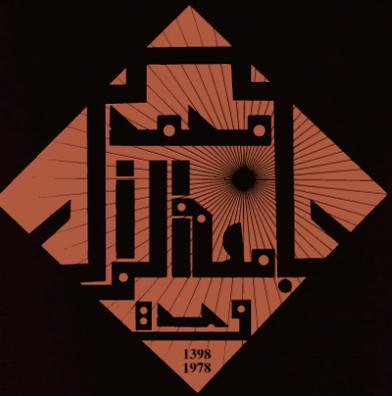


# L'innovation à l'ère du numérique





# L'innovation à l'ère du Numérique

1 *Origines ?*

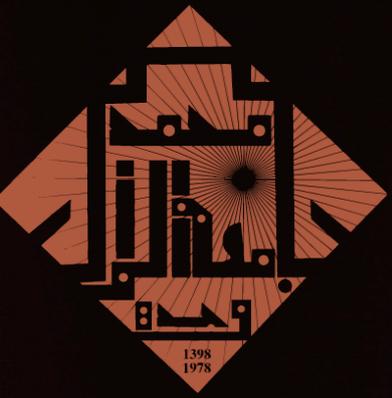
6 *Perspectives ?*

*Aujourd'hui* 2

5 *Modèle de l'Innovation  
Technopédagogique*

*Culture numérique* 3

4 *Innovation ?*



# L'innovation à l'ère du Numérique

I *Origines ?*

6

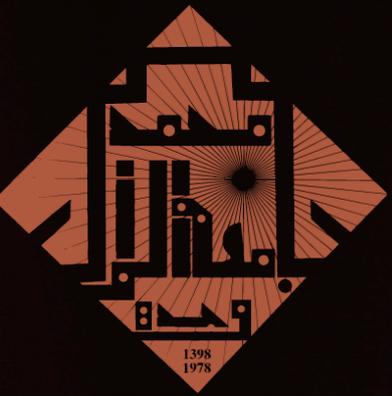
2

5

3

4



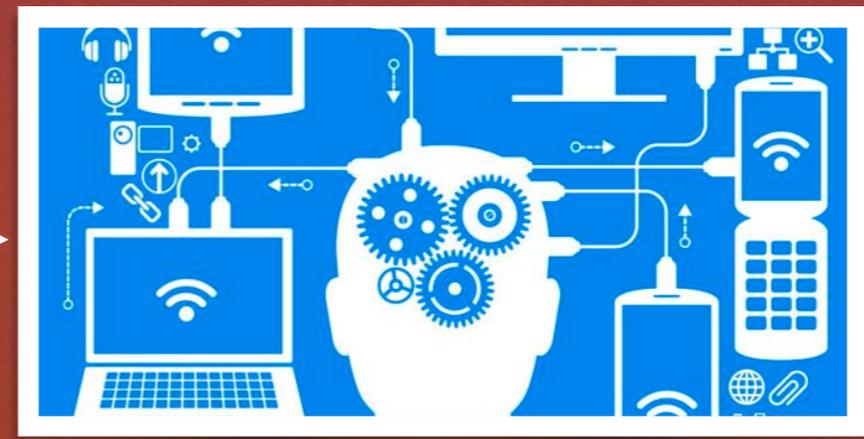
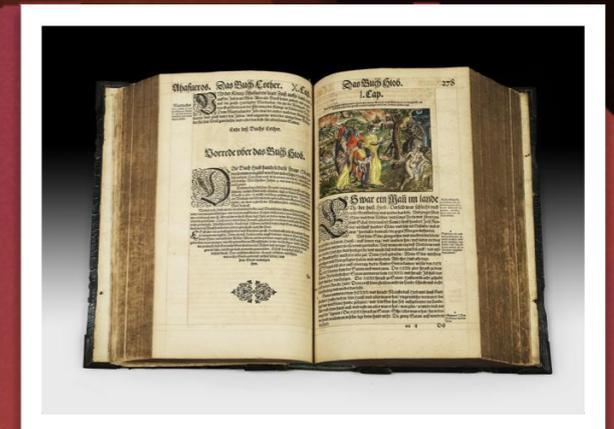
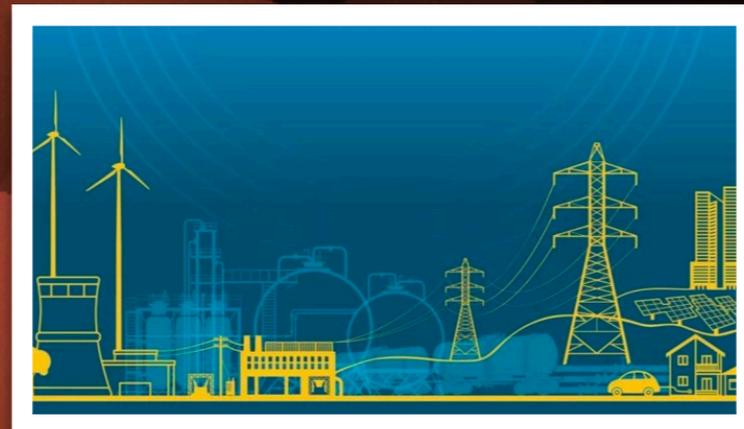
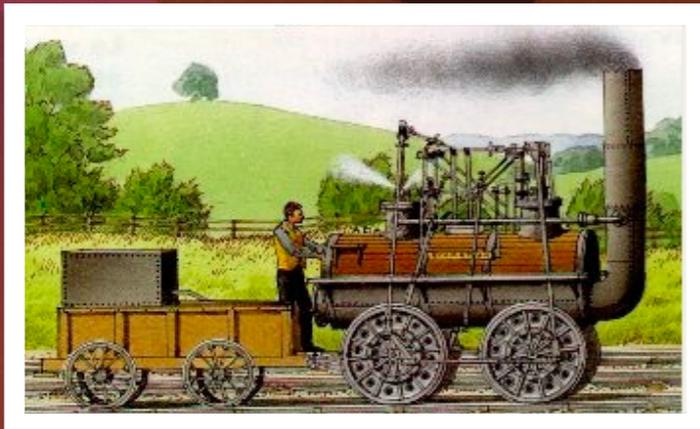


# L'innovation à l'ère du Numérique

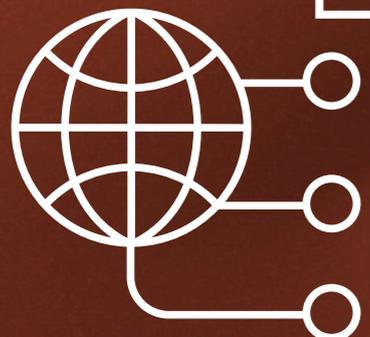
Bruno De Lièvre

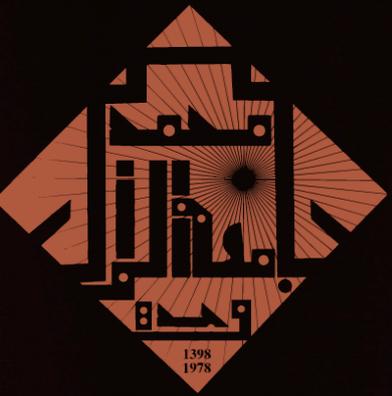
## I Origines ?

## I.I Usages > Techniques



- Usages**
- Produire
- Partager
- Utiliser
- Savoir
- Cardon, 2019





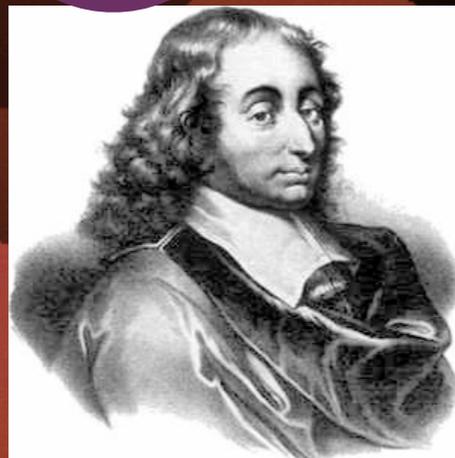
# L'innovation à l'ère du Numérique

Bruno De Lièvre

## I.2 Automatisation

### I Origines ?

Cardon, 2019



Blaise Pascal (1642)

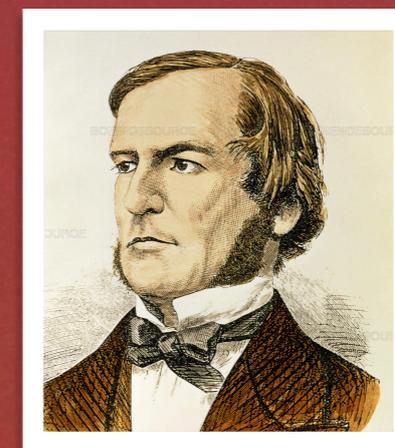
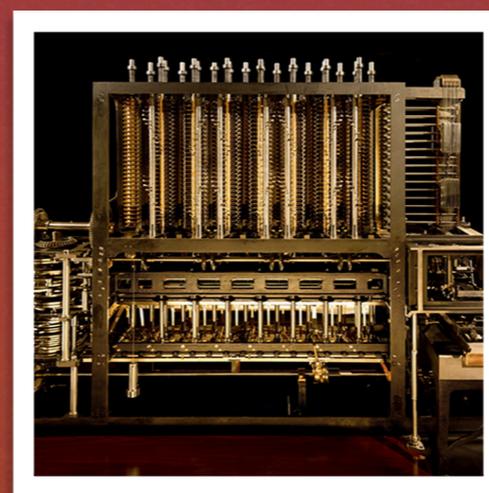


Charles Babbage

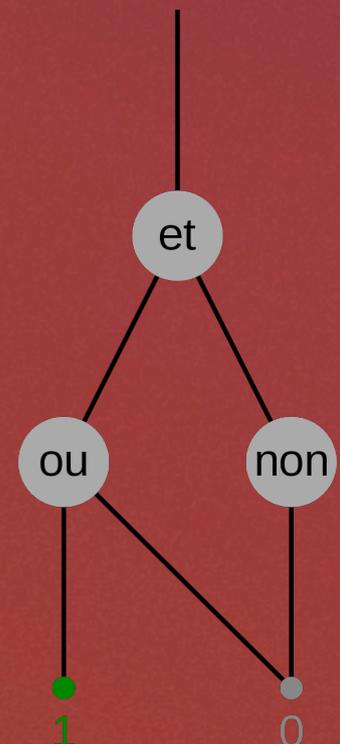


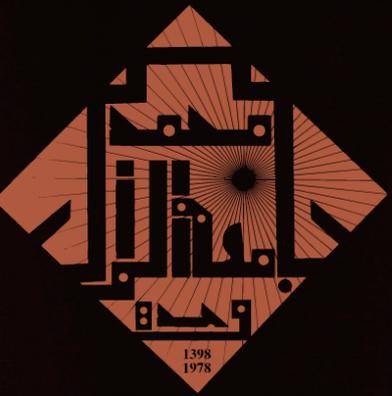
Ada Lovelace (1834)

1er algorithme du monde



George Boole, 1854

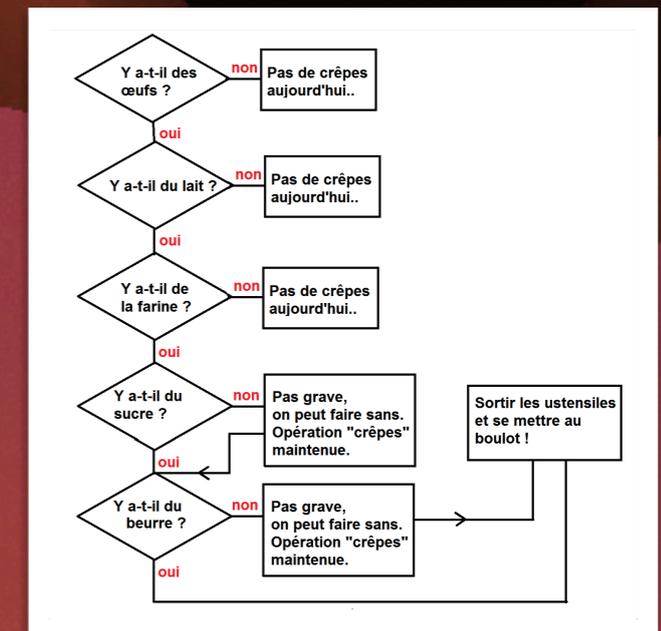
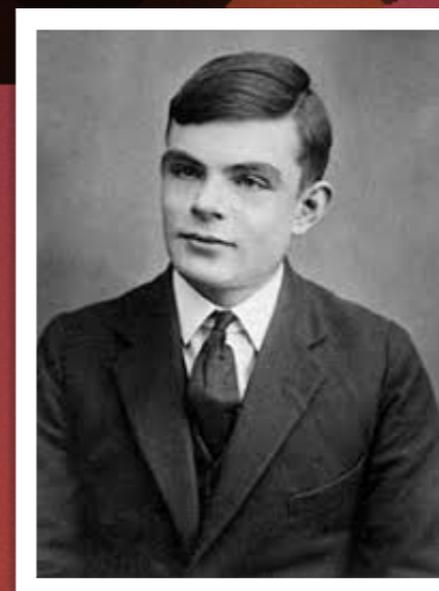
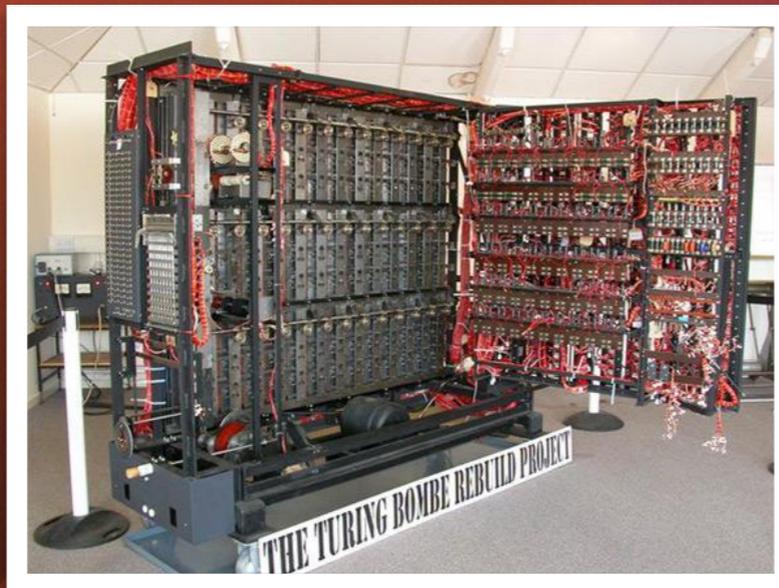
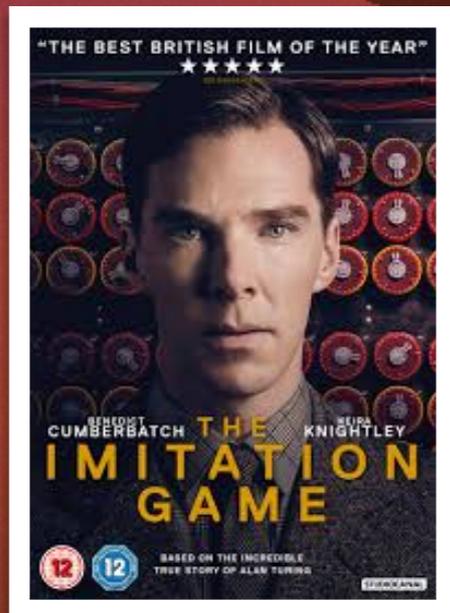




