

J.W. Forrester said that : “The vision of the world that anyone of us has is nothing but a model. All our decisions are made from models. All laws are written, relying on models”.

• **A contribution of the MADS work group...**

The content of this paper is the result of reflexions carried out by the MADS work group (“Méthodologie d’Analyse des Dysfonctionnements dans les Systèmes” in French, therefore, MADS - Methodology for the Analysis of the Malfunction of Systems).

This group, created in 1989, gathers the experiences and competencies developed in the last twenty year, individually up to 1980 and then collectively by : engineers from the CEA (Commissariat à l’Énergie Atomique”); J.L. Ermine (CEA INSTN - responsible for the teaching of informatics - SACLAY), P. Périlhon (CEA INSTN- in charge of the teaching of Safety - GRENOBLE), J.M. Pénalva - (CEA - Head of the Applied Informatics Laboratory - MARCOÛLE), professors-researchers from Bordeaux I University ; S. Charbonneau (law lecturer) J. Dos Santos (physics and chemistry) Y. Dutuit (physics), M. Lesbats (biology).

... to the elaboration of a Science of Danger.

- By observing the socio-professional world we discover a great diversity in the way danger is apprehended. It can be centered on man, a whole population, the environment, artificial systems (or things built by man). The variety of these centers of interest led to the development of different activities and different studies and prevention techniques (ergonomy, safety and occupational hygiene, human reliability, safety of the installations, dependability, sanitary engineering, applied ecology, epidemiology, industrial toxicology, the management of a crisis...) that co-exist but most of the time ignore one another. These activities becoming more and more professional, a certain number of training courses have appeared, leading to different diplomas or professions that are still very much self-centered.
- This situation is very unfortunate, especially at a time when risk prevention laws are becoming more and more international in order to better protect the workers, the populations, the environment or the premises. Therefore a reflexion should be carried out so as to define a problematic, common to the different modes of apprehension of danger and that would lead to the emergence of a new field of knowledge : The Science of Danger (SD).
- This reflexion has a threefold objective :
 - **a pedagogical objective** ; we are trying to develop pedagogical strategies by taking into account the transdisciplinary aspects of the SD and to set up a European diploma, acquired by credit accumulated units obtained in the European Union states..

- **an operational objective** ; we will have to suggest, develop and/or discriminate methods and tools to identify, assess, control and manage risks. Initially, the work group has relied on an operational method for technological risks analysis (The MOSAR method), developed in the 70ies by P. PERILHON. Our reflexion was about the integration of this method into a more general approach of safety by the use of the systemical problematic and methodology.
- **a cultural objective** ; The aim of the SD is to improve the actual level, and the one perceived, of the safety of man, particularly in front of the development of technoscience. Now, we believe (1) that this “promethean enterprise” cannot be reduced to only scientific, technical and economical factors ; it must, if it wants to succeed, integrate the whole of the institutional, ecological and cultural parameters : “The authentic prevention of hazards resulting from industrial techniques must always start as far upstream as possible, at the level of the acceptability of the risk... The fact to know, from the start, whether a risk is acceptable or not decides about all subsequent considerations and analysis... The acceptability of risks having a technical origine relies essentially on the notions of meaning and value”. Any contribution to the elaboration of a Science of Danger must, to be credible, contain and develop a critical analysis of the objectives, the functioning, the decisions made by technoscience, by dealing with problems such as the compatibility of technoscience and democracy, the decision of experts and the choice of the citizens (2),... The science of danger must therefore develop a risk culture adequate to the issues of our age.

• **By “science” we mean...**

We will avoid the epistemological debate that would consist in explaining discriminating criteria in order to give the label of “quality science” to such or such form of knowledge ; we will only retain, with P. VALÉRY, the minimum criteria : “Science means : to put things clearly, order, pure classification... It is found in increased organization, more conscience and connections... Science is, to look for the part in a whole that can express the entirety...”.

Pedagogy :

reflexion on the adequation between the organizational aspects and the didactic and epistemological contents of a course.

