

From Infowar to knowledge warfare: preparing for the paradigm shift

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Successful firms, such as Intel, maintain an innovative environment, seek continuous performance improvement, favor customer orientation (e.g. through partnerships with customers and suppliers), enhance results orientation, and place *speed* of creation, defense and development of value-chains at the core of their strategic focus. To maintain its leadership, Intel developed "war rooms", and encouraged informal relationships that crisscrossed organizational boundaries. Nevertheless, when Intel had to face InfoWar practices, it had to acknowledge that the company failed to prevent and to anticipate large-scale Info-destabilization.

New businesses live on the brink of disasters. Yet, "organizations have many stabilizers but quite often lack proper destabilizers". We will argue in this paper that InfoWar — informational arena-based warfare — has been thought within the boundaries of old schemata that will no longer be accurate in the XXIst century. These schemata includes misconceptions of management, organizations, economics, welfare and of purpose of development.

We will investigate, in the footsteps of Hedberg, Jönsson, Starbuck, Steele, Wilensky, and many others, design principles that worked, and no longer worked. Founding our comments on observations of real-world experiences, we end with recommendations as to prepare nations, organizations and people for the forthcoming paradigm shift: from InfoWar to Knowledge Warfare (K-Warfare).

Why Policy Makers Got Trapped in the Information Paradigm

World leaders, who mostly belong to a generation that is not born with a computer at home, has been strongly influenced by cybernetics. In a cybernetic world, economic and social life is seen as a system ; values are categorized ; economic systems are modeled ; social structures are typologized, and ideologies are invented to put all these systems together. In such a world, policy makers are not long to assume that information is power, and systematized information, the structure of power itself.

History has been, so far, consistent with such implicit assumptions. Power was centralized, and, therefore, needed centralized intelligence. The world was organised into blocks, and therefore, needed compartmented information. Economic and social systems were hierarchical, and therefore, hierarchical information made sense.

From the starting point, this cybernetic view of the world was quite erroneous. As Varela and Maturana pointed out, neurons that participate in the building of "vision" only account for 20% from the eyes' retinas, whereas 80% of them come from other parts of the brain. In other words, 80% of our "vision" is internally constructed. Vision is mostly knowledge, not information. Furthermore, this knowledge is mostly tacit ; it escapes our individual or collective awareness.

Eventually, people — including policy-makers — learn without being aware of what is being learned ; code without being aware of coding ; and most dramatically, learn without having intended or planned to learn. Most learning is incidental.

Emerging "Information Warfare" doctrines fail to acknowledge this fragility of learning. Mapping without knowing is a non-sense. Mapping, as an act of "vision", is mostly derived from these 80% of neurons, in our brains and not in our retinas, that participate in the construction of images, and help us to transform noticed and unnoticed stimuli into sense-making. Such weapons as "private-sector communication satellite

constellations that instantly link individuals, on-demand high-resolution imaging spacecraft and rapidly evolving gigabit/sec.-class networks" are no less than phantasmagorias, if we neglect to take care of these disturbing, — yet remaining —, autonomous neurons of our brains.

A small firm of less than 12 employees, named "Indigo", is an exemplar. Indigo produces and publishes five confidential newsletters, including the *Intelligence Newsletter*, a well-repute source of intelligence among policy makers in Europe. Myths and rumors circulate, seeing in Indigo's high accuracy a ploy of obscure foreign intelligence. French readers suspect foreign intrusions. Foreign readers suspect French manipulation. In fact, Indigo is nothing else than an efficient "knowledge-refinery", that is to say a firm purposefully designed for the efficiency of its knowledge generation. In-site observation shows that "far from being pliable, knowledge generates its own path of transformation, while simultaneously transforming and being transformed by its organizational settings. An implication is that those who would manage knowledge should respect this propensity for autonomous development". Cautious towards systematized information gathering, Indigo's staff is operating within a "community of practice" — i.e. an intensive and highly-contextualized socialization process —, and favors HUMINT. The whole organization is focused on sense-making instead of information-collection. Intensity and depth of internal and external socializations are considered as the core organizational competitive advantage. The rate of defaults is close to zero. The overall performance, in terms of growth and ROI, is twice higher that similar organizations such as the *The Economist Intelligence Unit*.