## I.3 Informatique

### I Origines ?

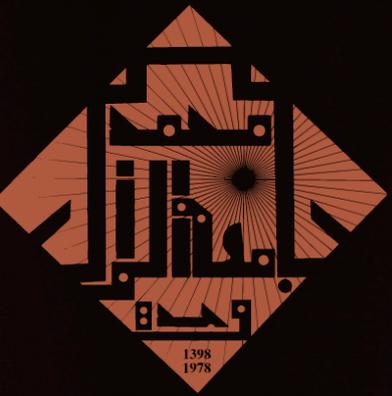
#### Alan Turing (1954)



Toutes les questions peuvent être décomposées en opérations simples =  
**algorithme**

Cardon, 2019





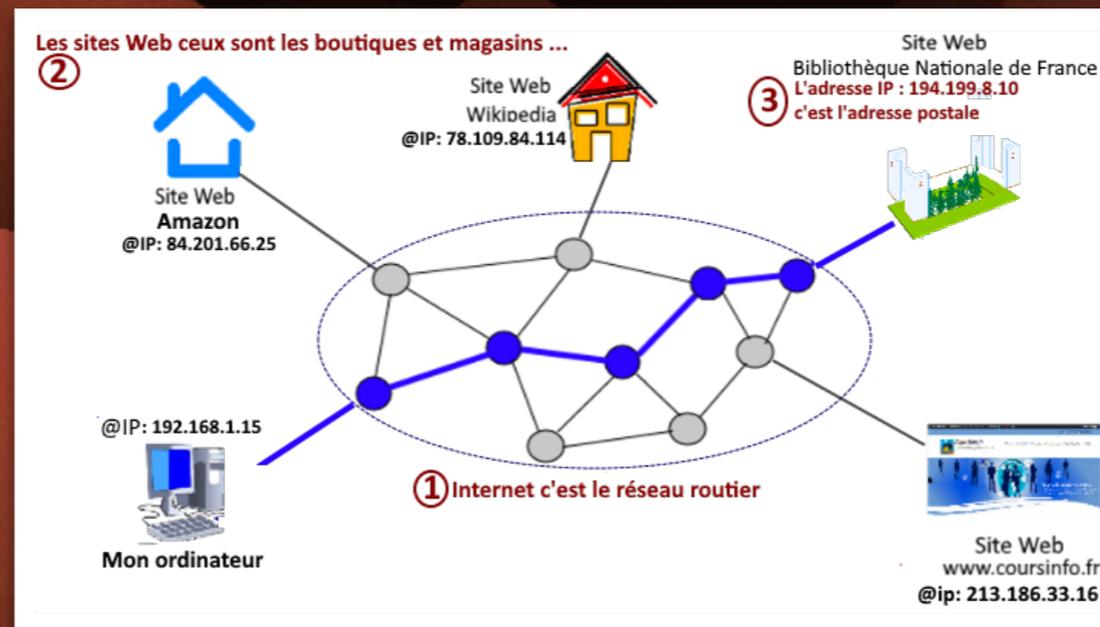
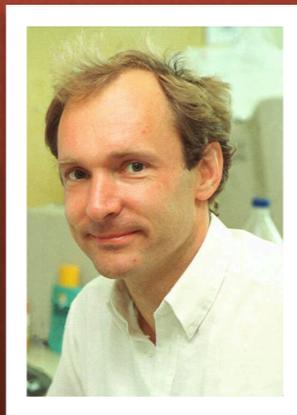
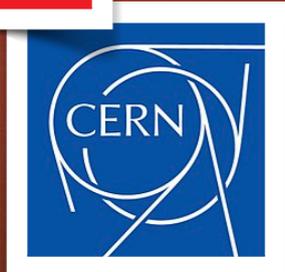
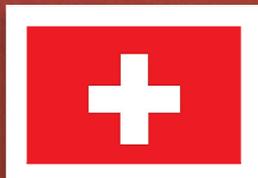
## I.3 Le Web et Internet

### Origines ?

Web  
1990

<http://www>.

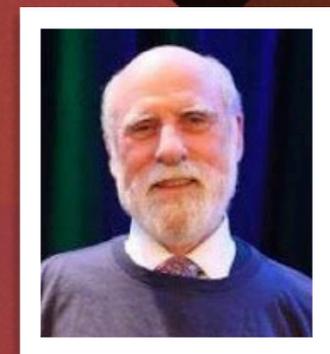
Tim Berners-Lee



Transmission  
Control Protocol  
Protocol  
**TCP/IP**  
Internet Protocol

Internet  
1960-1983

Vint Cerf



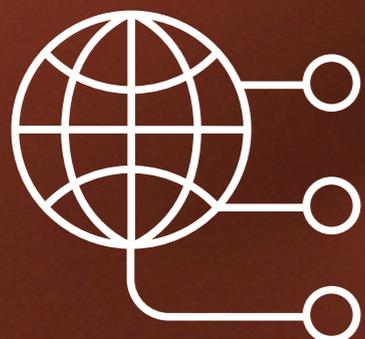
DARPA  
(Defense  
Advanced  
Research  
Projects  
Agency)

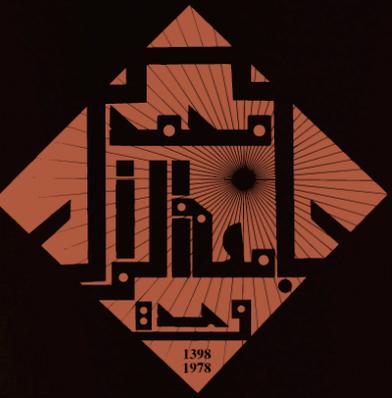
Internet, c'est ce qui relie (routes)

Le Web, c'est ce qui est relié  
(sites, personnes, firmes,...)

Cardon, 2019

# Internet ce n'est pas le Web





# L'innovation à l'ère du Numérique

*Aujourd'hui*

1

2

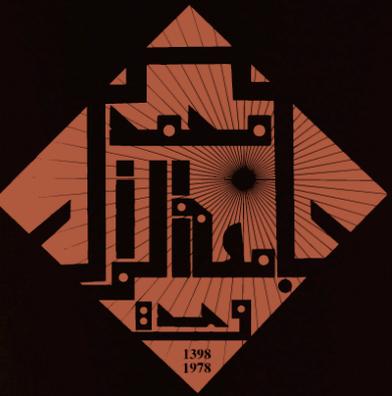
3

4

5

6





# L'innovation à l'ère du Numérique

Bruno De Lievre

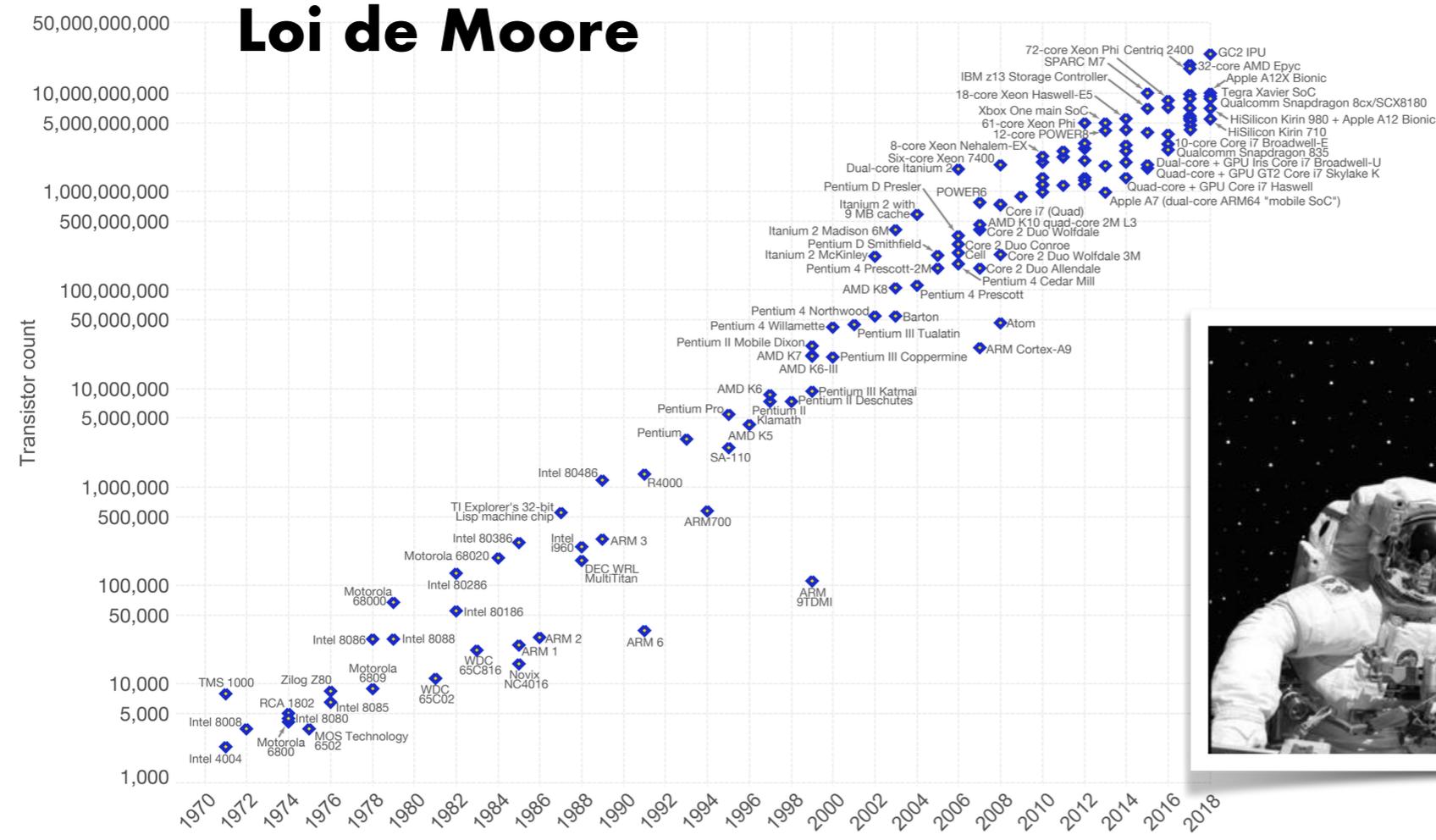
2

## Aujourd'hui

## 2.1 La Puissance

### Moore's Law – The number of transistors on integrated circuit chips (1971-2018)

Moore's law describes the empirical regularity that the number of transistors on integrated circuits doubles approximately every two years. This advancement is important as other aspects of technological progress – such as processing speed or the price of electronic products – are linked to Moore's law.

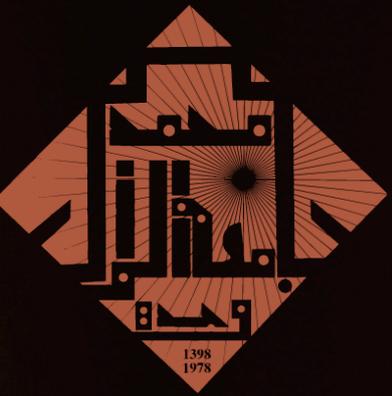


**Le nombre de transistors double tous les 2 ans (la puissance augmente - la taille diminue)**



Data source: Wikipedia ([https://en.wikipedia.org/wiki/Transistor\\_count](https://en.wikipedia.org/wiki/Transistor_count))  
The data visualization is available at [OurWorldinData.org](https://www.ourworldindata.org). There you find more visualizations and research on this topic.

Licensed under CC-BY-SA by the author Max Roser.



