

Experimental approach in computer science research

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- AISSE
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Contains

- Research process ? Which one ?
- Specificities of Research in computer sciences
- Qualitative vs Quantitative approaches

- Research can be seen such as a process

Identify a problem

Explore related work

Identify a problem

Explore related work

Identify lacks

Identify a problem

Explore related work

Identify lacks

Propose an idea

Design & formalize
the idea

Identify a problem

Explore related work

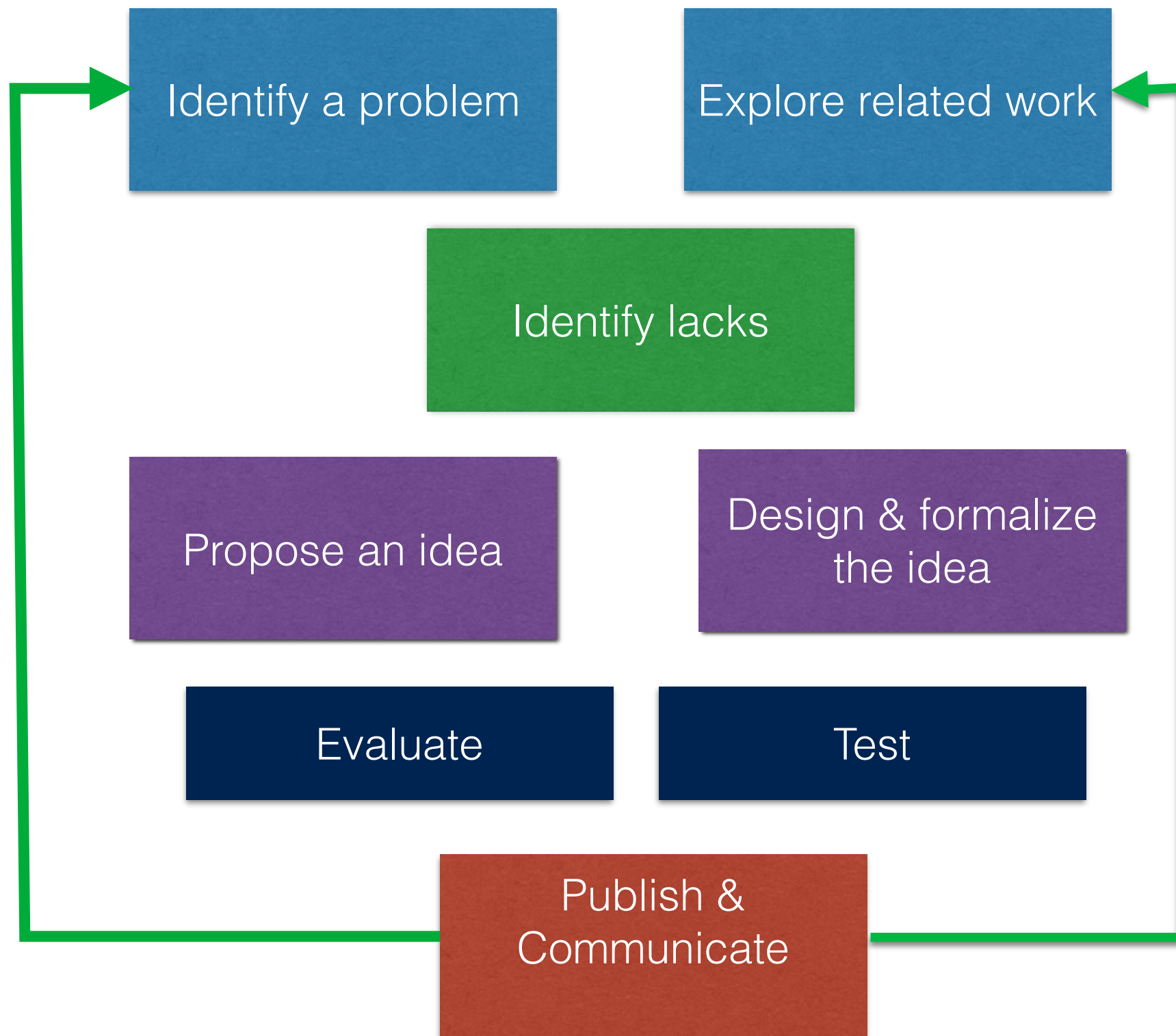
Identify lacks

Propose an idea

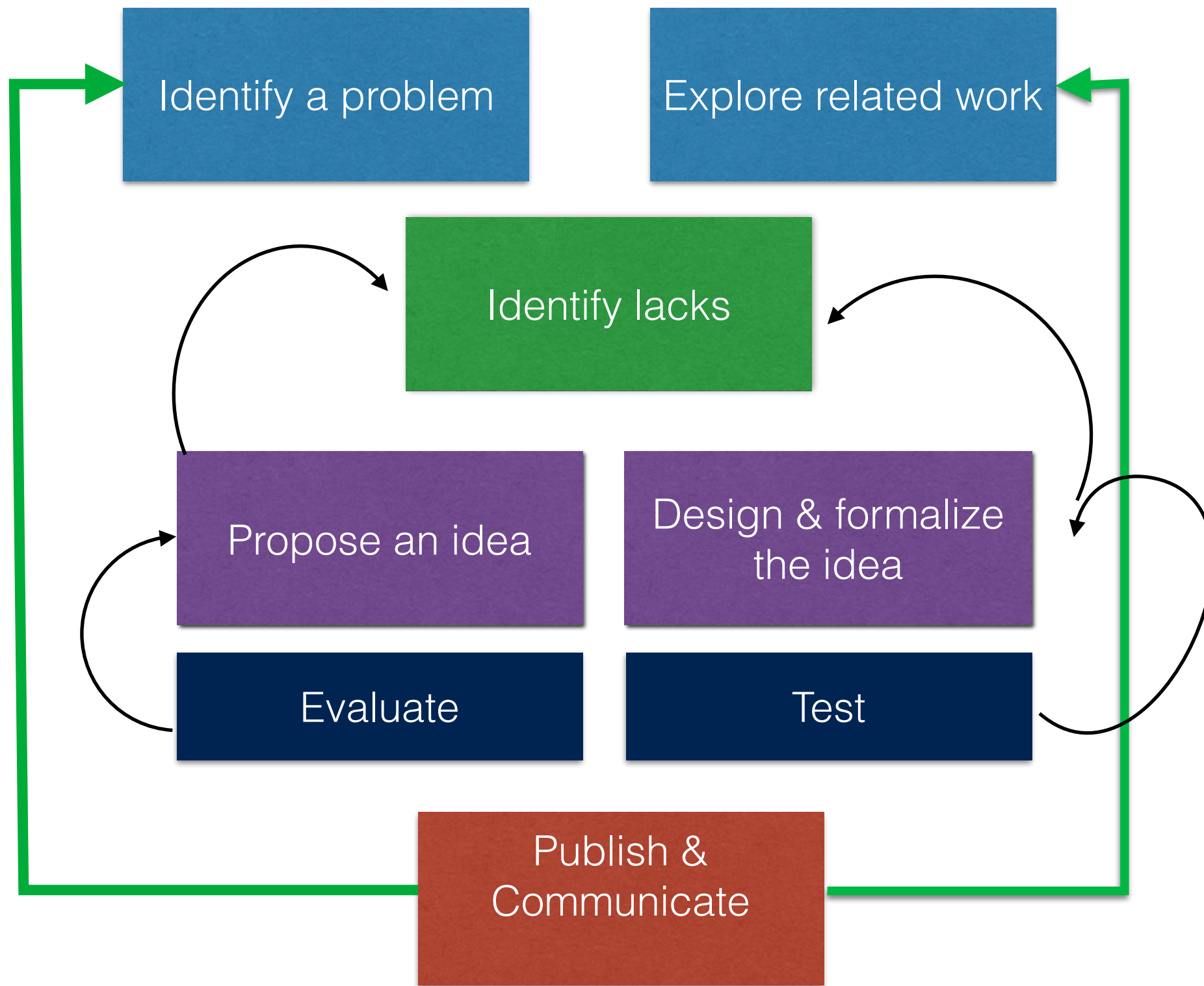
Design & formalize
the idea

Evaluate

Test



- But it is not really linear
- Back and forth are needful
- It is necessary to think like an iterative manner



Research in computer science : specificities

- Do you see some specificities about research in computer science ?
- Which ones ?
- In your opinion, why research in computer science is different than research in natural science or in social science ?

Research in computer science : specificities

- Herbert Alexander Simon, « The science of the artificial », (1969), MIT Press, traduction et postface par Jean-Louis Le Moigne, La science des systèmes, science de l'artificiel, (1974).