To understand such a performance, let us remind that information is not knowledge, and then let us investigate how to deal with knowledge, instead of information. As general Francks pointed out, "Vietnam was the first battlefield use of computers. The Univac 1005, which the 25th infantry division installed in 1966 at Cu Chi, filled an entire van (...) Images of the enemy and terrain were captured with conventional cameras and television with light intensification devices, radar, and infrared devices. Sensors and high altitude reconnaissance scanned 100,000 square miles per hour providing commanders with a heretofore unknown view of the battlefield". Meanwhile, Vietnamese population was digging underground tunnels. Similarly, French Foreign Legion was settling its command outposts on hills, as to dominate battlefields, and meanwhile, Vietnamese soldiers were digging the crops and burying themselves in the face and "vision" of the enemy... Proving, if necessary, that neurons from the retinas only account for 20% of vision. What was dramatically missing was not information, but knowledge in general, and an adequate form of "knowing" in particular. "We are on the threshold of an era where order can be achieved largely through knowledge... not necessarily through physical order"

Knowledge vs. Information, Knowing vs. Knowledge

Understanding the differences between 'knowledge' and 'knowing' is essential to a successful entry in this new paradigm. "One contemporary cliché is that more and more turbulent settings are requiring organizations to use more and more knowledge, and that this in turn forces organizations to process more and more information". A knowledge-base is all the learning of people and institutions more or less explicitly encapsulated in minds, brains, models, signals, culture, rules, guidelines. Greek philosophers used to categorize this human knowledge in three ensembles : the *techne*, the embodied technical know-how ; the *episteme*, the abstract generalization derived from knowing-how, and the *phronesis*, the wisdom of social practice, i.e. the ability to derive aggregates from social learning. In modern management literature, the investigation of knowledge within and in-between organizations is merely derived from the same twenty-four centuries old conceptualization. The conventional view is that the relevant knowledge comes from explicit situational analysis, i.e. it is objective knowledge. As Detienne and Vernant pointed out, education in the Judeo-Christian world has been strongly influenced by the pursuit of Truth as the sole goal of knowledge generation. Starting in 400 BC., knowledge is systematically understood as "objective knowledge", leaving 'meaner' forms of knowledge and knowing, — such as conjectural knowledge —, disregarded and low-grade. The governmental intelligence cycle itself is a pursuit of objective knowledge. Intelligence generation is driven by an objectivation force, that discards unreliable information and sources according to truth-setting rules. As Wilensky put it, the intelligence bodies are overcrowded with "facts-and-figures men", who "introduce a 'rational-responsible' bias" (...) "Facts-and-figures men are preoccupied with rational argument and criteria; their technical competence compels opposing parties to be more careful or honest in their use of information, to match each other expert for expert, fact for fact". Thus, current doctrines of InfoWar are all implicitly based on a biased assumption that large-scale truth seeking is superior to depth and differentiation of knowing modes. Such doctrines are based on the belief that the process of organizations and nation's 'getting into difficulties' is essentially one of the degradation and increasing disutility of their knowledge-base. Yet, when doctrine generators are asked to define such a "knowledge-base", they have to face their incapacity to describe and to qualify it.

Knowledge-base, as a matter of fact, is a static concept. It assumes that knowledge can be systematically put in the form of a representation, and neglects all various forms of tacit knowledge in general, and collective tacit knowledge, in particular. Thus, the same Judeo-Christian bias applies to the representation of

knowledge. Knowledge is assumed to be merely a long-term representation ; is seen as a commodity ; is talked in terms of volume and stocks ; is described with a vocabulary borrowed to hardware management. In such a biased conception of knowledge, one usually distinguish short-term, or procedural, representations that can be immediately acted on one side, and long-term, or structural, representations, whose access and development need several apprenticeships.

As a consequence, focus should be put on the advancement of "knowing", instead of the accumulation of "knowledge". Development of national intelligence capabilities should therefore target the improvement of interpretational and sense-making skills, instead of pursuing the utopia of the ubiquity of a knowledge seen as a commodity. Such a self-deception has its roots in the reproducibility of information. Redundancy of information is a serious waste of resources in most industrial democracies. For instance, in France, no less than 80 administrative bodies distribute to small and large businesses the same information again and again. This redundant information eventually leads to redundant intelligence administrations, leading to the hypertrophy of bureaucratic, and inefficient, intelligence bodies. The 1996 reorganization of the U.S. Intelligence Community is an exemplar of this lack of focus on "knowing" capabilities, and of the exaggerated attention given to the accumulation of "knowledge". In 1992, Ernest R. May "urges the Committee to think of individuals in the Intelligence Community as well as of their organizational boxes". Frank Carlucci, a former Assistant to the President for National Security Affairs, underlines that "Congress could render a valuable service if it would lead the Intelligence Community through the process of cultural change that many of our businesses have gone through". As Orton and Callahan noted, "unwarranted duplication remains a problem; and intelligence remains too isolated from the governmental process it was created to serve".