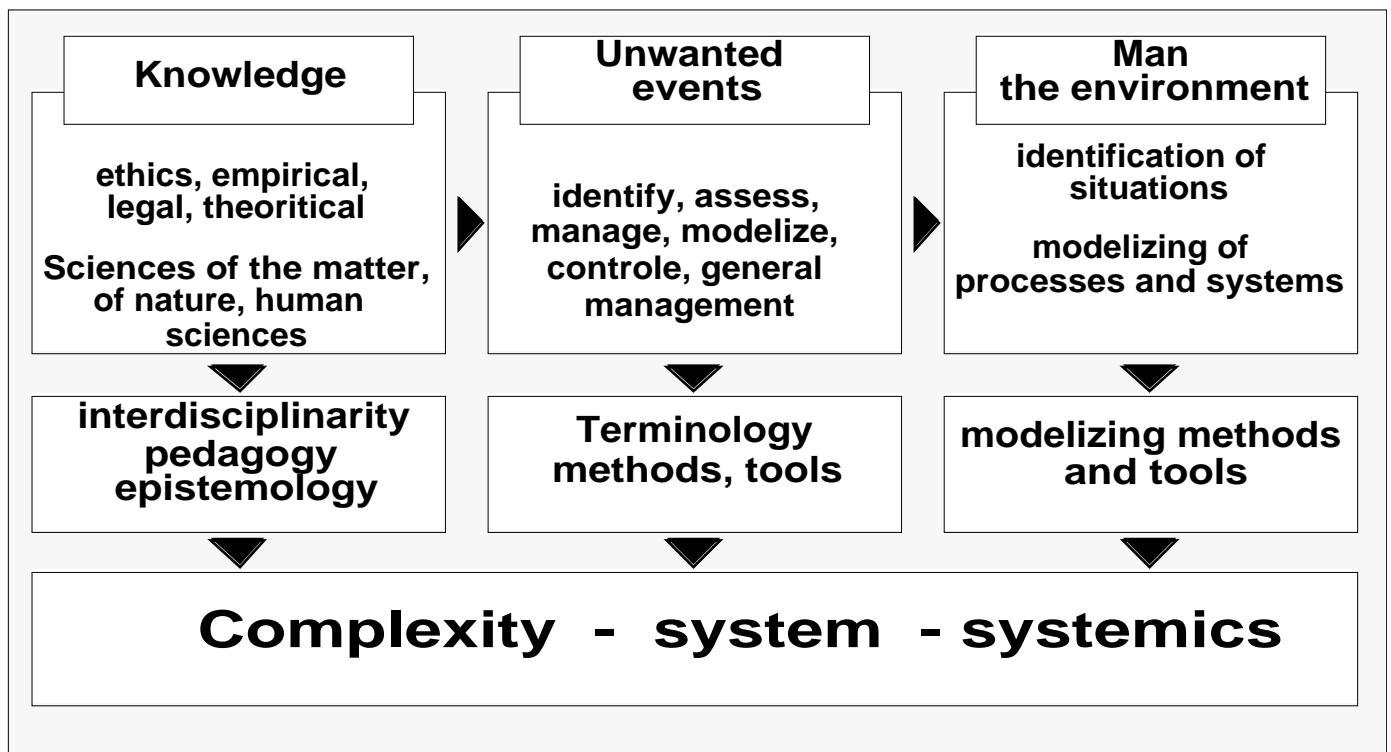
Didactic :

research (theoretical and/or experimental) on the transmission and appropriation modes, in one specific knowledge field.

Epistemology :

reflexions on the formation, transformation and exchange of scientific concepts, on the development and reorganization of a field of knowledge.

fig. 1 Problematiques of the Science of Danger ? a state, an action... a discipline



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Problematics, methodology, method, tool : the meanings we retain :

- Problematics

- *set of problems that arise in one particular field of knowledge,*
- *a certain way of setting problems specific to one notion or to one field of knowledge.*
- *a problematic is defined by the limits of the ideological horizon in which it has been raised.*

- Methodology

- *reflexion whose object is to examine the nature, value and choice of the materials with which we can build up our knowledge in order to determine for what use they can be suitable or unsuitable.*

- Method

- *programme setting, in advance, a series of operations to carry out and signaling some deviations to avoid, in order to achieve some fixed result.*

- Tool

- *technical process to calculate or to experiment, that is used to carry out series of operations in a method.*

...and by science of danger we mean

The Science of Danger (SD) is a set of knowledge the object of which is to apprehend Unwanted Events (ENS in French).

- We call *Unwanted Events* the Phenomenons likely to cause unwanted events on the individual, the population, the ecosystem, installations. They are derived from and apply to the structure, the activity, the evolution of natural and artificial systems. This definition explains two categories of unwanted events : phenomenons attributed to the source system but also to the effects the latter have on the target system.
- We call *installation* any man-made establishment, any building, fixed or mobile (industrial premises, urban premises, agricultural premises, means of transport). This constitutes the *general method* of knowledge and action used by the Science of Danger.

The verb “apprehend” means for us : to represent modelize, identify, assess, control, manage locally (tactical management) and in general (strategic management). It can be carried out *a priori* (prevention) or *a posteriori* (backfeed from past experience).

- The Science of Danger is made of knowledge belonging to *techniques of danger* that are varied, structured around the problematics of identified methods and tools (ergonomy, safety and occupational hygiene, human reliability, safety at work, safety of the installations, dependability, sanitary engineering, applied ecology, epidemiology, industrial toxicology, management of crisis, natural risks...).

These techniques of danger draw their own knowledge from a great number of *applied disciplines* (work physiology, ecology, toxicology, work law, environmental law, engineering, epidemiology, work psychology, sociology of organizations...). The applied disciplines being, in turn, related to *fundamental disciplines* (mathematics, physics, chemistry, biology, law, economy, ecology, sociology...).