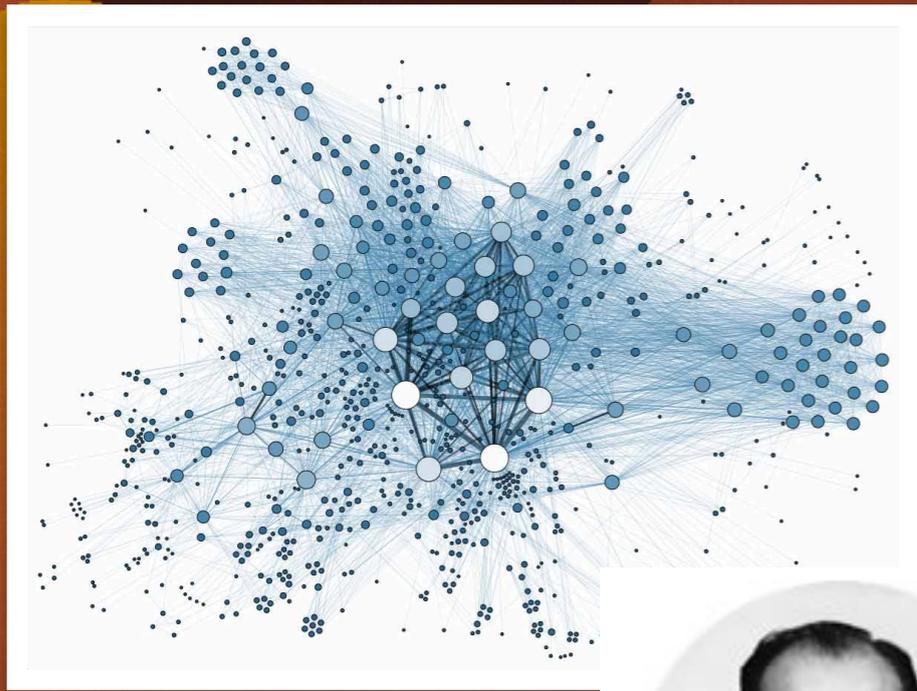
# L'innovation à l'ère du Numérique

Bruno De Lièvre

2

Aujourd'hui

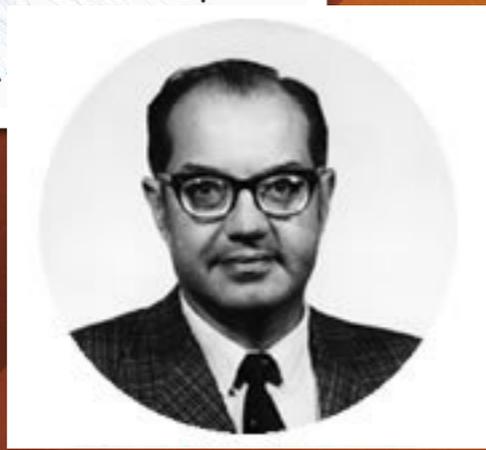
2.2 Les réseaux



Téléphonie

Internet

Intelligent à la périphérie



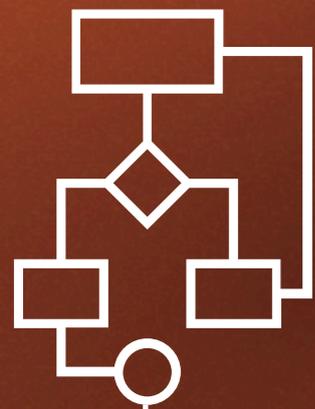
Paul Baran (1962)

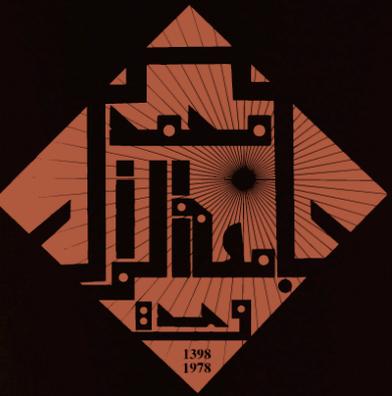
**TYPES OF NETWORKS**

CENTRALIZED	DECENTRALIZED	DISTRIBUTED

Reproduction of an original figure in "On Distributed Communication Networks" by Paul Baran

Center for Global Development

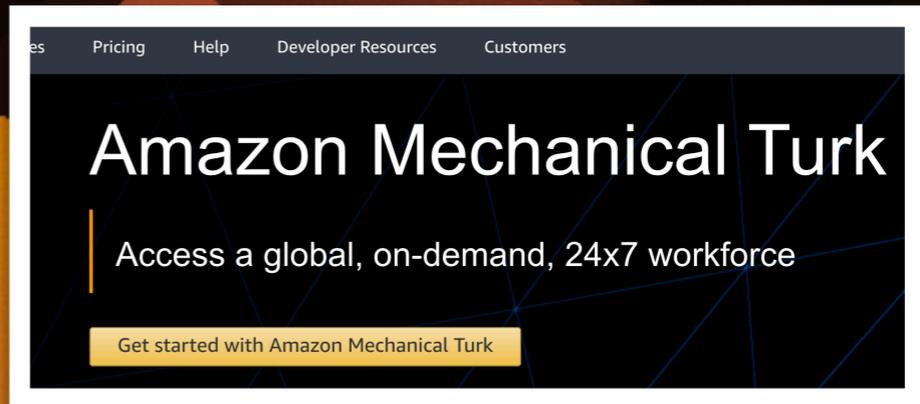
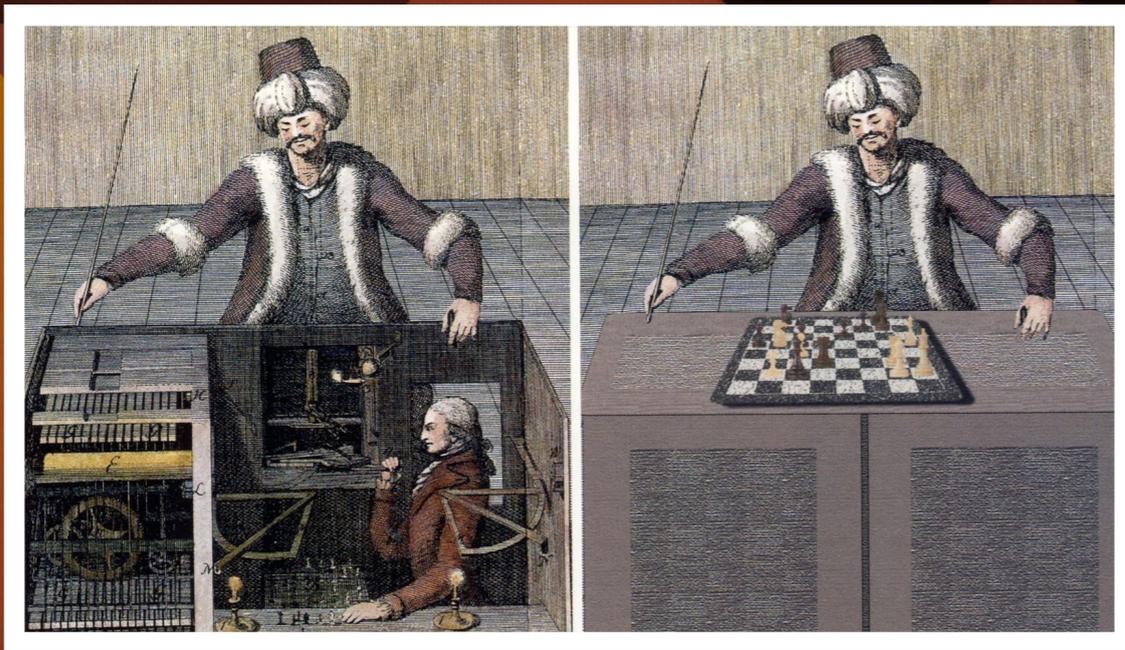