The focus on "knowledge as a commodity" vs. the "improvement of knowing" can also be observed in the conceptual frameworks that are judged to be a good basis for knowledge-based warfare. Col. Steven J. Sloboda, formerly in charge of long-range planning for U.S. Space Command asserts: "Space is literally the fabric upon which we will weave our approach to knowledge-based warfare. Space is the enabling ingredient... Fortunately, the convergence of our experience in space operations, communications networking, and information processing seems to make the move to knowledge-based warfare achievable". Unfortunately, human souls and minds are not fully readable from outer space. The "folk theory" that trust moves not words might well be misleading in a knowledge-based paradigm. The Vietnam, Gulf and former Yugoslavia experiences — three modern war theaters with intensive use of satellite information — are exemplar cases of the limits of satellite cartography in penetrating human intents. Moreover, such experiences underline the limits of InfoWar. As Dragnich noted, the "so-called information war" that has been proposed "to wage against the Serbs is ridiculous. The Serbs do not need the outside world to tell them that communism and Slobodan Milosevic are bad"

Misconceptions of management

Thus, management should be designed and understood as primarily a knowledge-generation process. Many companies tend to follow management practices that take the physical world for granted. When the Berlin Wall fell, Finland believed that the announced geostrategic shift would require the acquisition of combat fighters. The market was estimated at around US\$ 3 billions. Four French companies, Snecma, Matra, Dassault and Thomson, and the Defense Administration decide to enter the race for this competitive bid. When the newly settled French Economic Intelligence and Corporate Strategies Commission, at the French Office of Planning, decided to develop a few exemplar case studies, the case of the Mirage 2000-5 was selected. The audit revealed that lack of coordination and knowledge sharing was at the roots of the commercial failure. Managers who negotiated the contract were chosen according to corporate criteria. Internal competition prevented any attempt of crisscrossed knowledge transfers. Another French firm, the Aerospatiale, which has an in-depth knowledge of the Finland aeronautics market was not consulted by the competing pool. In the absence of a long-term knowledge strategy, the State was unable to display any capitalization of knowledge on Finland. The lack of longitudinal capitalization of geostrategic knowledge led to the incapability of designing required distinctive attributes in the competitive bid. In the middle of the negotiation process, the political turmoil in Finland was perceived as an obstacle, whereas the American companies reinforced their coordination and lobbying to use these elections as a leverage for their offer. Indeed, the French consortium was competing with a hypothetical F-16 offer, while the American were proposing the F-18. As Wilensky warned, "in all complex social systems, hierarchy, specialization, and centralization are major sources of distortion and blockage of intelligence".

However, it seems that this analysis can be put a step forward. In this intelligence failure, the main cause was the inappropriateness of management practices to a non-market environment. The French consortium failed to recognize and acknowledge forces that acted outside the narrow borders of the targeted market. In a transversal environment (i.e. that implies geopolitical, geoeconomical, local politics, technology and society), with a transversal offer (i.e. typically a consortium of different firms, proposing dual technologies), traditional "market management" fails to grab critical issues. As R.D. Laing noted, the range of what we think and do is

limited by what we fail to notice... If non-market knowledge is not integrated in management duties and skills, it is bound to be neglected. Thus, "non-market strategies result from a management process that incorporates knowledge of the market and nonmarket environments, information about specific issues, and conceptual frameworks that guide strategy formulation and implementation".

Misconceptions of organizations

Most organizations are unfit for the management and capitalization of intangible assets in general, and counter-productive in terms of knowledge generation. However true one "must analyze the flow of information along the value chain as well as the movement of goods", it might be quite insufficient to cope with the new conditions of competitiveness.

The whole concept of value-chain, and the education given to managers on that matter, should be revised. Managers and scholars are used to thinking of organizations as stable contractual bodies, with physical locations (headquarters, plants, departments, etc.), while the new economics call for a focus on industries as systems, rather than buildings and walls. Bo Hedberg introduces the concept of "imaginary organizations" to picture these new economic conditions.

An "imaginary organization" is a knowledge-infrastructure concerning markets, potential opportunities for production and creation of value-chains. Hedberg uses the example of Gant, an American garment brand that was bought by Swedish investors, and developed worldwide. Gant has no proprietary plants. The whole organization consists of a team of managers that coordinate market needs and channels with a constellation of independent suppliers. The core competitive advantage of Gant lies in the corporation's ability to coordinate market needs with independent systems' inputs. Gant uses its knowledge infrastructure to define and find matches between independent production and design capabilities and market needs.