• Science of danger and complexity

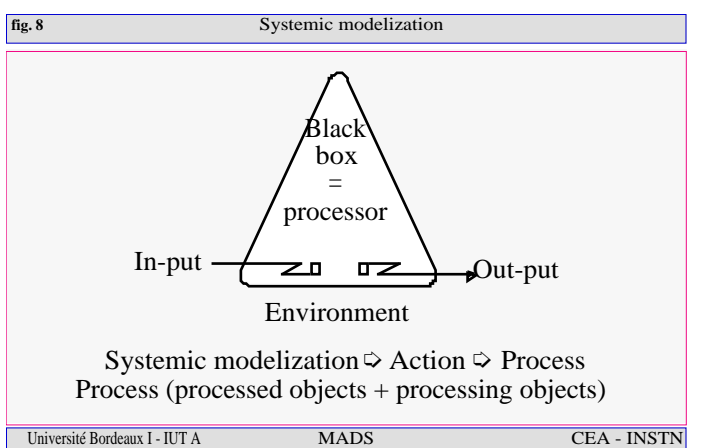
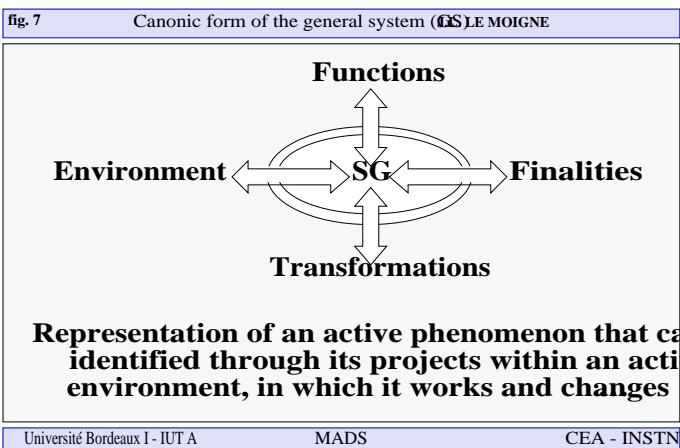
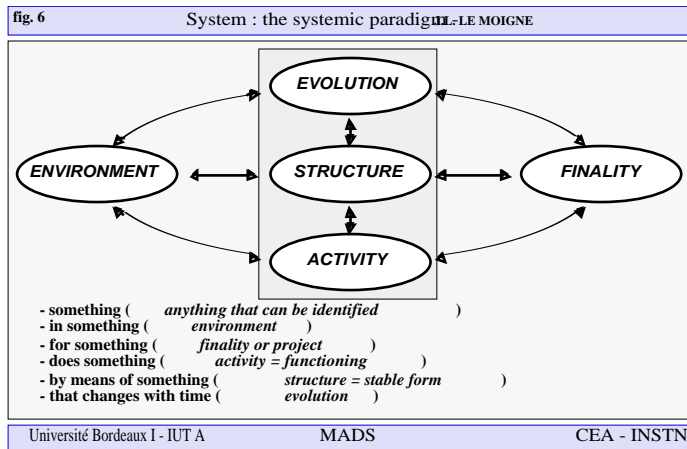
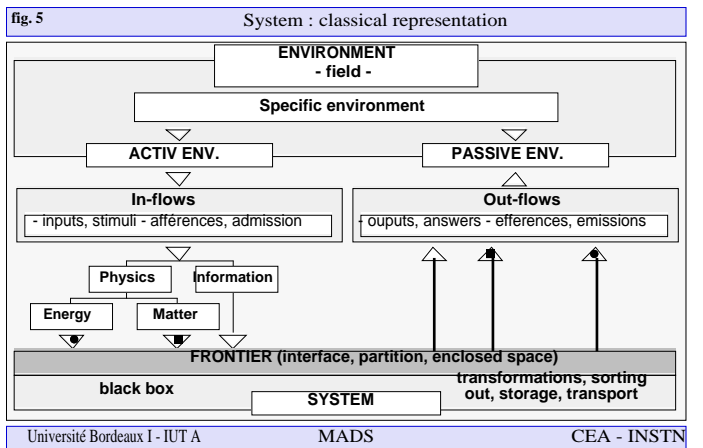
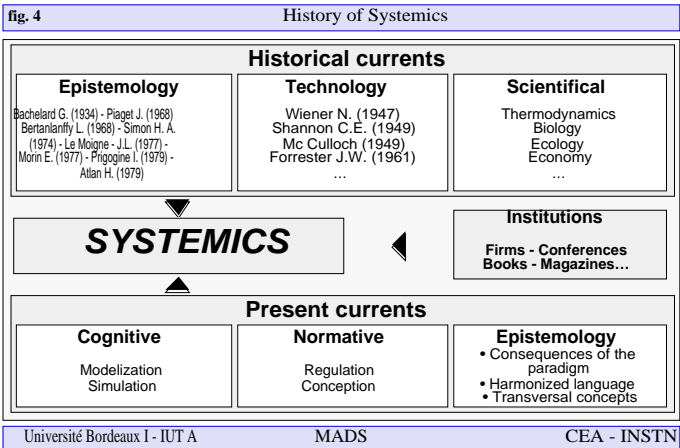
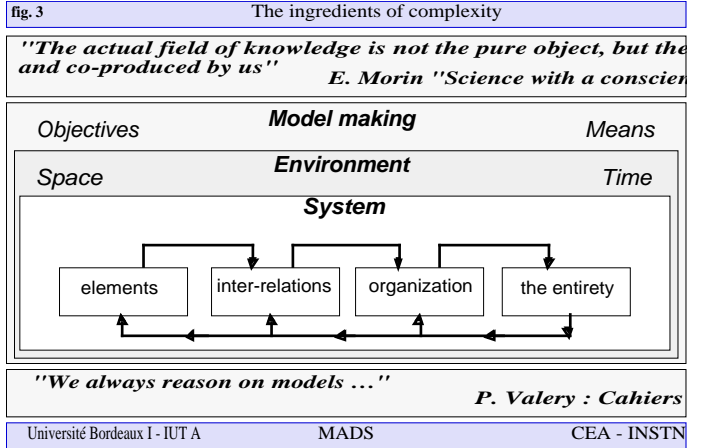
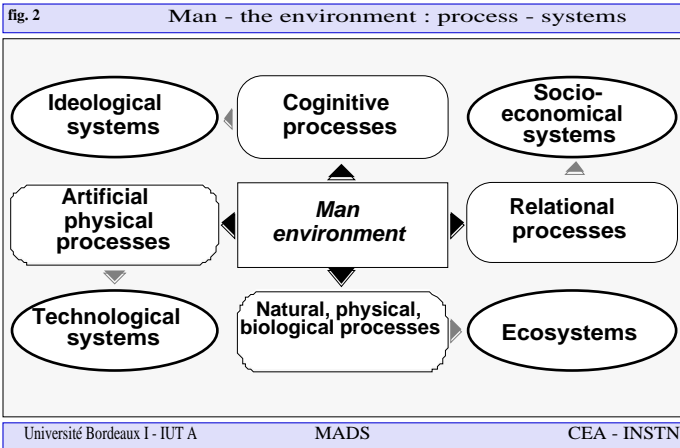
By defining more accurately the key words in the anodyne looking definition we suggest we can realize the scope of the problematics of the science of danger and sift out all the ingredients that characterize its complexity (fig. 1).