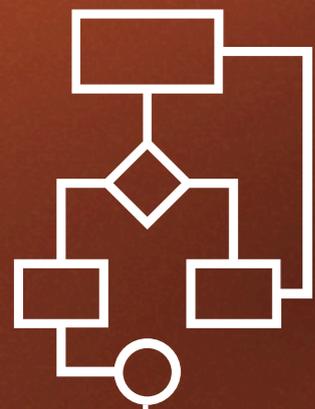
2

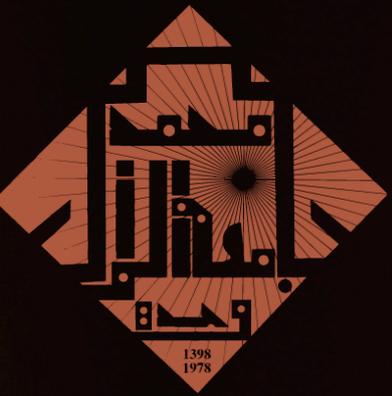
Aujourd'hui

2.3 Le Travail



## Digital Labor





2

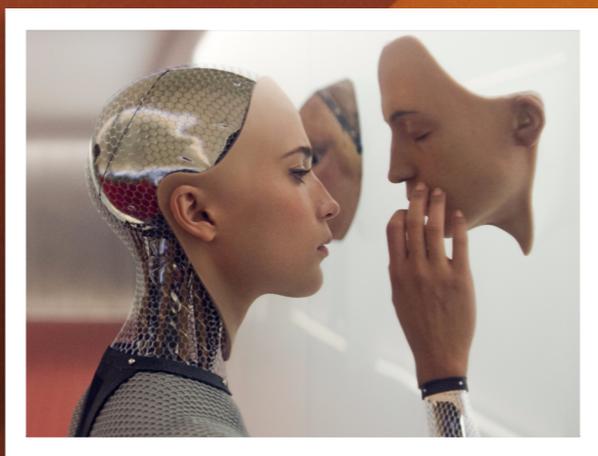
# Aujourd'hui

## 2.4 L'Intelligence artificielle

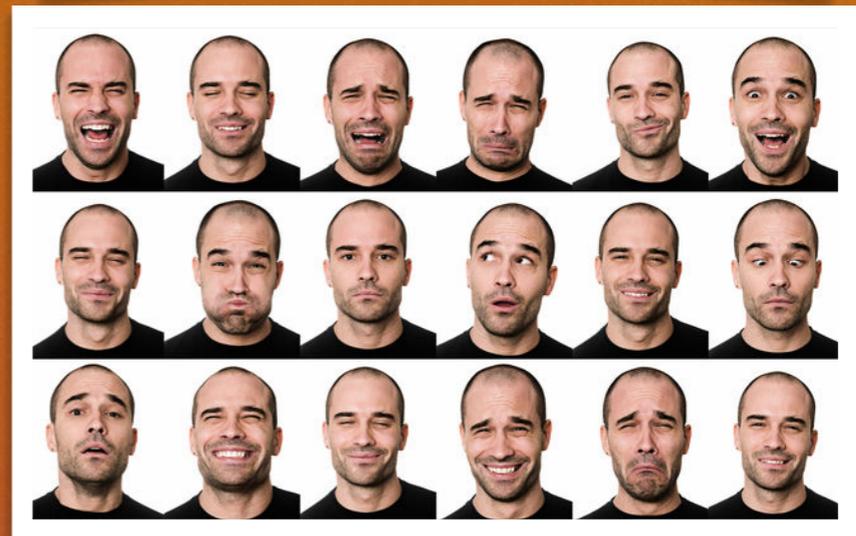
Stade 1 : Réactivité



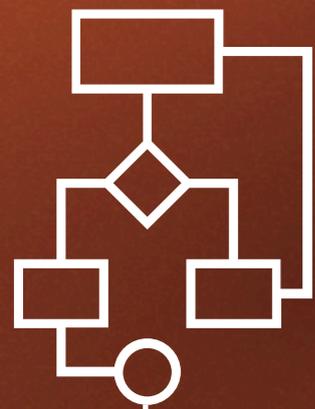
Stade 2 : Mémoire limitée

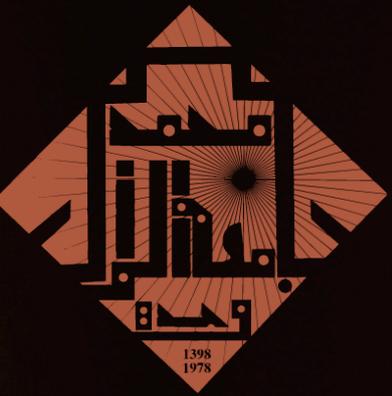


Stade 4 : Auto-conscience



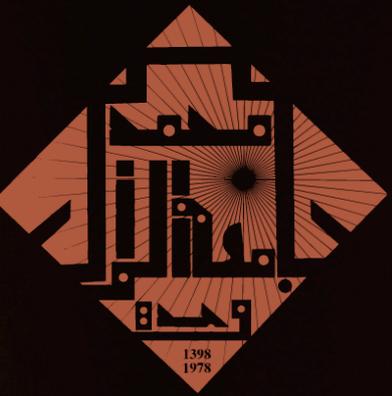
Stade 3 : Théorie de l'esprit





# L'innovation à l'ère du Numérique





3

## Le numérique ?

## 3.1 ou la Culture numérique ?

De Lièvre & Temperman, 16

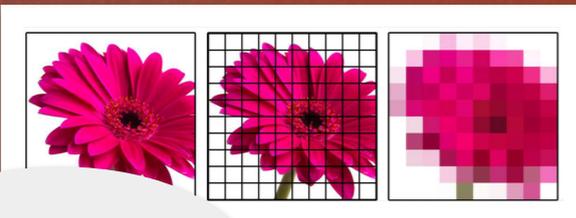


TIC



TIC E

Ecole



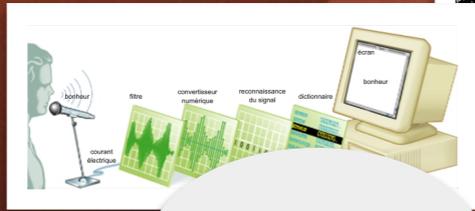
Numérique



Internet



Programmer



Informatique



IA

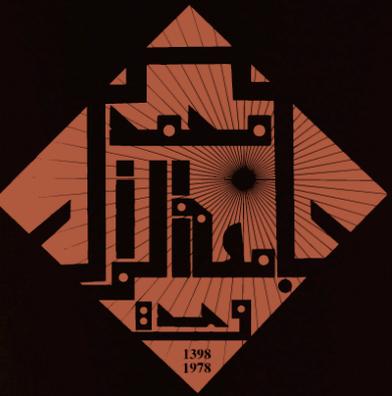


Société

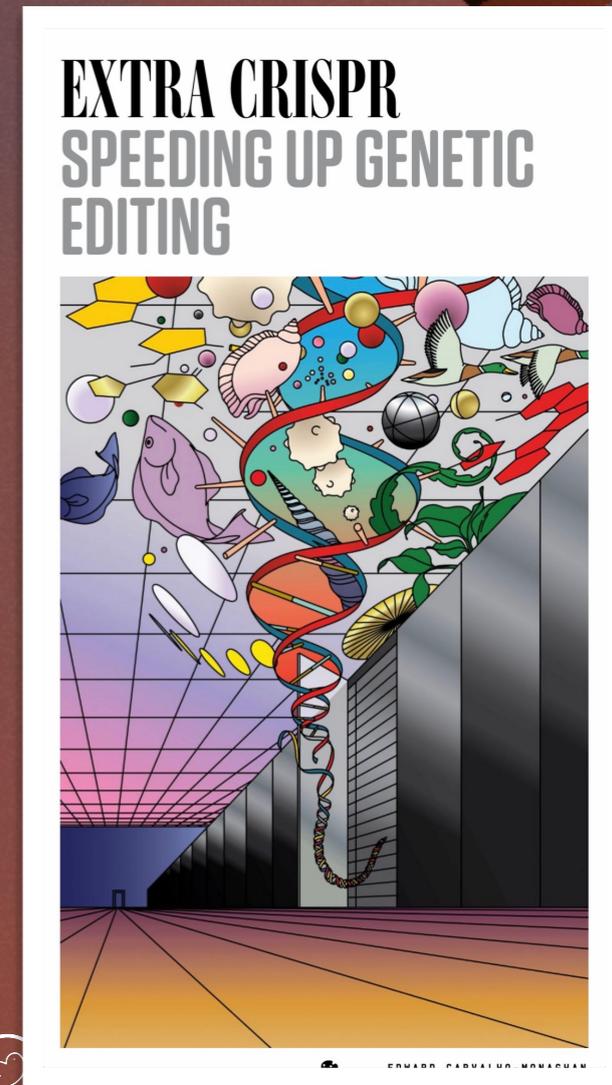
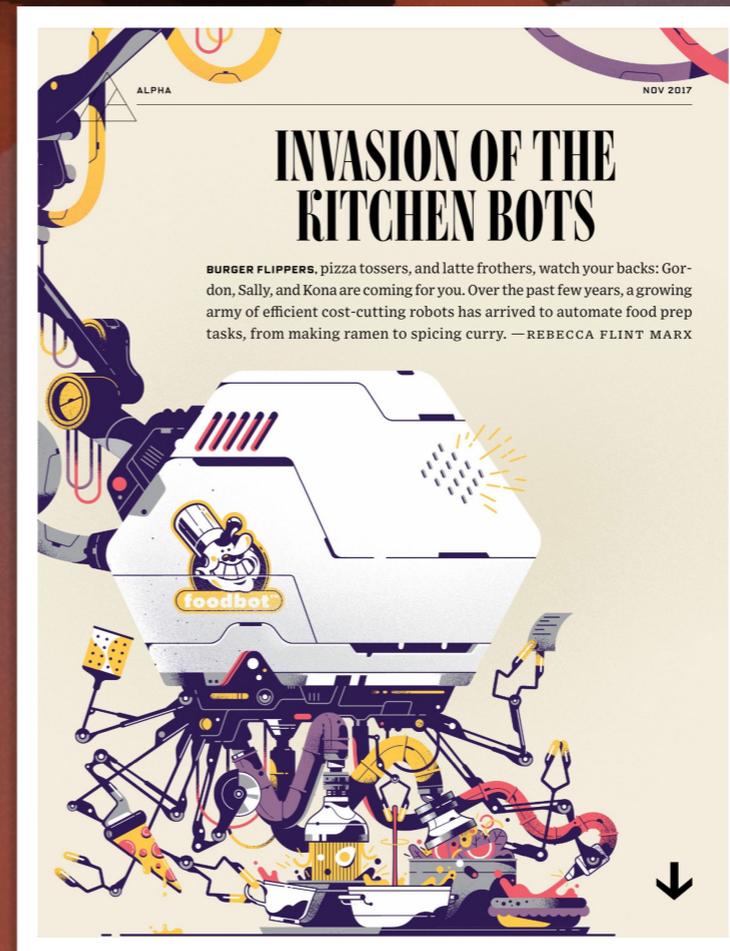
Culture Évolution

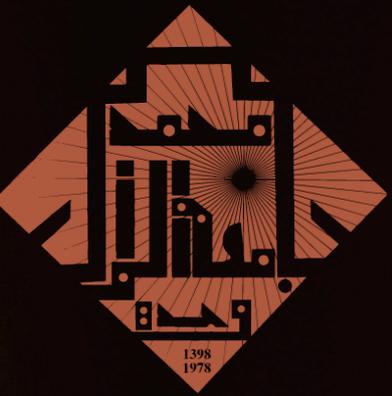
« Numérique »





## 3 La culture numérique 3.2 ...est pervasive





3

La culture numérique

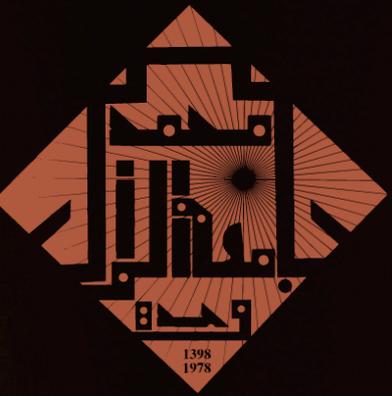
3.3 Pharmakon



*Dans toute technologie, il y a simultanément deux tendances opposées, l'une est bonne, positive, émancipatrice et l'autre négative, prédatrice.*

Stiegler, 14





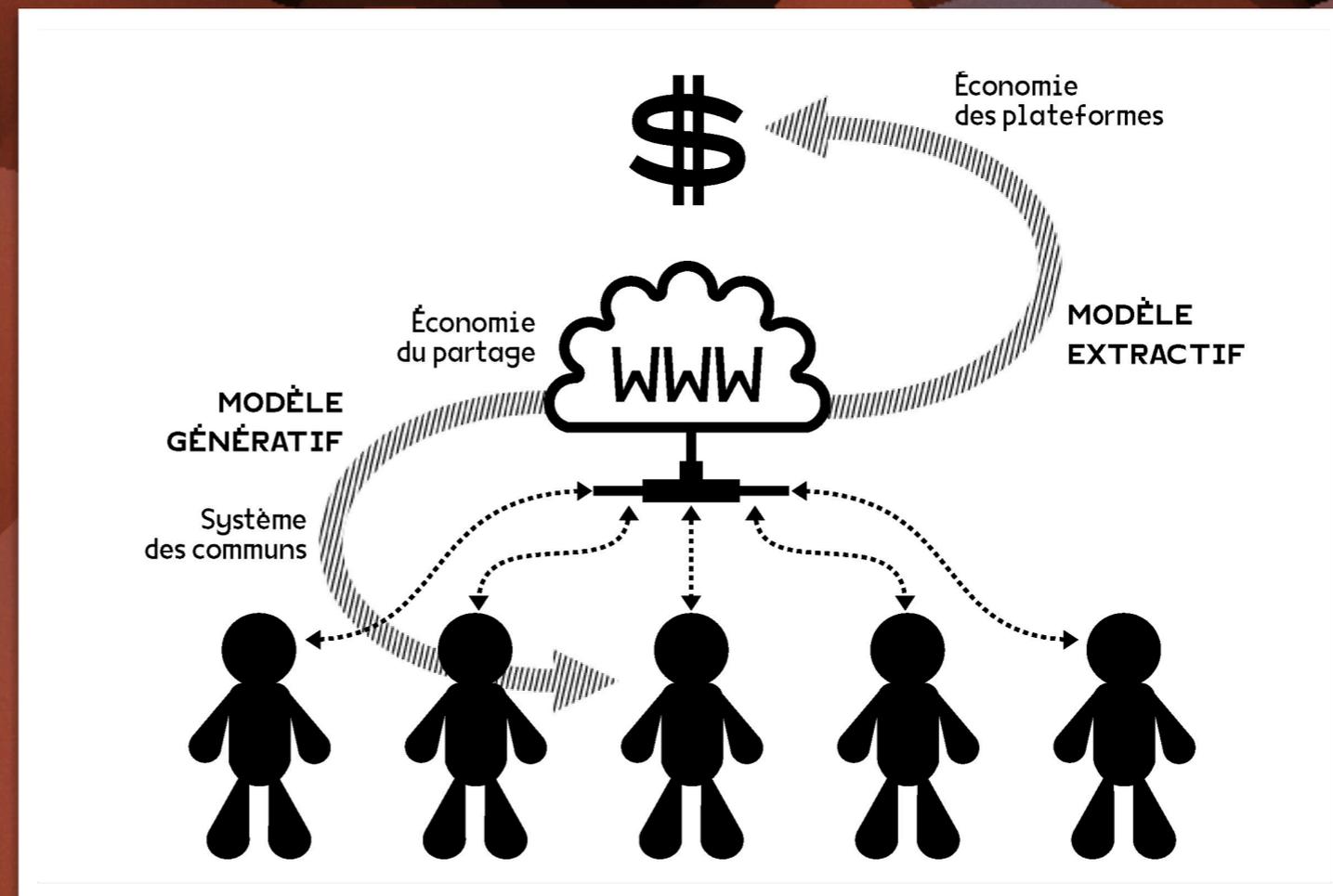
## 3 La culture numérique

### 3.4 Valeur rendue ou capturée



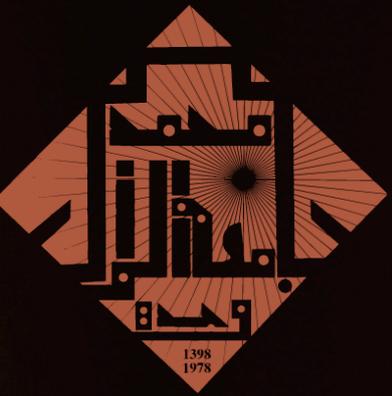
« Si vous avez du pain, et si moi j'ai un euro, si je vous achète le pain, j'aurai le pain et vous aurez l'euro et vous voyez dans cet échange un équilibre, c'est-à-dire : A a un euro, B a un pain. Et dans l'autre cas B a le pain et A a l'euro. Donc, c'est un équilibre parfait. Mais, si vous avez un sonnet de Verlaine, ou le théorème de Pythagore, et que moi je n'ai rien, et si vous me les enseignez, à la fin de ce échange-là, j'aurai le sonnet et le théorème, mais vous les aurez gardés. Dans le premier cas, il y a un équilibre, c'est la marchandise, dans le second il y a accroissement, c'est la culture.»  
Michel Serres

Serres, 13



Cardon, 19



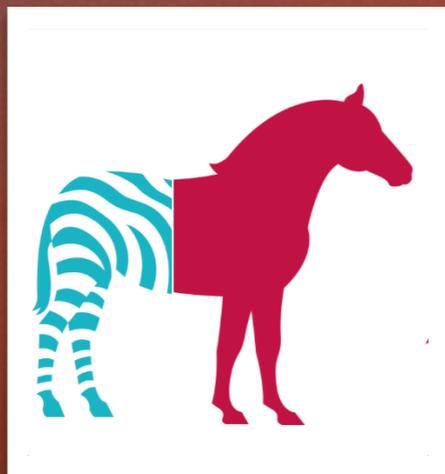
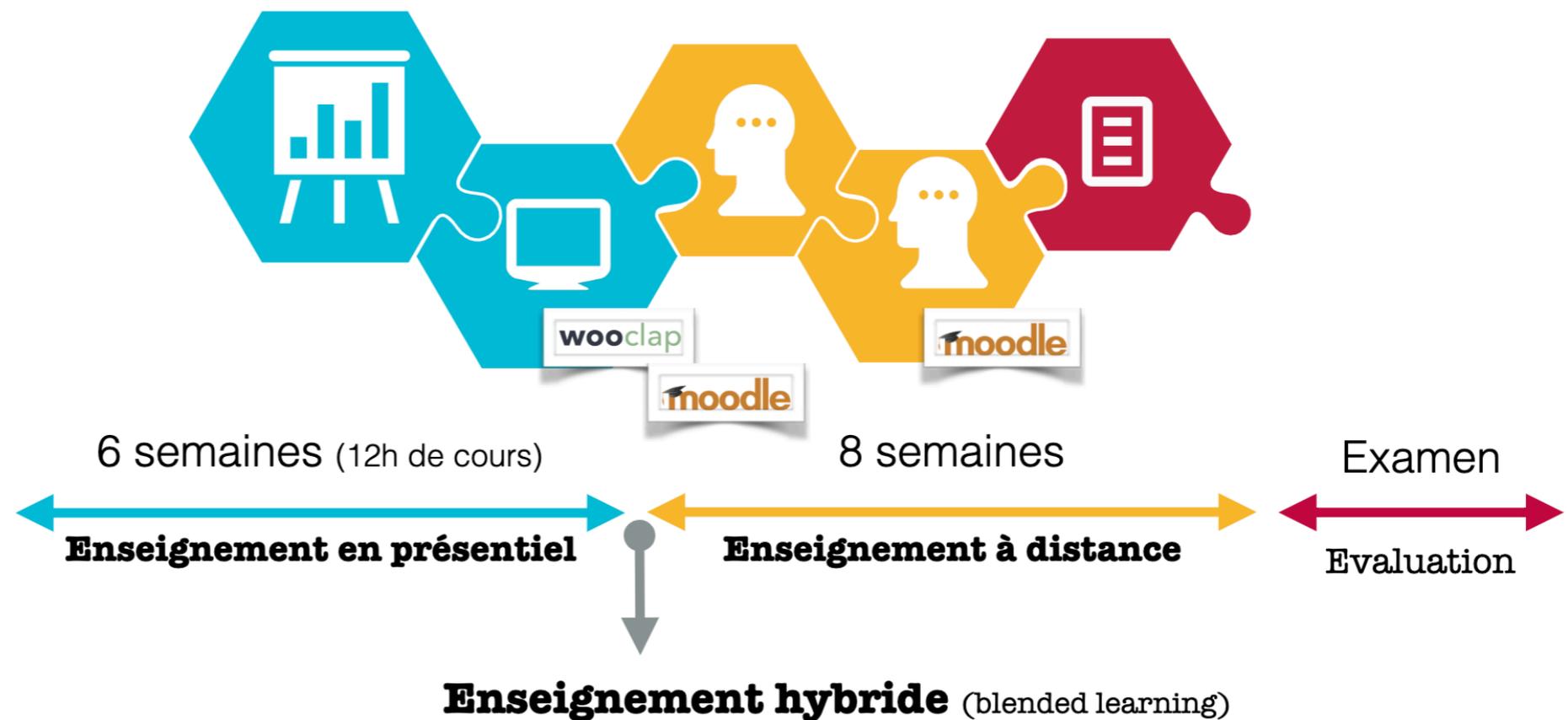