This whole perspective of "knowledge infrastructures" is likely to be the dominant paradigm in the coming century. Hewlett Packard in France got rid of local middle management supervisory staff to replace it with a centralized information platform at its headquarters. The "information infrastructure" collects customers' needs and requests, and dispatches the information directly to managers and maintenance engineers' notebook screens through Electronic Data Interchange. Locally, Hewlett Packard suppressed many subsidiaries and branches. Managers and maintenance engineers work at home, being constantly on the move to meet customers' needs and specifications on sites. The whole organization is transformed in a knowledge-generation node, with many peripheries where action is taking place.

Could such a model be implemented on a national scale, and what would be social and welfare consequences? It is quite probable that such a "knowledge infrastructure" could be designed and implemented on a national scale. It would require administrations, large and small corporations and individuals to share a communal information infrastructure where demands and supplies of tangibles and intangibles would find their matches. In such a perspective, competitive advantage of nations would eventually lie in national ability and speed to generate (and discontinue without social and economic costs) virtual value chains to operate them. Attempts such as the Department of Commerce's Advocacy Center in the United States, and the Committee for Economic Security and Competitiveness (CCSE) attached to the Secretariat General de la Defense National (SGDN) in France, are evidently pursuing such a model.

Both the Advocacy Center and the CCSE pursue an objective of coordination and alertness between administrative bodies and private organizations. However, while the Advocacy Center is located at an operational level with a direct link with the intelligence community, the French CCSE is placed under the authority of the Prime Minister, and its main focus is a supra-coordination of administrative bodies (Ministries of Finances, Defense, Foreign Affairs, French Office of Planning...) that already fulfill, more or less properly, a coordination role. Political ambitions, in France and in the United States, and intelligence communities' internal conflicts, are however impeding the performance of both the French and American experiences.

Misconceptions of economics & welfare

Economics theories mainly failed, for they either never succeeded to address the benevolence issue in economic development, or rapidly lost its focus when attempting to grab it. Myths that surround the development of InfoWar or InfoEconomics, are mainly myths of malevolence: 'cyberwarriors', 'viruses', 'logic bombs', etc. Whereas we leave the paradigm of economics of forces, physical order, heaviness and superiority of gender on genius, we tend to bring with us the bad habits of past and history. InfoWar experts and analysts react to the emergence of the 'knowledge paradigm' with a defense attitude towards the unexpected. Whereas a global knowledge infrastructure could have been an opportunity to substitute a threat-equilibrium with 'integrative power', policy-makers tend to project ideologies and doctrines that proved to be

wrong, instead of inventing the conceptual framework that will fit the new economics.

Two biases lie behind the design and mission of these governmental-level information coordination bodies. The first bias could be pictured as an "intelligentsialization" of the information infrastructure. Both governments have chosen a top-down implementation of their information infrastructure, thus applying obsolete governmental schemata to the management of knowledge. While experts are calling for the development of the largest "knowledge sharing culture", national knowledge-infrastructure projects are being drawn with an elitist buyest. It might occur, around 2010, that such decisions were historical self-deceptions. Doing so, governments tend to confuse information logistics (a structural perspective) with knowledge sharing (an interactionist perspective). In other words, artificial efficiency is reached today because decision makers and policy makers who share information already hold the requisite knowledge to make this information actionable. Thus, it gives the illusion that the development of an information structure is a necessary and sufficient condition to attain a national knowledge infrastructure.

On the contrary, such a policy will prove to be counter-productive. It will eventually create an isolated body of upper-level knowledge, disconnected with the reality of social development and learning, and therefore, increasing the gap between people who act, learn and talk, and people being acted, learned and talked. Economic performance might be reached through an routinized logistics of generic knowledge amongst business leaders, industrialists and politicians, but social performance is already doubtful. Research findings suggest that permanent improvement and continuous learning cannot be achieved in situations of disarticulated socialization. Information infrastructures, as designed in American and French projects, favor information exchange, including possible use of information highways, and neglect to design proper socialization devices that would enhance permanent and collective sense-making. Furthermore, such knowledge infrastructures are already perceived by the population as jobs-destructive, in opposition with almost all fourteen points of Deming's principles of continuous transformation. One of these principles says that fear should be driven out, so that everyone may work effectively. Surrounded by myths of malevolence, economic intelligence sharing-infrastructure, on the contrary, announces a quest for economics of coordination costs, worldwide economics of scale, and the birth of a knowledgeable elite, with privileged and discretionary access to uprising knowledge infrastructures. Hewlett Packard was an exemplar on that point. Local managers disappeared, leaving their place to management technicians "being acted" by electronic data interchange. Many firms, more or less consciously, took this curve. Asea Brown Boveri (ABB) reduced its corporate staff, after its fusion, from more than 4000 to less than 300 "global managers". Given the fact that middle managers already live and work in suburban areas, effect is an increasing gap between geographically-concentrated conceptual knowledge, and geographically-dispersed procedural know-how. Instead of encouraging a cooperative culture, knowledge infrastructures may implement a perennial rupture between an exclusive and very small knowledgeable suprastructure, and a very large, fragmented and desocialized, cognitively-taylorized substructure.