- Classical disciplines mainly study repetitive processes, that can be reproduced, controled, that are permanent, reversible. They have proved their efficiency that led to the progress defining our industrial society”

The science of danger studies *events*, that is to say, at first analysis, what is unforeseeable, unlikely, accidental, what may not be controled, is irreversible, what “remains after rationality has been applied”... a great many difficulties appear... (5)

The notion of unwanted event is an anthropocentric one ; the same type of event can, according to the times, the socio-cultural environment, the strategies or the roles of individuals, be unwanted by some people, seem indifferent to others and even... be wished by others.

- If we claim we want *to apprehend* events we therefore decide, by a methodological principle, that these are not the results of chance. The event is the result of associations, combinations, intercorrelations of events, that happen in very different lapses of time (short term, medium term, long term), during the coming together or the disturbance of structured sets. To study the event, in a way, consists “in solving the paradox of demanstrating as unavoidable something that, at first analysis, was considered as unforeseeable”.



- The possibility of *apprehending* the events is subordinated to the pertinence of the mode of representation of natural ou artificial systems (ecosystems, technological, socio-economical, ideological systems). This mode of representation implies the identification of the processes undergone and/or caused by man (cognitive, relational, natural, artificial processes) (fig. 2).
- Taking into account what has been said above, it is easy to see that *the basic knowledge* related to the science of danger is very wide (Sciences of the matter, of nature, human sciences...), heterogeneous (reference to an ethic, theoretical and empirical knowledge). The teaching of this knowledge therefore requires beforehand, an *epistemological reflexion* so as to set forth a unitarian language, transversal concepts,...
- Huge quantities of interactions and interferences between a great number of units... Uncertainty, indetermination, random phenomena... representation, modelization... heterogeneous knowledge and levels of organization... here are the ingredients of *complex systems* (fig. 3). The management of complexity needs new approaches of comprehension and intervention (5).

• *From complexity to systemics...*

- The knowledge covered by the reference to a systemic approach is, according to us, the sought source. Besides, its ambition to work at the elaboration of a language making it possible to coordonate the attainments issued from various disciplines, the *systemic approach* proposes methodological principles for the investigation of natural and artificial systems, with the aim of improving their conception, their functioning, their management (fig. 4). An approach is said to be systemic if it is based on the concept of system and on the associated concept of model, built to apprehend à phenomenon perceived as complex.
- The concept of system has always been a “base-notion to designate any set of relations between componants that make a whole”. To treat a “set” as a system consists, at first analysis, to establish the fact that the knowledge of this set is subordinated to the knowledge of the parts that make the whole, of the interactions between these parts, of the interactions with the environment, of the objectives of the observer/actor of the whole (fig. 5).

As far as we are concerned, it is in J.L. Le Moigne’s book entitled -Théorie du systèmes général (4) that we have discovered the richest source to quench our expectancy.

We found in this book the epistemological aspect necessary “to think by yourself in complexity” (5) and to develop the didactic of the SD. We also found “a conception/construction instrument for models of phenomena or for the projects perceived as complex by an

observer”, instrument that we consider of prime importance for the pedagogy of the Science of Danger.

The systemic paradigm as J.L. Le Moigne shows it, expresses the multiple articulations between the five key-concepts (activity, structure, evolution, finality, environment) that one finds implicitly or explicitly, in the various meanings of the word system. This theoretical and artificial construction has been called *general system* (fig. 6 and 7).

- The basic concept of systemic modelization is not the object, or the combination of stable objects (structure), but the action that will systematically be represented by the black box. To characterize the action it is easy to use the general notion of process (fig. 8).