## 3 La culture numérique

### 3.5 ...et le lien social ?

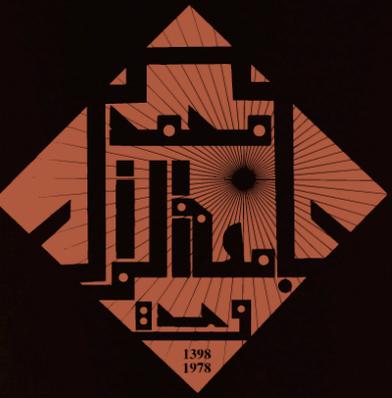
#### Mise en application d'une hybridation de MOOC

*Boumazguida, Kumps et al. (2019)*



Boumazguida, 2017





# L'innovation à l'ère du Numérique

1

2

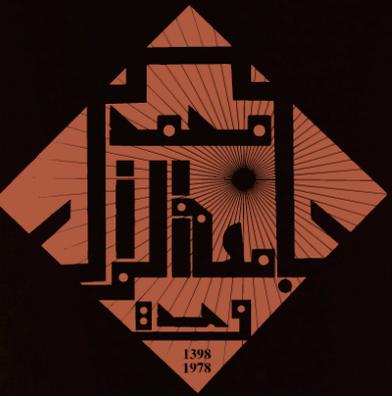
3

4 *Innovation ?*

5

6

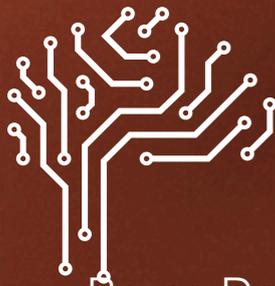
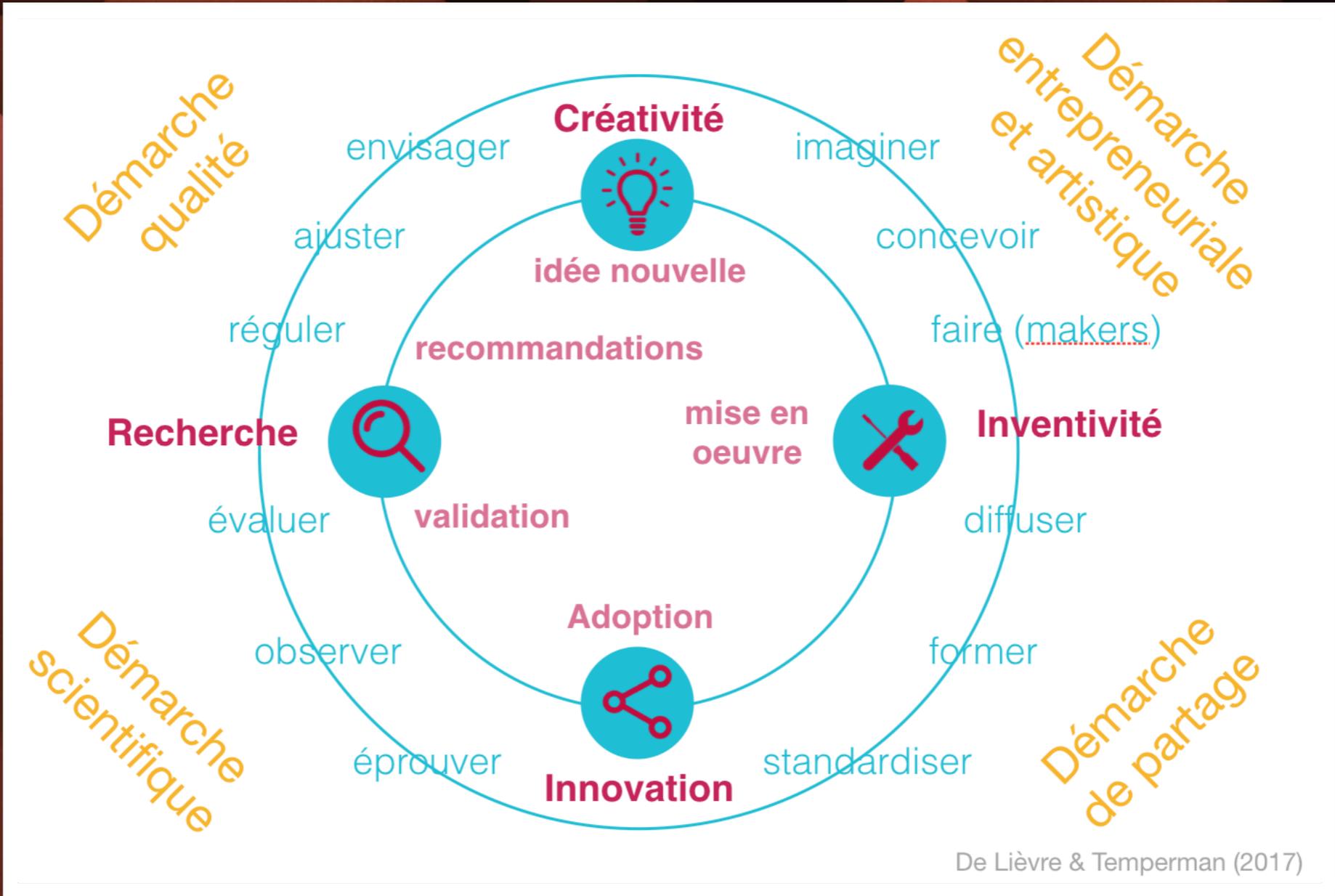


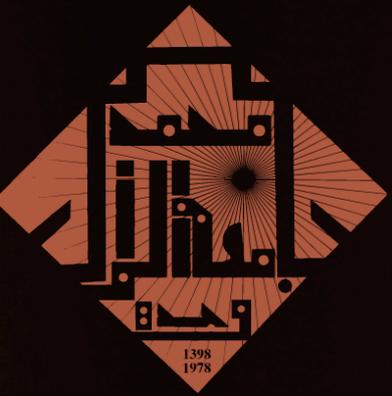


4

## L'innovation

### 4.1 Créativité % Innovation

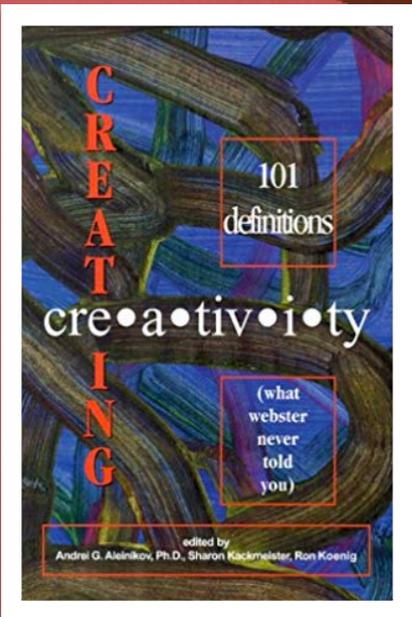




4

## Créativité

### 4.2 Définition - Modèles



**Caractéristique  
Personnelle**

Général



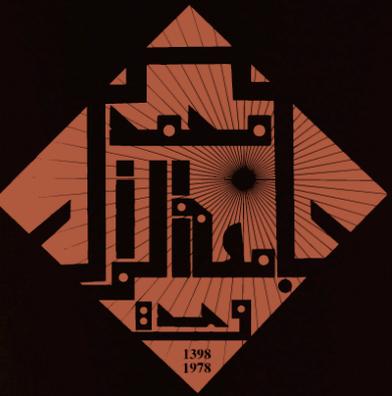
**Spontané**



**Guidé par une  
question**

Spécifique

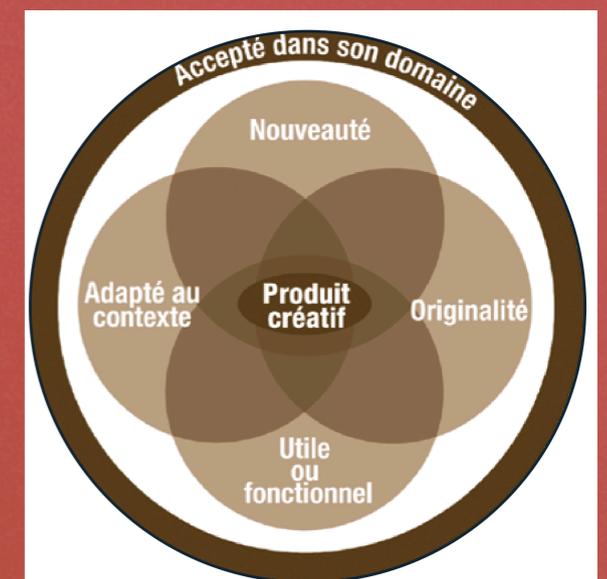
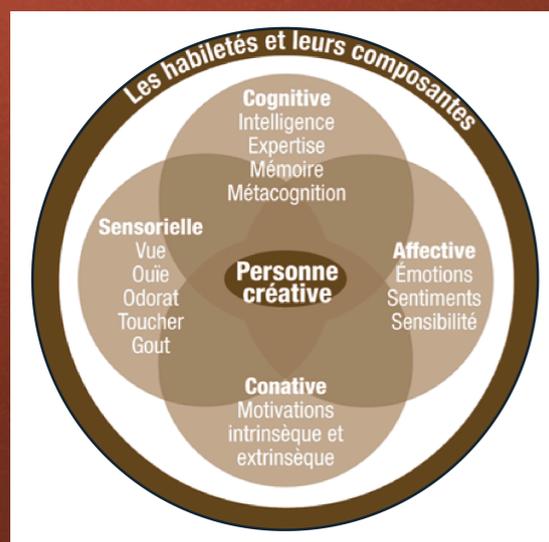
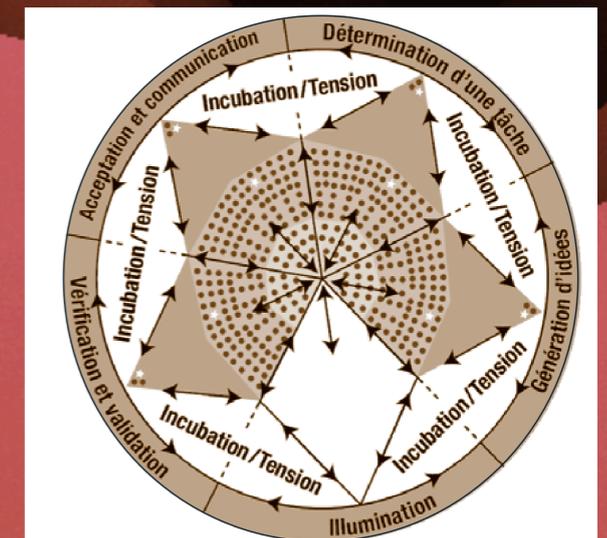
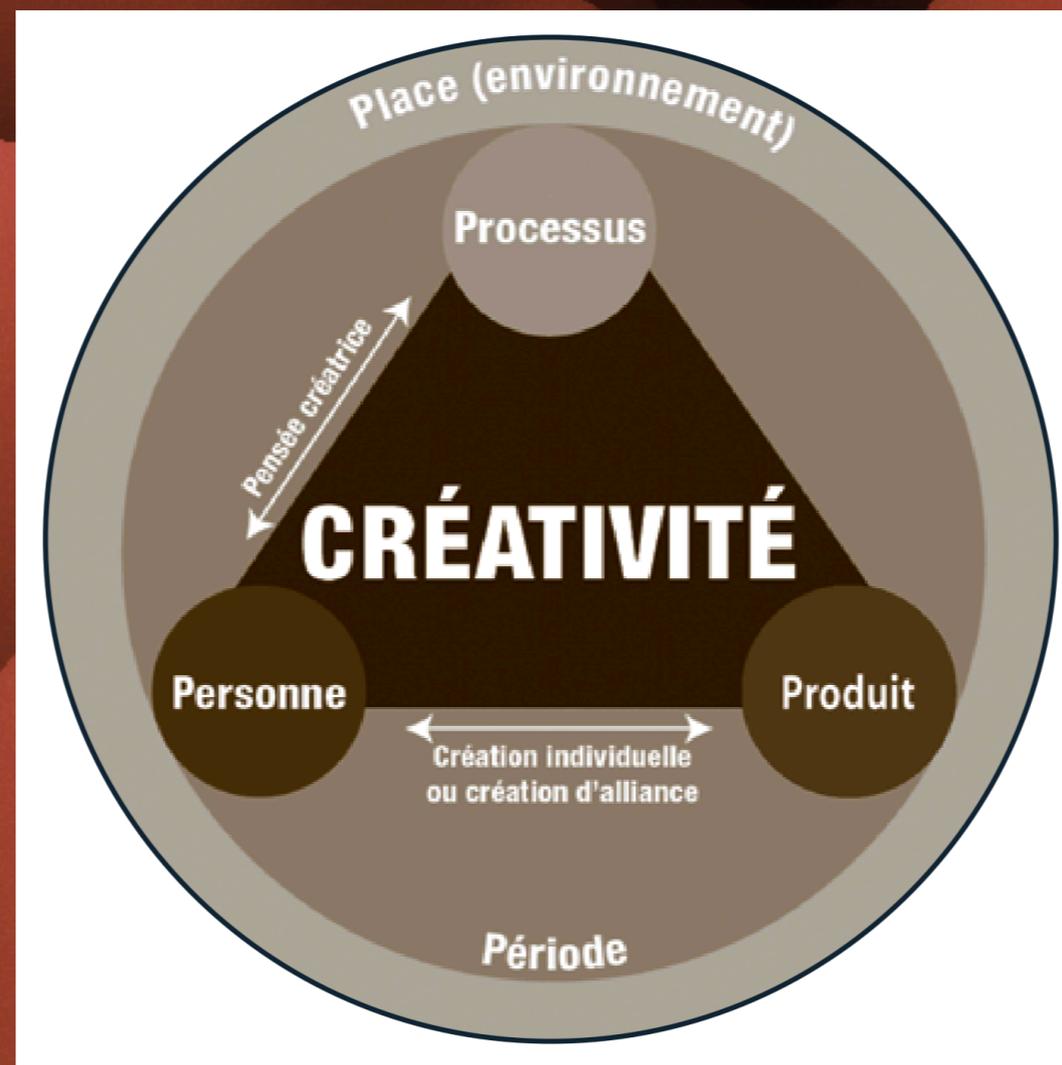