In Deming's theory, effectiveness is derived from continuous efforts "toward the simultaneous creation of cooperative and learning organization to facilitate the implementation of process-management practices, which, when implemented, support customer satisfaction and organizational survival through sustained employee fulfillment and continuous improvement of processes, products, and services". Similar thinking can be found in intelligence history in general, and in the XVIth century Elizabethan doctrine of governmental intelligence in particular: "Elizabeth was intellectually the most enlightened monarch of her time. Francis Bacon writes that she was "undued with learning," and "to the end of her life she sets hours for reading... (more than) scarcely any student of her time". One way to please her was to talk "In Praise of Knowledge", as Essex did with his essay, most probably written by Bacon". Queen Elizabeth I's intelligence shadow adviser, Sir Francis Bacon, was the author of the *Advancement of Learning* in 1605, and also authored an essay entitled "Followers and Friends" in 1597. The other intelligence doctrine advisor, Sir William Cecil, authored on his part, of a forward-looking memorandum entitled *Matters Necessary to be Done, Troubles... that all May Presently Ensue, Things Necessary to be Considered, With Speed, with Foreboding, With Foresight, Plots and Designs*. Speed, consistency and sharing of knowledge-generation processes on a large-scale base were already put at the center of national development strategies.

The difference between 16th century Great Britain and current industrial democracies, however, is a fundamental shift from *obedience* to *commitment* of the governed. To continue to design information infrastructures in the Elizabethan style, is overlooking that knowledge is nowadays widely distributed. "Cooperation, in this context, is synonymous with collaboration among different individuals, groups, or organizations, where all entities are engaging in noncompetitive, mutually beneficial, win-win activities".

Why Shifting from I-War to K-War: A case-study

As Wilensky once put it, "information has always been a source of power, but it is now increasingly a source of confusion. In every sphere of modern life, the chronic condition is surfeit of information, poorly integrated or

lost somewhere in the system". Roots of such failures can be found (a) in the persistent confusion between knowledge and information, (b) on the large-scale focus that has been given in education to cumulating of knowledge-bases vs. permanent improvement of the diversity and flexibility of modes of knowing, and (c) in the failure of scientists in integrating in new organizational forms and purposes, the advancements of social cognition and collective learning. Yet, "managers are becoming increasingly aware that informed adaptability is at a premium and to attain it they may need different modes of organization to find and solve different types of problems". Nevertheless, and consistent with a perception of knowledge as a commodity, "organization" on one side, and "knowledge" on the other side, are systematically approached distinctively. Organization theorists propose many alternatives and original organizational forms, but leave managers with the duty of generating adequate knowledge to operate them. Knowledge sociologists put much emphasis on the many forms of socializations that participate in the building of cognitive skills, but are reluctant to study how organizational design and knowledge generation interact.

German definition of the world "Intelligenz" could shed some light on such an intricate issue. The *Wirtschafts-Lexikon*, a principal German dictionary, in defining intelligence, puts "an emphasis on mental processes geared to adaptation, integration, and recognizing significant relationships. These processes are interesting: were we to consider them as characteristics of some organizational form, we would come very near to the 'intelligence system' definition (...) German thought also recognizes the importance of the perception of causal connection and of capacity for combination". To achieve the integration of "knowing" and "organizing", German authorities have historically put a strong focus on the continuity of education to intelligence in the society. After World War II, the Economic Police was reintegrated in national industrial infrastructures. Today, German students receive education from German Generals and Senior Military Officers in most business schools as to maintain a longitudinal awareness of the role played by intelligence and military art in the understanding and design of business organizations.