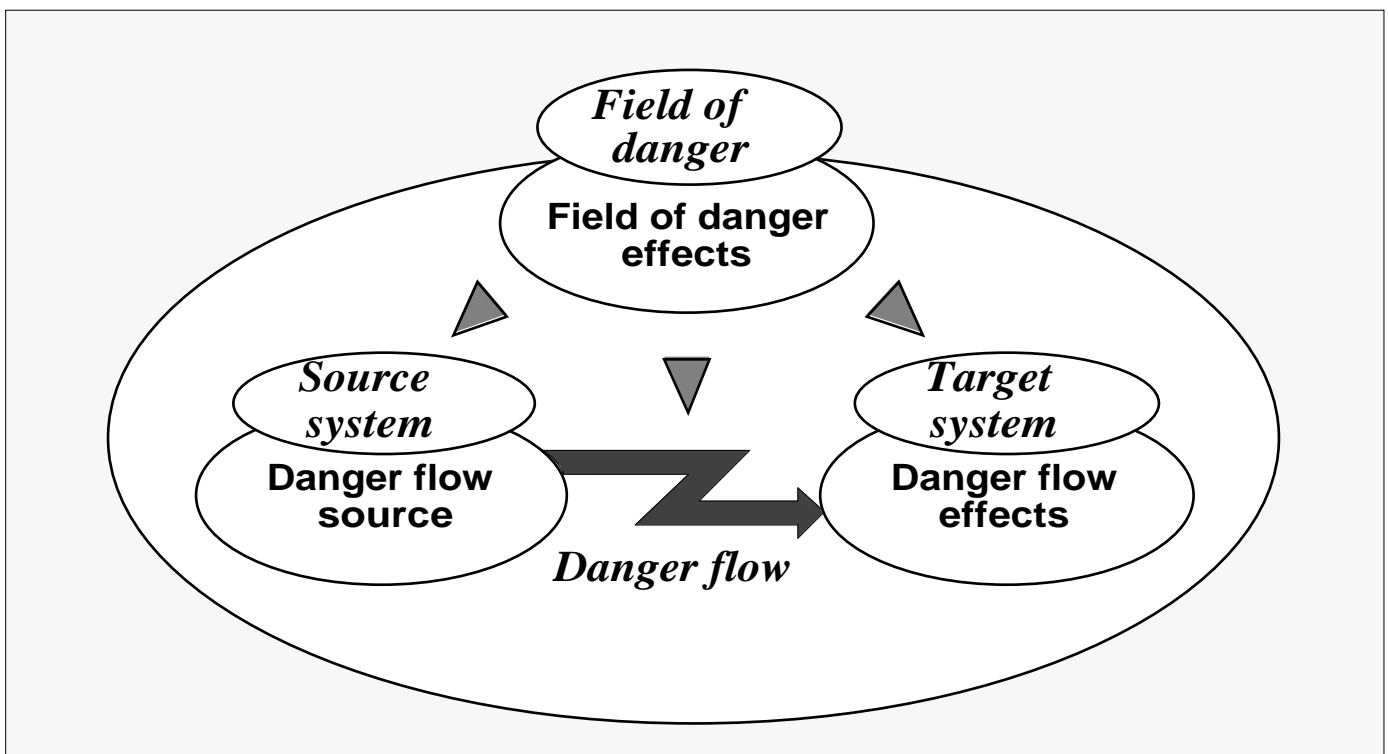
A process can be defined as the ordered set of changes that affect the position *in Time (T), in Space (S), in Form (F) or in Nature (N)*, a family of identified objects (3). The concept of process always evokes :

- a duality between processed objects (that undergo changes) and processing objects (that cause the changes),
- a description of the changes affecting the processed objects.

Any model of an object in the environment, any model of its “behaviour” can be conceptualized through a process. What more, an object can, a priori, be identified in processes. It will be represented within these processes (whether it is actor or acted upon, or both) by its transaction with them at anytime, by a “black box” receiving, or taking other objects set in action by this process : the in-puts at time t, and the emitters or the returned ones after processing : the out-puts at time t.

- The relation of the system with the environment is characterized by two phenomena :
- a transaction of the system with the environment in the way of *matter, energy* ou *information*, that we call flow,

Fig. 9 - Reference model : the danger process



- a shift of the balance (of the stability) of the system showing the capacity of influence the environment has on the system, that we call *field*.

• *From systemics to the danger process*

Based on systemics we have developed a *reference model* called *danger process* (or MADS model) (fig. 9).

- To establish this model we call danger flows the unwanted transactions between a system and its environment. The origine of the danger flow is called source system ; the rupture of the balance (stability) concerning the structure and/or its activity and/or its evolution, is called danger source. The part which the danger flow affects is called target system ; its rupture of balance (stability) is called danger effect. One has to point out that this danger effect can itself be danger source, therefore changing a target system in to a source system, which illustrates the phenomenon of chain unwanted events that we call danger scenario.
- We call danger field the active environment likely to affect source and target systems, and the danger flow. According to the type of question asked (identification, assessment, controle, local or general management) the danger field will be physical, psychological, legal, socio-political...
- To the source and target systems correspond *state variables* whereas we attach *environmental variables* to the field and to the flow, *flow variables*. The danger sources are also characterized by *source variables*. The knowledge of the values of these variables, numbers or symbols, arecalled attributes and enable us to estimate the risk assessment factors.

Any study in the field of the Science of Danger consists first in modelizing the danger process, that is to say to put into relation a danger source system and a danger target system by means of a danger flow within an active environment called danger field.

"A system of ideas is made of a constellation of concepts associated in a solidary way, the arrangement of which is established through logical, links, according to axioms, postulats and underlying organization principles... Mediator between human spirit and the world, systems of ideas take consistence and objective reality from their organization". E. MORIN 1991 (5).

• *The danger process is built in different stages :*

- **first stage : general representation of the source and target systems.**

According to the question asked, the technical and/or scientific knowledge give us *various representations* of these systems.

- Some disciplines propose *structural* knowledge on the system, others representations of its *functioning*, and others propose models of its internal *evolution* or of its behaviour as regards its *environment*.

- The aim of this first stage is to *collect information* about the systems, source of danger or target of the danger, as well as about the active and passive environments.

- **second stage : representation of the processes source of danger and of the the processes likely to suffer from the effects of danger..**

- In the source system one has to identify the *processes* source of danger -couple : processing objects/processed objects-

- In the target system one also has to identify the processes -couple processing objects/processed objects- that are likely *to suffer from the effects*, the danger impacts. These Unwanted Events are called *danger effects*.

- The processes to identify are *cognitive* processes, *relational* processes, *technological* and *biological* processes. These processes can be considered as processes that are source of danger but also as targets that suffer from the effects of danger.