4

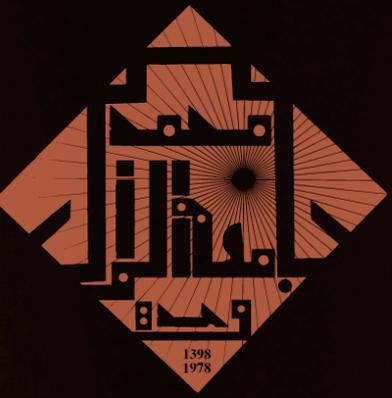
## Créativité

### 4.2 Définition - Modèles



Filteau, 2012

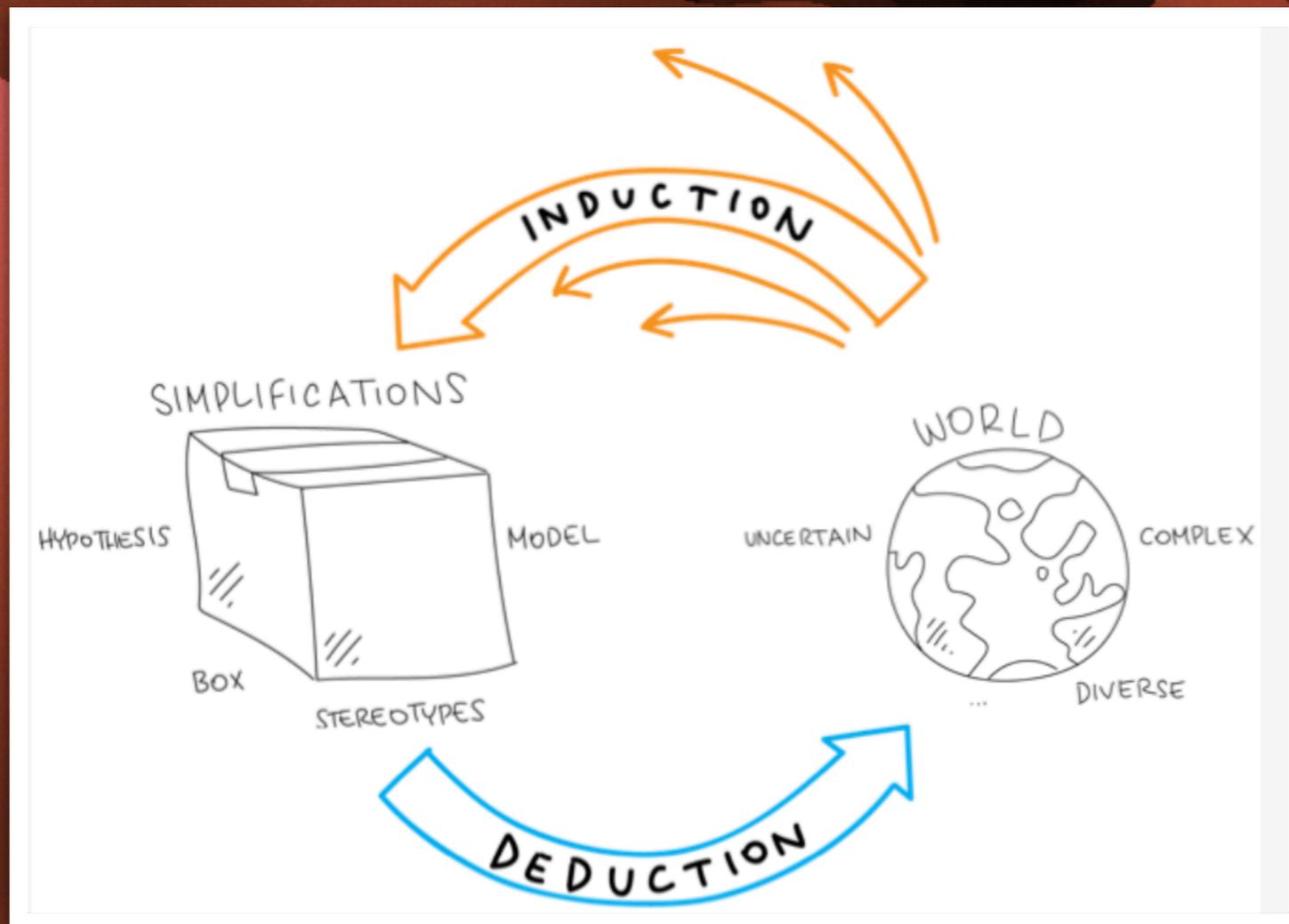




4

## Innovation

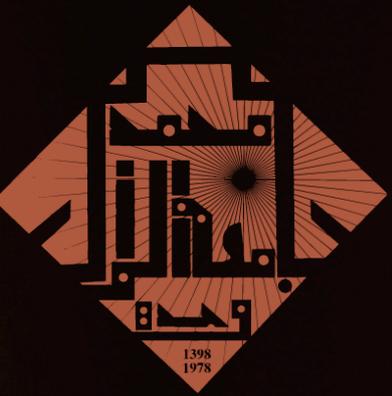
### 4.3 Divergence - Convergence



**Penser :**  
**Perception**  
**simplifiée**

**Créer :**  
**Changer de**  
**perception**

De Brabandere, 2018



4

## Innovation

### 4.3 Divergence - Convergence

#### Les trois systèmes cognitifs

##### Systeme heuristique

Pensée «automatique»  
et intuitive

Fiabilité  Rapidité 



1

##### Systeme d'inhibition

Interrompt le système  
heuristique pour activer  
celui des algorithmes

→ Fonction d'arbitrage

3

##### Systeme algorithmique

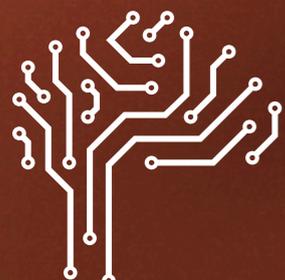
Pensée réfléchie  
«logico-mathématique»

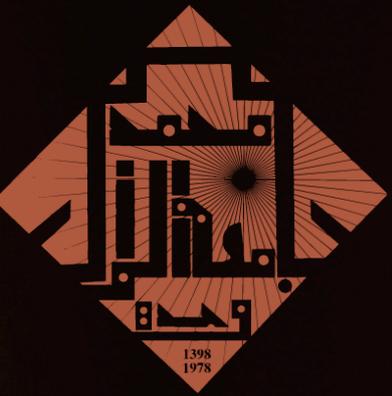
Fiabilité  Rapidité 



2

Houdé, 2016



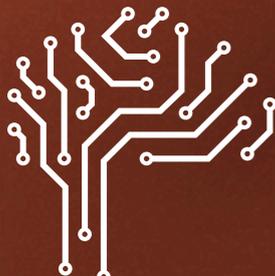
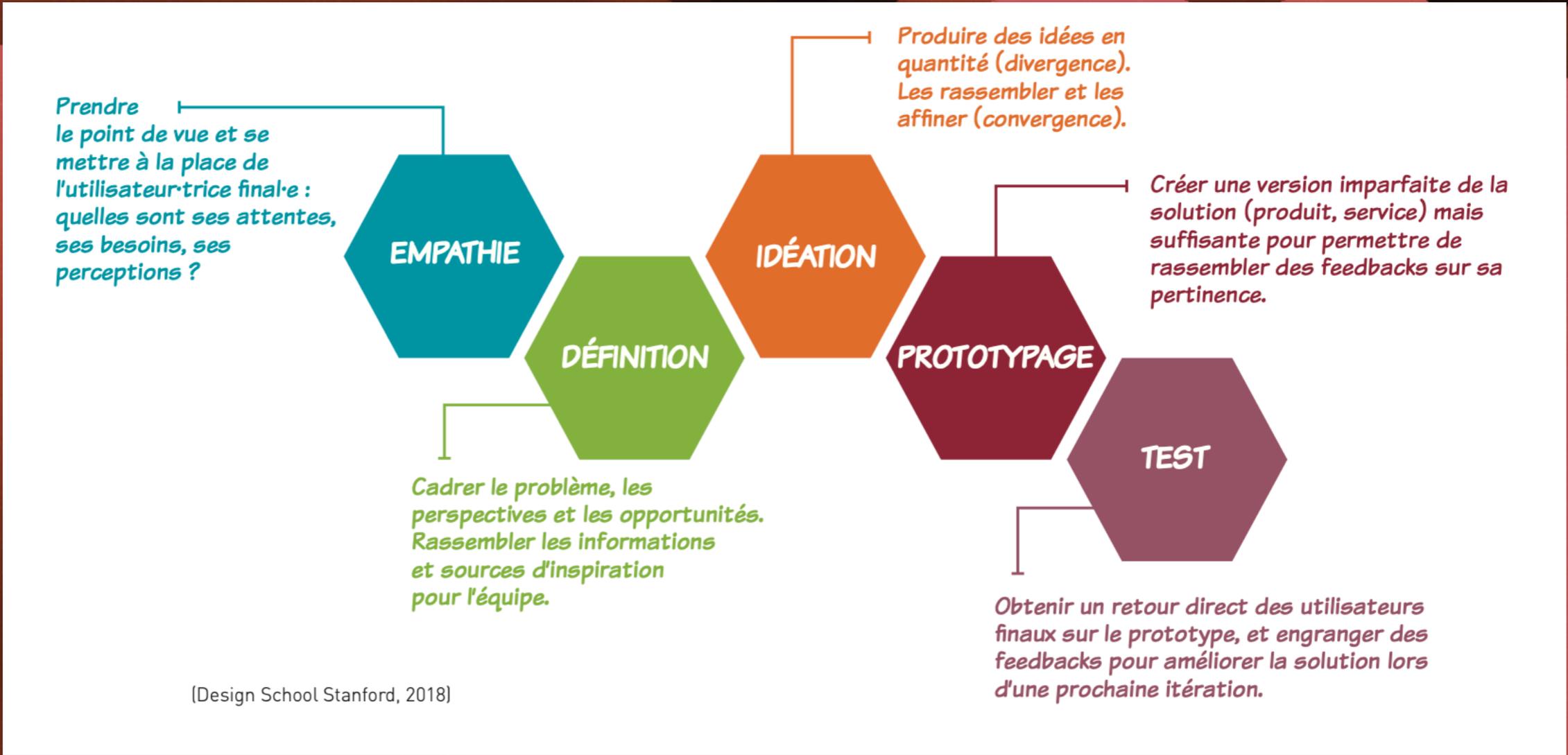


