements, medical support, support provided by the host nation, and personnel

5. COMMAND AND SIGNALS

— Command devices and command and control concept
— Communication devices

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