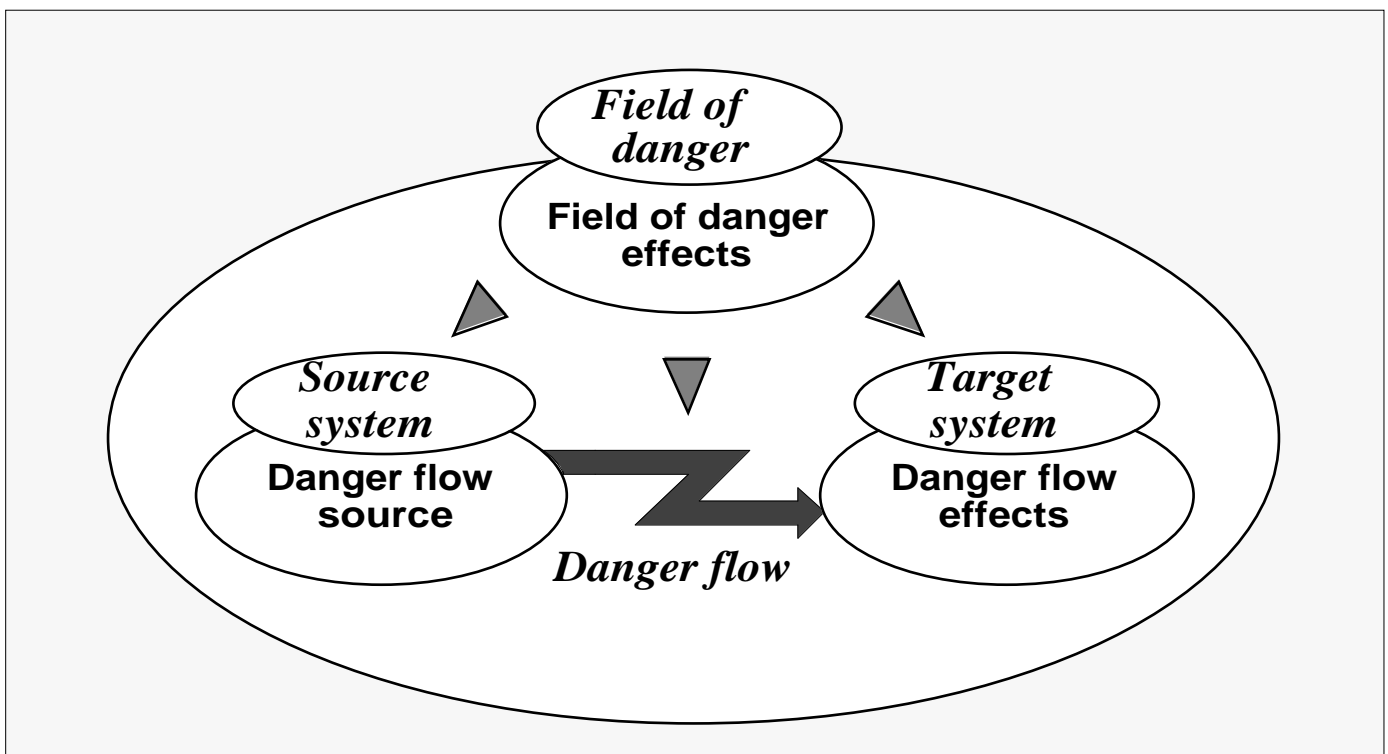
- **third stage : modelize the danger process.**

- The processes that are source of danger have to be linked to the processes likely to be affected at the level of the danger target (fig. 9).

- the link takes place by modelizing a danger flow, the link going from source to target (4).• The oriented representation built - source, flow, target - is immersed in a *danger flow*. This danger flow is strewn with processes that can influence the state of the source system, therefore the processes source of danger, the flow, but also the target system, therefore the processes that take place there and that can suffer from the danger effect.

- There are 3 types of danger flows : the danger flow for matter, energy and information. These flows can be processed by the field *-notion of field processor-* by time processors (chronic flow, flow limited in time) by space processors (punctual, diffuse flow). These flows are processed by the source or target systems by means of source or target processors (transformation of the flow) and of nature processors (transmutation of the flow).

Fig. 9 - Reference model : the danger process



The reference model given is not only technical and topographical. It can be used to represent yourself the danger process from microscopic level to macroscopic level (level of apprehension of the Unwanted Events) and to represent the same reality under aspects that can be very different (cognitive, relational, technical and biological processes). The choice of an aspect can depend, among other things, on the type of question asked by the modelizer..

• **A general method of knowledge and action can be defined : identify, analyse, control, manage locally and generally the Unwanted Events.**

- **The identification** of the UE's within the danger process consists, a priori or a posteriori, in locating them at the level of the danger process, that is to say :

• to look for the origine of the danger flows at the **level of the source system** (in its structure, its functioning, its evolution or in the effect that the active environment produces there), therefore at the level **of the processes that take place there** (cognitive, relational, technological and biological processes),

• to seek the creating or amplifying effects of the danger flow, caused by the field processors,

• to seek the effects caused by the danger flow on the target system (that is to say the modifications of structure, functioning and internal evolution caused by its active environment), therefore on the processes that take place there (cognitive, relational, technological and biological processes).

- **The analysis** of the UE's in the danger process is :

• to analyse UE's consists, a priori or a posteriori, to carry out a risk analysis (probability of occurrence or frequency, seriousness) by means of identified tools taken from the various Techniques of Danger (Safety, Ergonomy, Sanitary Engineering, Hygiene and Public Health...).

• The available evaluation scales can be quantitative (cardinal), qualitative (ordinal) ; they all aim at giving us information about the occurrence of a risk and its seriousness.