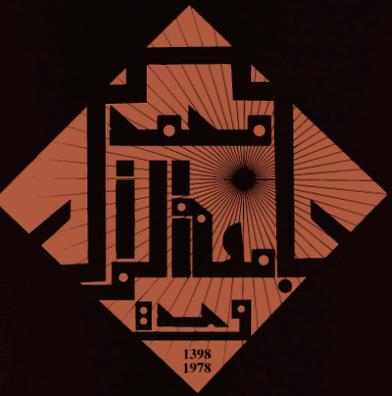
4

## Innovation

### 4.4 Design Thinking

Louvain Learning Lab, 2019





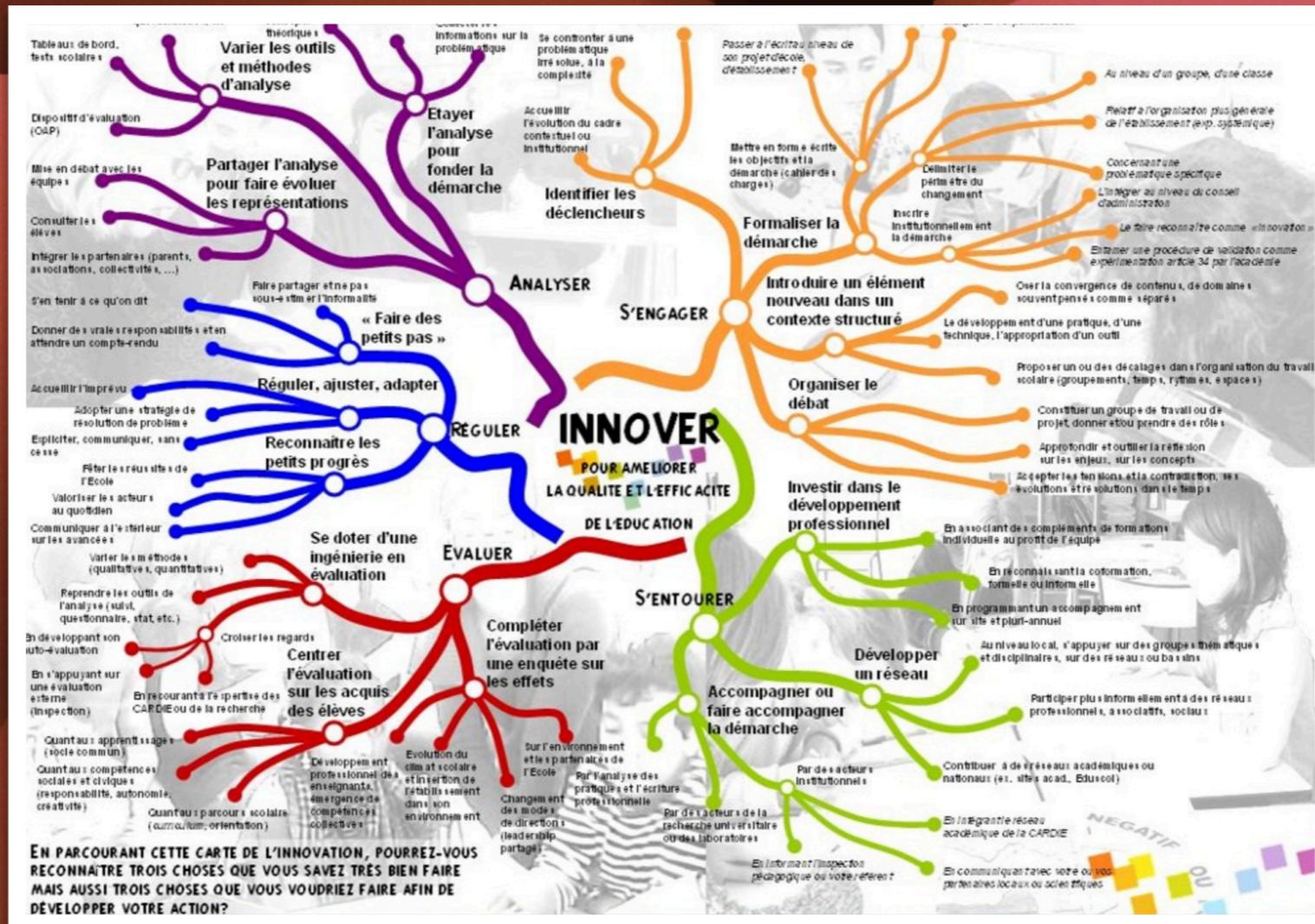
# L'innovation à l'ère du Numérique

Bruno De Lièvre

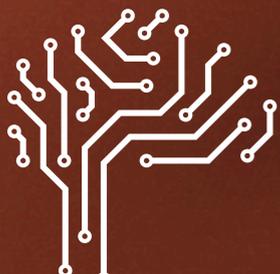
4

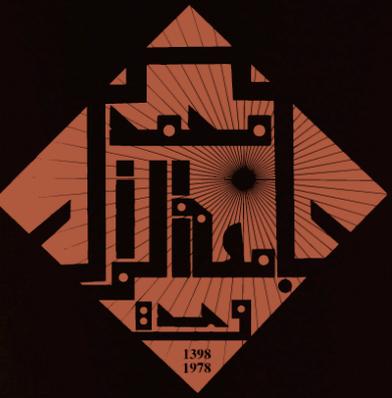
## Innovation

### 4.5 Pratiques créatives en ligne



Muller, 2014





# L'innovation à l'ère du Numérique

1

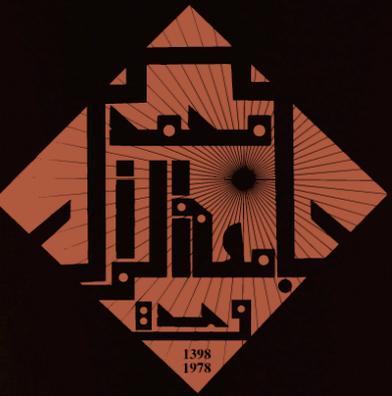
2

3

4

5 *Modèle de l'Innovation Technopédagogique*

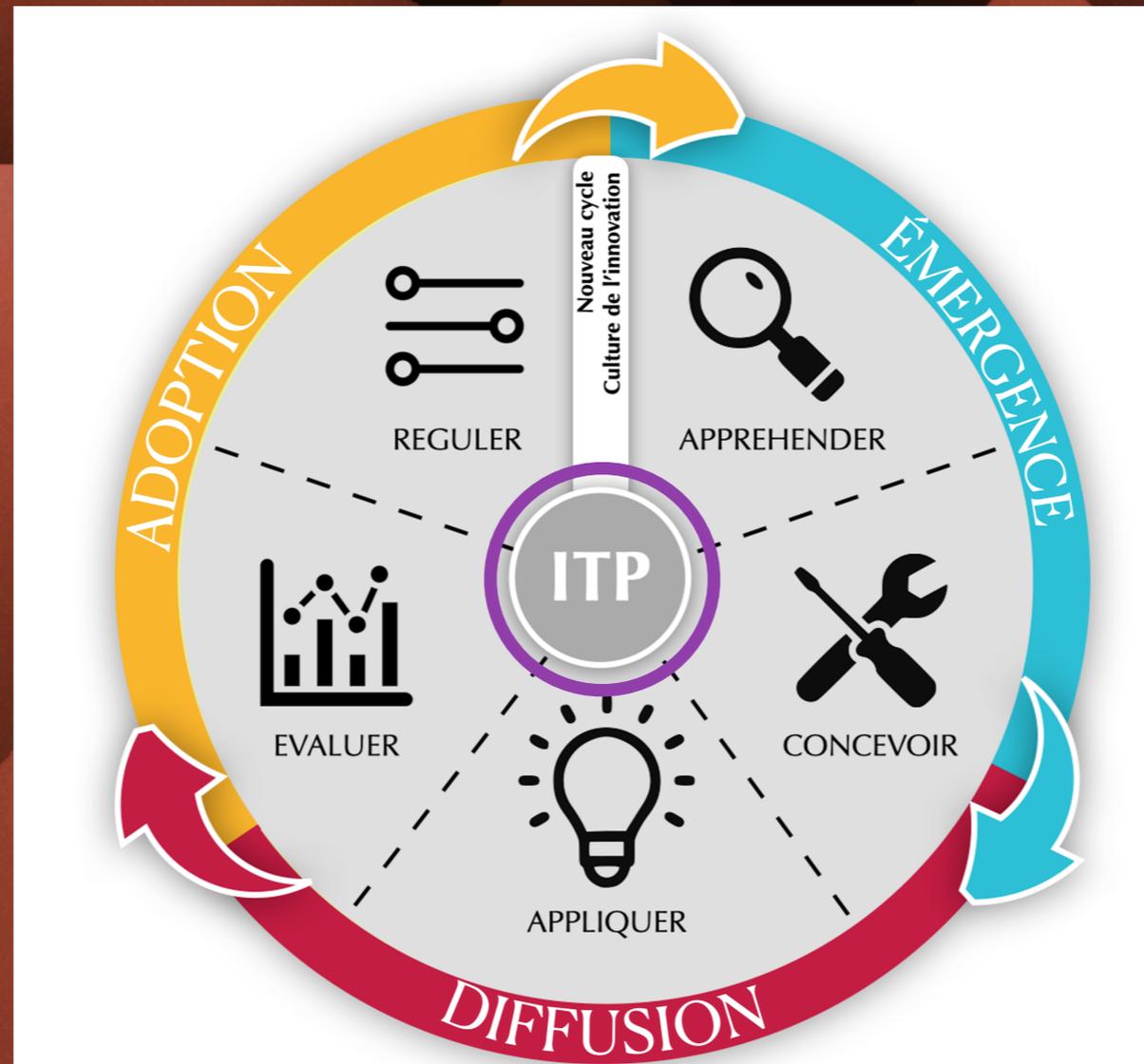
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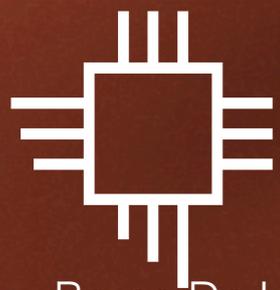
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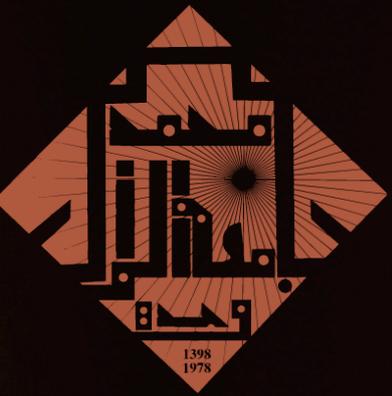
## Modèle de l'Innovation

## Technopédagogique



Housni & al., 2022





# L'innovation à l'ère du Numérique

1

2

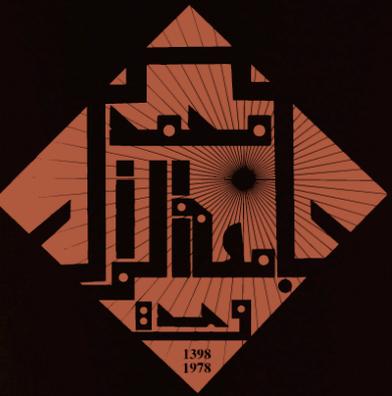
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4

5

6

*Perspectives ?*



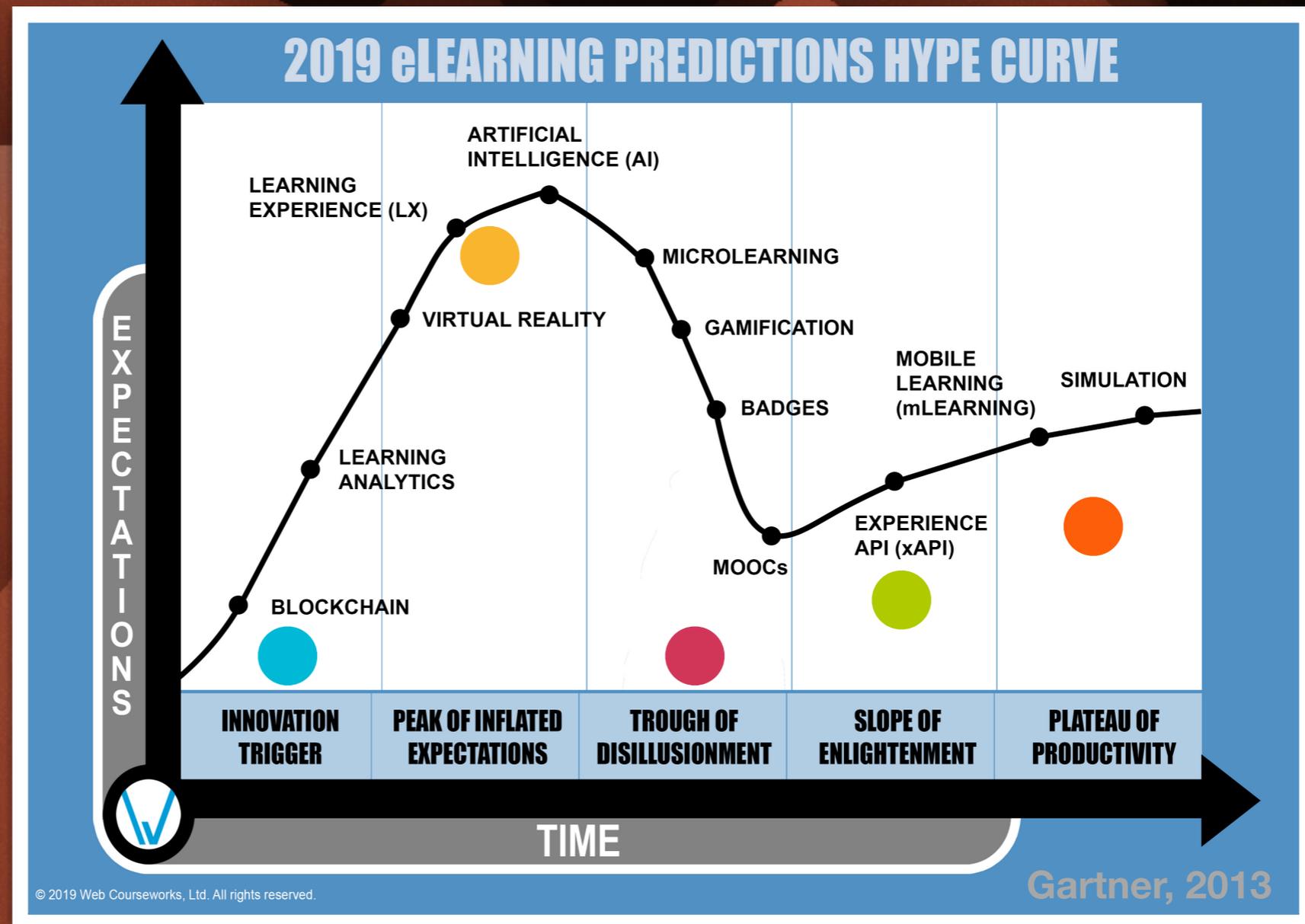
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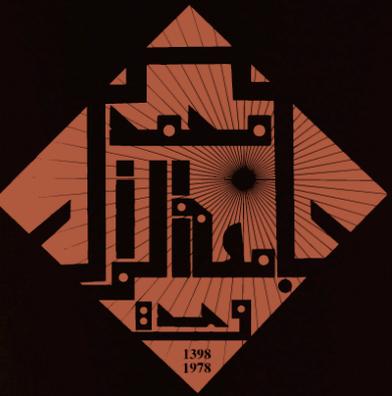
## Perspectives