The Perrier case illustrates the importance of "the perception of causal connection and of capacity for combination", so much favored by German intelligence. On July 3, 1989, Perrier and Pepsi Co are negotiating the creation of a joint-venture, in which Perrier would hold 65% of the shares. The negotiations are disrupted on July 16. In August 1989, Perrier sells its subsidiary, the *Société Parisienne de Boissons Gazeuses*, which distributes PepsiCo in France to its main competitor, Coca Cola. This competitive move is perceived as a retaliation. In November 1989, PepsiCo denounces the poor performance of Perrier in the management of its license, announcing the disruption of all contractual arrangements for December 1990. PepsiCo took Perrier to court on November 8, 1990; and announced, a day after, that it would be eventually interested in taking over the soft-drinks activities of Perrier, if stock price would be more attractive. Meanwhile, the Coca Cola stock reached the historical price of 72\$ on November 18, 1989.

On January 19, 1990, a laboratory of North Carolina discovers traces of Benzene in samples of Perrier mineral water. Experts suspect the information to have been transmitted through a mole in Perrier production plant in Vergeze. "Causal connection" can be made between the test results, and the nearby location of a Coca Cola plant. The laboratory Manager does not remember having replaced its test equipment, but "combined" information show strong evidence of all tests equipment being graciously replaced by a Coca Cola sponsoring of the laboratory. On February 2, 1990, the Food and Drug Administration warns Perrier that mineral water being distributed in the United States contains Benzene.

At that time, Perrier is a potential target for a take-over. Nestle would eventually be interested, and has made aggressive competitive moves on the European market. In particular, Nestle has managed to sing an exclusivity with Walt Disney Europe; walking on Coca Cola traditional proprietary territory. On February 5, 1990, the Food and Drug Administration confirms the presence of Benzene in Perrier mineral water. On February 10, Perrier is forced to acknowledge, but reacts very quickly by announcing that all bottles will be withdrawn from the market. On February 12, Perrier's stock is losing 14%. Suntory, the Japanese distributor of the brand announces the withdrawal of 10.000 bottle cases from the Japanese market. On February 14, German authorities forbid Perrier mineral water on their markets. The French Commission of Stock Operations (COB) announces an investigation on suspicious stock movements that occurred on February 9. Sales are stopped in the United States, Canada, Japan, Germany, Switzerland, Denmark and Hong Kong.

The InfoWar could have found its end in this last event, but Perrier held 25% of the American sparkling waters' market, with an annual sales of US\$ 500 millions. Perrier reacted with great dexterity facing such an Info-Destabilization. Financial markets' observers were promptly reassured on the integrity of the natural water source. The human error was fully explained with a worldwide dissemination of accurate counter-information. Sanitary authorities announce the results of scientific investigations: "The daily consumption of half-liter of Perrier during 30 years do not increase the risk of cancer". The Perrier stock gains 6.3% on Paris stock exchange.

The second phase of this large-scale InfoWar arises on February 20, 1990. A 36 years old Athenian woman

asks Perrier 7,5 millions Francs for the damage caused by the explosion of a bottle that supposedly led to the loss of her eye. Evidence shows that the incident occurred on August 25, 1986, that is to say four years before. Several similar court cases appear in different places of the globe : a lawyer in Bridgeport defends Mrs Vahlsing ; eight similar cases of Class Action appear in Connecticut and Pennsylvania. Perrier discovers that Kroll, the investigative consultancy that took care of its information in the United States, has withdrawn key-information from its reports. In 1991, Nestle finally took over Perrier.

Very similar cases of InfoWar, such as the Shell-Greenpeace Brentspar's case, or the case of "benzene threat" for Octel Co. Ltd in the United Kingdom, lead to the same conclusions : (a) an isolated organization cannot cope alone with large-scale Info-Destabilization without considerable loss ; (b) successful large-scale InfoWars involve interorganizational agreements, and collective manipulations of worldwide information infrastructure (mass media, scientific institutions, customer groups, etc.), and most importantly, (c) ability to rapidly make sense (i.e. generating knowledge) is superior in counter-fighting InfoWars than systematic collection and compilation of open information, already coming from a corrupted or contaminated information infrastructure.