• The analysis methods and the evaluation tools for the unwanted events can be classified into several groups : a priori, a posteriori, technico-legal, scientific and technical. We suggest to choose them according to the **type of question** asked the modelizer but also according to the **time** he has to carry them out.

- **The control** of the UE's in a danger process consists in acting, a priori or a posteriori (return of experience), to

decrease the probability of occurrence (or the frequency) of the UE, as well as its seriousness.

• Acting on the danger source system and at the level of the processes that take place there (without neglecting the effect the danger field can have on their state). These **preventive** actions can therefore have several aspects : controlling internal initiative events in the source system, controlling negative effects of the field on the source system and on the various processes that take place there, controlling the danger flow after it has appeared in the source system, acting on the out-interface of the source system...

• Acting at the level of the danger flow and before its effect on the target system, or on the target system itself so as to decrease the seriousness of the effects on the processes that take place there (without neglecting the action the danger field can have in order to increase the effects of the flow on the target system processes)..

These **protective** actions on the target and/or **intervention** actions usually try to minimize the seriousness of the danger effect.

• Therefore, controlling the UE's consists in setting up processes of regulation that are technological, relational, cognitive, biological and that take place at the level of the systems that are source or target of the danger. These regulations constitute real **barriers** trying to control the danger process.

- **Managing**, locally and generally, the UE's within the danger process consists in thinking, a priori or a posteriori, about actions to set up in order to increase at one's level (local or general), the efficiency of the identification, analysis and of the control of the danger processes. These managing tasks of the danger process are **organization and piloting tasks**. We can determine at least **three categories of actors** in the local and general management of danger processes : the managers of the system source of danger, the managers of the system target of the danger, the managers of the danger field.

• A great many **organisation and piloting levels** of prevention, protection and intervention can be identified. They go from local management to general management of the danger process.

Table 1 - The view-point of the Danger techniques

Source system	Target system	View-points
Installation	Installation	Dependability, safety of the premises, ...
Installation	Operator	Ergonomy, Safety at work, work conditions ...
Opérateur	Installation	Human reliability, internal malevolence, ...
Installation	Population	Hygiene and public health, hygiene and safety of the environment, sanitary engineering,...
Population	Installation	External malvolence, ...
Installation	Ecosystem	Hygiene and safety of the environment, applied ecology, sanitary engineering, ...
Ecosystem	Installation	Natural risks, site study, urbanism,...

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Fig. 10 - Ergonomy

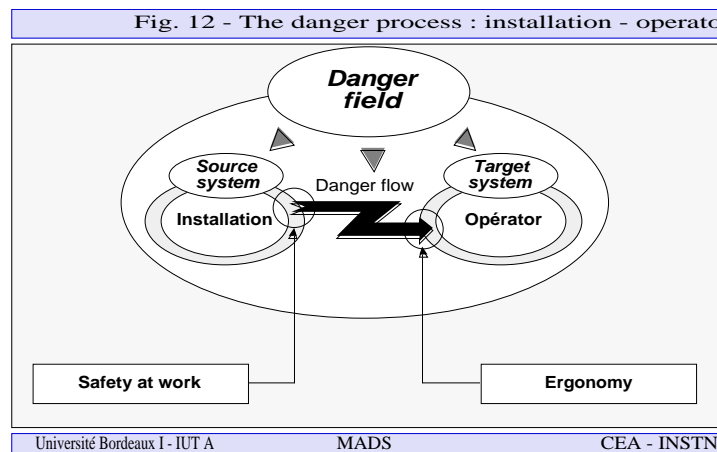
Definition and objectives	Analyse human work to adapt it to man, improve work conditions and the quality of products.
UE's	Bad work conditions, pressure, tiredness of the operators, accidents due to tiredness. Accidents and/or occupational diseases.
Problematics	Centered on the activity of the operator and on the conditions of this activity, systemic, socio-technical and economical, non-normative
Methods	Origin of the tools
Ergonomic method (from the analysis of the request to diagnosis) ...	Psychology, physiology, engineering, sociology of the organisation
Key words	Activity, task, regulation of the activity, constraint, pressure, process and organisation of task, design and correction

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Fig. 11 - Safety at work

Definitions and objectives	Aptitude of the production system to work without damaging its human environment
UE's	Malfunctioning of the installation. Accident and/or occupational diseases for the operators
Problématiques	Centered on the installation, technico-legal and normative - traditional approach ; obligation of means - - systemic approach ; obligation of result -
Methods	Origin of the tools
MOSAR Safety study ...	Law, standards, regulations, engineering, mathematics, and informatics, ...
Key words	Installations, risk, danger, regulations, standardization, obligation of result

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- The presence of *multiple actors* intervening in this management (at every organisation or piloting level) brings about many conflicts between actors at the same level or actors acting at different levels. In democratic countries, ***law is the main management support of these conflicts***. It determines the social minimum that is the goal of the danger process management.

The science of decision constitutes the systemic tool to manage the danger process.

- ***The “danger process” model is a model to classify the Danger Techniques : the notion of “view-point”.***

- Four types of systems can be considered, in turn, as danger source or target of the danger : *man* (the operator, for example), *the population*, *the ecosystem*, *the installation*. The table 1 classifies the most used Techniques of Danger and lets emerge the notion of *view-point*.

- *The view-point is defined by the type of target system that one tries to protect from the effects of the source system.*

- The same Danger Technique can sometimes be found in the list of disciplines that have different view-points. It is the case, for example, of a technique trying to protect two target systems by controlling the Unwanted Events coming from the source system (eg : Health and Safety of the environment, Sanitary engineering).