### 6.1 Hype Curve (Gartner)

REGULATION  
PROGRESSIVE

DES  
INNOVATIONS



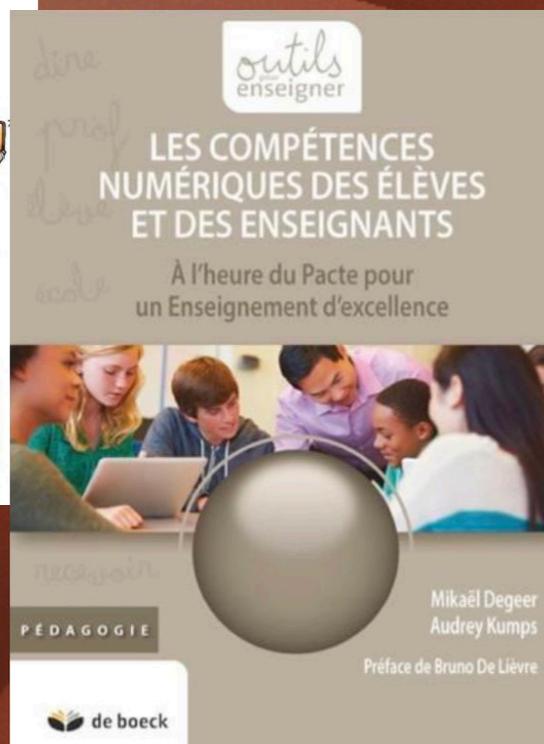
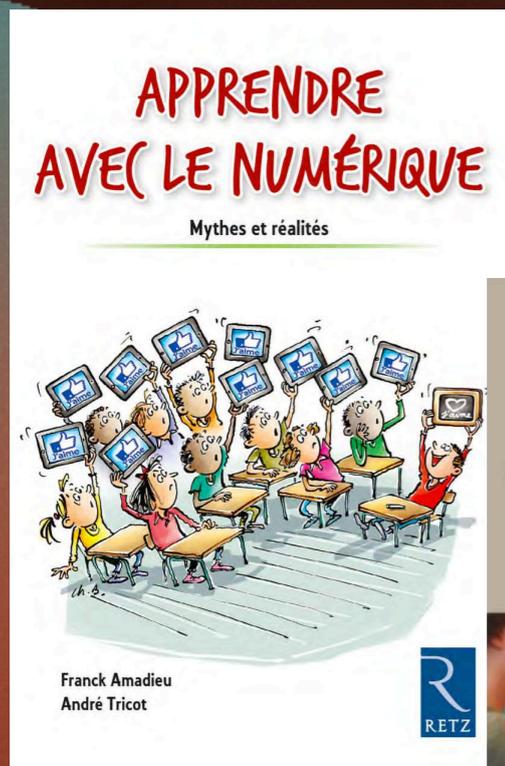


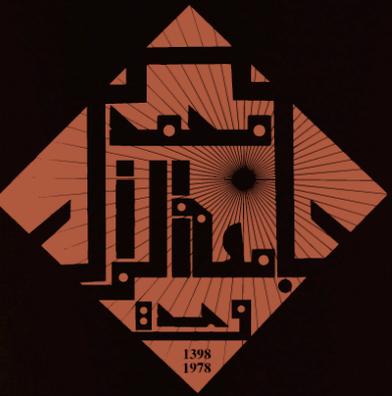
6

## Perspectives

### 6.2 Pas de la magie

Un moyen  
d'apprentissage  
Pas un miracle





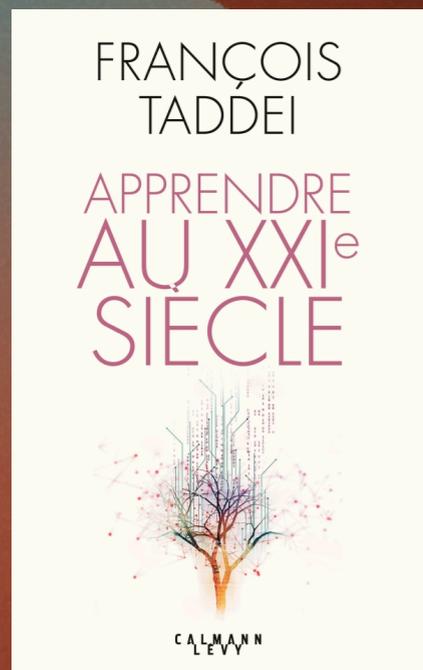
6

Perspectives

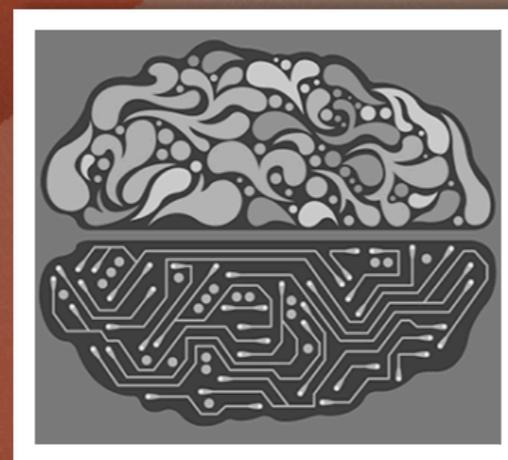
6.3 Complémentarité

Intelligence collective ?

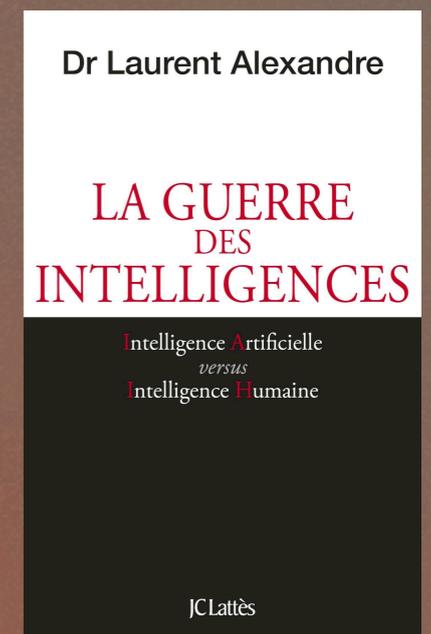
Intelligence artificielle ?



Humaine

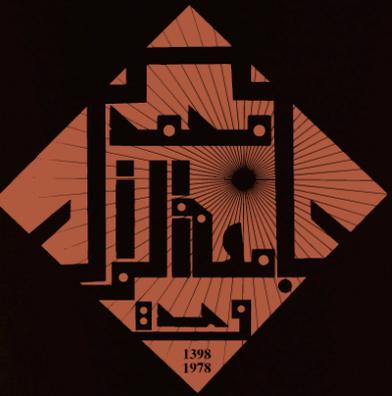


Numérique



Complémentarité !!





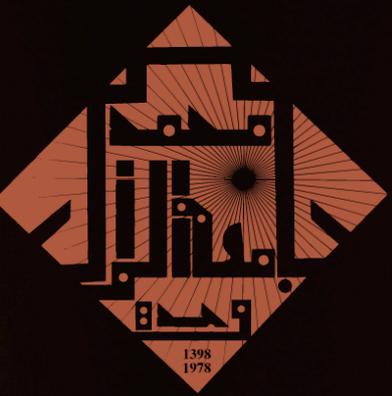
6

## Perspectives

### 6.4 L'Education numérique

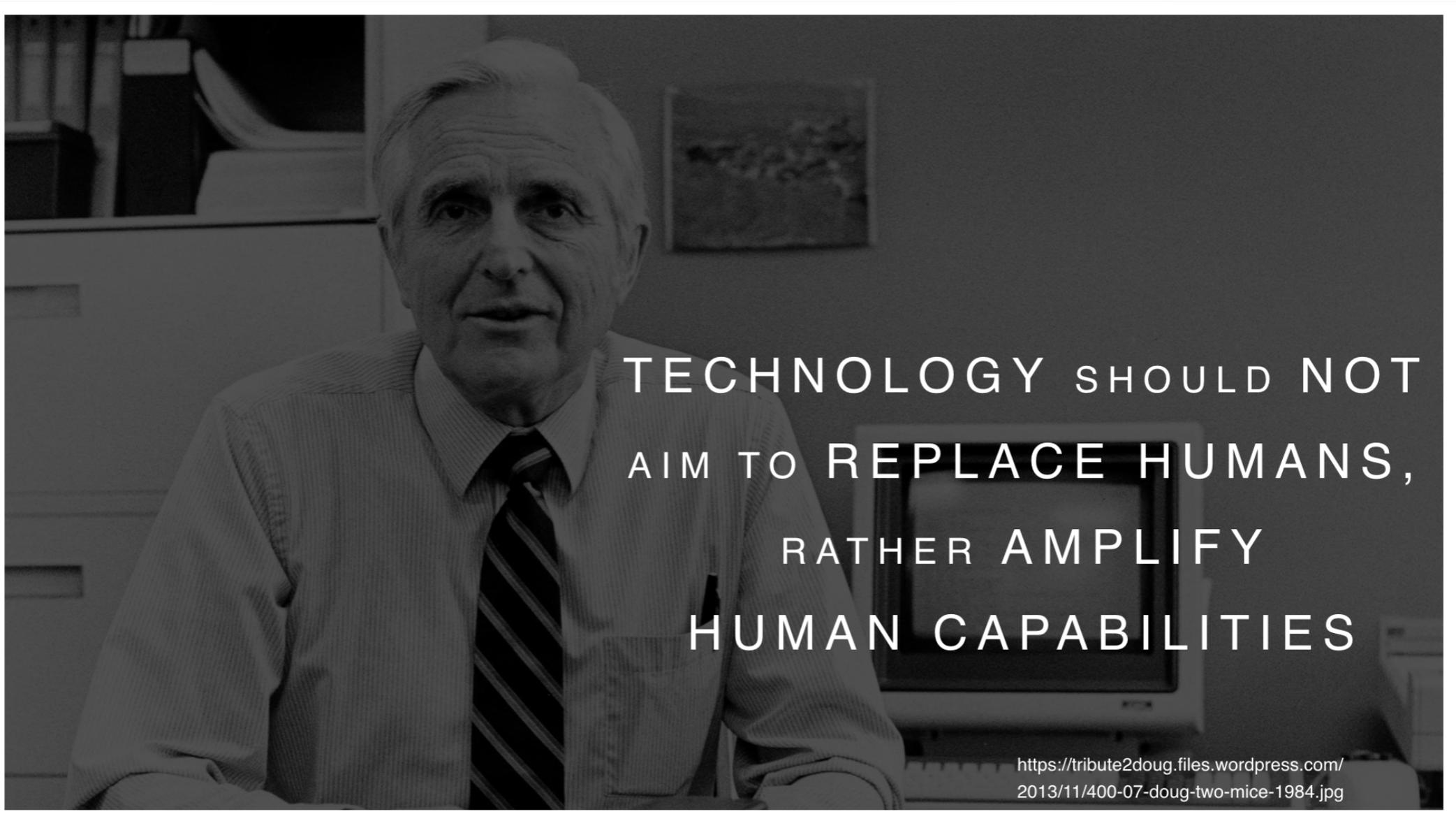
**Si le monde de l'éducation ne s'empare pas de la question, d'autres le feront (l'ont déjà fait ;-)**





# L'innovation à l'ère du Numérique

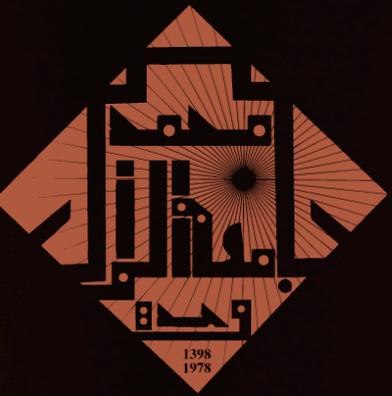
Bruno De Lièvre



TECHNOLOGY SHOULD NOT  
AIM TO REPLACE HUMANS,  
RATHER AMPLIFY  
HUMAN CAPABILITIES

<https://tribute2doug.files.wordpress.com/2013/11/400-07-doug-two-mice-1984.jpg>





# L'innovation à l'ère du Numérique

1 *Origines ?*

6 *Perspectives ?*

*Aujourd'hui* 2

5 *Modèle de l'Innovation  
Technopédagogique*

*Culture numérique* 3 **A vos questions !!**

4 *Innovation ?*