Conclusion

"Making the simple complicated is commonplace; making the complicated simple, awesomely simple, that's creativity". Preparing for the knowledge warfare paradigm requires a strong focus on reengineering of the whole education process of industrialized democracies. This is that simple, but policy makers will face strong resistance, especially from academics. Integration of strategic issues assessment should be put as early as possible in education. The current process is cumulative. The required process is interactionist. Instead of thinking of education in terms of sequentiality, policy makers should design education in terms of interconnectivity and interoperability. Many organizations would like today to increase the awareness of strategic issues among their engineers' population, and vice-versa, to increase the awareness of technological issue among their commercial task-forces. To do so, they design new systems, centralized economic intelligence units that dispatches technical of market information to both communities. Some firms, like Intel, encourage hybrid teams of engineers and managers as to fertilize crisscrossed issues. This is a result of a Taylorized learning and knowing. Emphasis should put on judgment, cognitive skills, cognitive flexibility, incongruity and ambiguity tolerance at the youngest age. In the knowledge warfare paradigm, strategic advantage does not lie in the concentration of facts-and-figures, but in the complementarity and singularity of the brains who interpret them. National widespread sense-making capability matters more than electronic information highways.

References

1. . Bo Hedberg, Sten Jönsson, 1978, "Designing semi-confusing information systems for organizations in changing environments", *Accounting, Organizations and Society*, Vol. 3, No. 1, pp. 47-64.
2. . F.J. Varela, H.R. Maturana, 1994, *L'arbre de la connaissance*, Paris: Addison-Wesley.
3. . H. Helmholtz, 1867, *Treatise on Physiological Optics*, Vol. III, translated from German by J.P.C. Southall (Ed.), 1962, New York: Dover.
4. . E.L. Thorndike, R.T. Rock, 1934, "Learning without awareness of what is being learned or intent to learn it", *Journal of experimental psychology*, Vol. 19, pp. 1-19.
5. . L. Hasher, R.T. Zacks, 1984, "Automatic processing of fundamental information", *American Psychologist*, 48, pp. 1372-1388.
6. . J.G. Jenkins, 1993, "Instruction as a factor of incidental learning", *American Journal of Psychology*, Vol. 45, pp. 471-477.
7. . W.B. Scott, "Information Warfare demands a new approach", *Aviation Week & Space Technology*, March 13, 1995, p. 85.
8. . <http://indigo-net.com/lmr.html>. Archives since 1993 are available in English on the Net.

9. . J.S. Brown , P. Duguid, 1991, "Organizational Learning and Communities of Practice" Toward a Unified View of Working, Learning and Innovation", *Organization Science*, Vol. 2, No. 1, pp. 40-57.
10. . W.H. Starbuck, in the preface of P. Baumard, 1996, *Organisations déconcertées. La gestion stratégique de la connaissance*, Paris, Masson. Forthcoming: London, Sage, 1997.
11. . J.E. Lave, E. Wenger, 1991, *Situated learning. Legitimate peripheral participation*, Cambridge: Cambirdge University Press.
12. . General F. M. Franks, Jr., "Winning the InformationWar: Evolution and Revolution", speech delivered at the Association of the U.S. Army Symposium, Orlando, Fl., February 8, 1994, in *Vital Speeches of the Day*, Vol. 60, Issue 15, p. 455.
13. . General F.M. Franks, *op. cit.*, p. 456. It is noticeable that Harry Howe Ransom's "Strategic Intelligence" article (1973, General Learning Press), when using the Viet Cong guerilla as an exemplar, and using an intelligence estimate NIE 143/53-61, "Prospects for North and South Vietnam", dated 15 August 1961, does not mention the existence of the Vietnamese underground logistics, and suspects the "Bloc to build up the eastern part of south Laos, improving the roads, mountain trails, and airfields, as a major supply channel" (p. 7). This is an exemplar of applying a cultural mode of knowing that projects ethnocentric schemata on a singular reality.
14. . W.H. Starbuck, *op. cit.*
15. . Detienne M., Vernant J.P. (1978), *Cunning Intelligence in Greek Culture and Society*, translated by J. Lloyd, Atlantic Highlands, NJ: Humanities Press.
16. . H. Wilensky, 1967, "Organizational Intelligence", in *The International Encyclopedia of the Social Sciences*, David L. Sills (Ed.), Vol. 11, New York: Macmillan & the Free Press, p. 321.
17. . J.C. Spender, Ph. Baumard, 1995, "An empirical investigation of change in the knowledge leading to competitive advantage", Research Paper, presented at the *Academy of Management Annual Meeting*, in Vancouver, August 5, under the title "Turning troubled firms around: Case-evidence for a Penrosian view of strategic recovery".
18. . J.F. Richard, 1990, *Les activités mentales*, Paris: Armand Collin.
19. . Ernest R. May, statement before the Senate Select Committe on Intelligence, 4 March 1992.
20. . Frank Carlucci, testimony before the Senate Select Committe on Intelligence, 4 March 1992.
21. . J. Douglas Orton, and Jamie L. Callahan, 1996, "Important 'Folk Theories' on Intelligence Reorganization", *The International Journal of Intelligence and Counterintelligence*, Volume 8, No. 4.
22. . W.B. Scott, 1995, "Information Warfare Demands New Approach", *Aviation Week & Space Technology*, March 13, p. 86.
23. . Alex N. Dragnich, "Containing Serbia", letters to the Editor, *Foreign Affairs*, November/December 1994, Vol. 73, No. 6, p. 198.
24. . The final report under the presidency of Henri Martre, and co-authored by Ph. Baumard, Ph. Clerc and C. Harbulot, was published by La Documentation Française in Februrary 1994, under the title *Intelligence économique et stratégie des entreprises*. The Mirage 200-5 case study was withdrawn from final publication.
25. . H. Wilensky, *op. cit.*, p. 323.
26. . David P. Baron, Fall 1995, "The Nonmarket Strategy System", *Sloan Management Review*, p. 75.