- ***The danger process as federating model for the knowledge and the action practices of the Danger Techniques.***

- So as to *test the pertinency of the danger process model* as far as the coordination of ideas on the field of Danger Techniques is concerned we are presenting here very briefly, for Ergonomy, Safety at work, applied Ecology, Hygiene and Public Health and Hygiene and the Safety of the Environment, a definition and the objectives of each discipline, the Unwanted Events (UE's) they try to prevent, the problematics that rule them, a few methods are set up and a few key-words given.

The information given here below in tables, enable us to differentiate them by using our reference model, the danger process.

- Two examples of disciplines having the same view-point : Ergonomy and Safety at Work.

- Let us take the orientated couple - source system, the installation ; target system, the operator - we define two Danger Techniques : Ergonomy and Safety at work. These disciplines attempt to protect the operator from the effects caused by the installation : they have the same view-point. Nevertheless these two disciplines have autonomous problematic methods and tools of knowledge and action.

How can we differentiate them by using the danger process model ?

- Figure 10 and 11 represent these disciplines. Schematically and after comparing the above mentioned elements, we can deduct that these two disciplines do not apprehend in the same way the situation presented here above : the problematics, methods and tools are different. We can sum up the fundamental difference that separates them as follows : Safety at work is a Danger Technique that identifies, analyses, controls, manages locally and generally the Unwanted Events that are essentially caused by the installation. These events are likely to cause effects on the operators : the knowledge and the action of this technique is centered on the ***source system and on the out-coming flow of danger*** (bad work conditions) (fig. 12).

Ergonomy is a Danger Technique that identifies, analyses, controls, manages locally and generally Unwanted Events caused by the effect on the ***target*** (the activity of the operator), likely to be caused by the ***in-coming danger flow*** (bad work conditions) : the knowledge and the action of this technique is centered on the ***in-coming flow and on the target system*** (fig. 12).

- We can notice that the analysis of the work conditions (analysis of the flow) is a set of knowledge and of actions carried out both by Ergonomy and Safety at work (noisy conditions, thermic conditions, lighting, toxicologic aspects...). This knowledge is used differently in practice by these two types of Danger Techniques.

- In our model, the ***flow determines the knowledge common*** to these two disciplines.

- Let us take the following two orientated couples ;

- Source system, the installation ; target system, the ecosystem -
- Source system, the installation, target system, the population -

Fig. 13 - Applied Ecology	
Definition and objectives	To protect the conditions of existence of all living beings (including man)
UE's	Pollution, nuisance, impact on the ecosystem, incidents, accidents, ecological catastrophes
Problematics	Centered on the analysis of the biotope - biocenose interaction and on the effects caused by the population on this interaction, naturo-centric (man lives in nature)
Methods	Origin of the tools
Study of the impact on the ecosystem, ecological methods, ...	Physico-chemistry, biology, ecology, ...
Key words	Pollution, impact : stability, regulation of the ecosystem
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Fig. 14 - Hygiene and public health	
Definitions and objectives	To protect the life conditions and the public health of the population
UE's	Pollutions, nuisances, impact on human populations, incident, accident, catastrophe involving the populations
Problematics	Anthropo-centric, technico-legal, normative - - technical and medico-social approach -
Methods	Origine of the tools
Study of the impact of the population, Epidemiology ...	Microbiology, physico-chemistry, toxicology, mathematics/statistics, ...
Key words	Pollution, regulations, information campaign, diffuse risks, epuration ...
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Fig. 15 - Hygiene and Safety of the environment	
Definition and objectives	To protect the environment of human establishments
UE's	Pollution, nuisance, fire, explosion, incident, accident, catastrophe, direct effects on the populations or indirect via the ecosystem
Problematics	Centered on the analysis of the dangerous installation, anthropo-centric, technico-legal and normative
Methods	Origine of the tools
Impact study, danger study, eco-assessment, ...	Physico-chemistry, mathematics, informatics, ...
Key words	Risk, danger, pollution, waste, treatment, major and diffuse risks
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They define two different view-points : the first couple, to protect the ecosystem, the second, to protect the population.

The three main disciplines that can be linked with these view-points are : Applied Ecology, Hygiene and Public Health and Hygiene and Safety of the environment. Figures 13, 14 and 15 present these disciplines.

The Hygiene and Safety of the environment has as objective *to protect the two types of targets* (the environment of the source system, the installation) the population and the ecosystem.

Its knowledge and means of action are centered on the identification, the analysis, the control, the local and general management of the Unwanted Events issued from the polluting installation whereas Hygiene and Public Health and Applied Ecology set up actions more centered on the identification, analysis, control, local and general management of the effects (impacts) on the respective targets they try to protect (fig. 16, 17).

- Sanitary Engineering proposes the entire means of regulating danger flows (eg : pollution) : this is a set of knowledge common to the three techniques mentioned here above.

- Similar reasoning can be carried out for all the view-points on the Techniques of Danger explained in table 1.

Presented like this, the Science of Danger, the object of knowledge and of action of which is the Unwanted Event, is made of and nurtures on knowledge coming from many Danger Techniques.

Each one has its problematic, its autonomous methods and tools taken from many fundamental disciplines. The Science of Danger is a science of coordination, of federation of ideas concerning the knowledge and the action practices of the many disciplines.

The Analysis Methodology for Malfunctions in Systems (MADS in French) that we suggest here, as well as its reference model -the danger process- are general tools of reflexions about the coordination of these ideas. We also think that they can be used as knowledge and action concepts on phenomenons issued from and applying to complex systems.

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