27. . T.A. Stewart, 1995, june 12, "The Information Wars: What you don't know will hurt you", *Fortune*, p. 119.
28. . Bo Hedberg, *Imaginary Organizations*, forthcoming, New York: Oxford University Press, 1996.
29. . For developments on integrative power, see Kenneth E. Boulding, *Three Faces of Power*, London: Sage Publications, 1990.
30. . See Ph. Baumard, " Guerre Economique et Communauté d'Intelligence ", *La Revue Politique et Parlementaire* (Political and Parliamentary Review), Paris, January 1992 ; Ph. Baumard, *Stratégie et surveillance des environnements concurrentiels*, Paris: Masson, 1991 and Ch. Harbulot, *La machine de guerre économique*, Paris: Economica, 1993.
31. . J.C. Spender, Ph. Baumard, *op. cit.* ; I. Nonaka, H. Takeuchi, 1995, *The Knowledge Creating Company. How Japanese Companies Create the Dynamics of Innovation*, , New York: Oxford University Press.
32. . W.E. Deming, 18986, *Out of Crisis*, Cambridge: Massachussets Institute of Technology, Center for Advance Engineering Study, pp. 23-24.
33. . J.C. Anderson, M. Rungtusanatham, R.G. Schroeder, "A theory of quality management underlying the Deming management method", *Academy of Management Review*, 1994, vol. 19, No. 3, pp. 480.
34. . S. Dedijer, 1989, "British Intelligence: The Rainbow Enigma", *The International Journal of Intelligence and Counterintelligence*, Vol. 1, No. 2, p. 82.
35. . Quoted by S. Dedijer, *op. cit.*, p. 83.
36. . J.C. Anderson, M. Rungtusanatham, R.G. Schroeder, *op. cit.*, p. 483.
37. . H. Wilensky, *op. cit.*, p. 331.
38. . Dale E. Zand, 1981, *Information, Organization and Power. Effective Management in the Knowledge Society*, New York: McGraw-Hill, p. 58.
39. . F.T. Pearce, and S. Dedijer, February 1976, "The Semantics of Intelligence", Research Paper, Lund University, p. 11.
40. . Ch. Harbulot, P-J. Gustave, November 1995, "La contre-information ou comment répondre à une attaque", *Cahiers de la Fonction Publique et de l'Administration*, No 140, pp. 11-13.
41. . Source: M. Najman, 1995, "Intelligence économique", a special television broacast, Strasbourg: Arte (Franco-German Television).
42. . D. Knott, "Views conflict on benzene threat", *Oil and Gas Journal*, May 23, 1994, p. 41.
43. . Source: *The Intelligence Newsletter*, march 7, 1996, "First large public conference on economic intelligence in Sweden", No. 283.
44. . H. Hedin, 1993, "Business Intelligence Systems: systematised intelligence acitivities in ten multinational companies", *The Journal of the Association of Global Strategic Information*, pp. 126-136.
45. . Lars Bengtsson, Jessica Ohlin, 1993, "Strategy Formation and Knowledge Acquisition Process", in Larsson et al., *Research in Strategic Change*, Lund Studies in Economics and Management, 21, Lund University Press.

46. . Charlie Mingus, 1977, "Creativity", *Mainliner*, 21(7), p. 25, quoted by W.H. Starbuck and P.C. Nystrom, 1981, "Designing and understanding organizations", in the *Handbook of Organizational Design*, Vol.1, Oxford University Press, p. 9.
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