« The thesis is that certain phenomena are "artificial" in a very specific sense: they are as they are only because of a system's being moulded, by goals or purposes, to the environment in which it lives.

If natural phenomena have an air of "necessity" about them in their subservience to natural law, artificial phenomena have an air of "contingency" in their malleability by environment ».(Simon 1996 : xi)

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Research in computer science : specificities

- **System** => computer science « object » proposed by researcher
- **Moulded** => observation & build & observe => build & evaluate
- **Goals & intentions** => goals and intentions to build system
- **to the environment in which it lives.** =>
 - to be able to adjust to; in relation to something or someone
 - a context where system « lives »

Research in computer science : specificities

Computer science research « build » an artefact which is goal of research.

Research in computer science specificities ?

Computer science research build an artefact which is goal of research.

Build

+

Evaluate

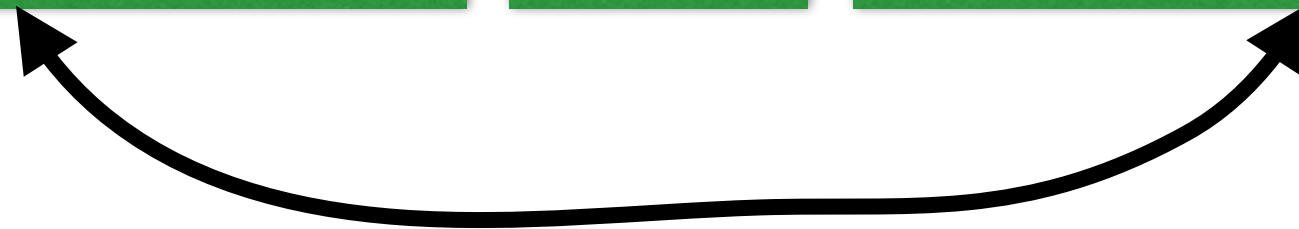
Research in computer science specificities ?

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Build

+

Evaluate



Research in computer science specificities ?

Computer science research build an artefact which is goal of research.

Build

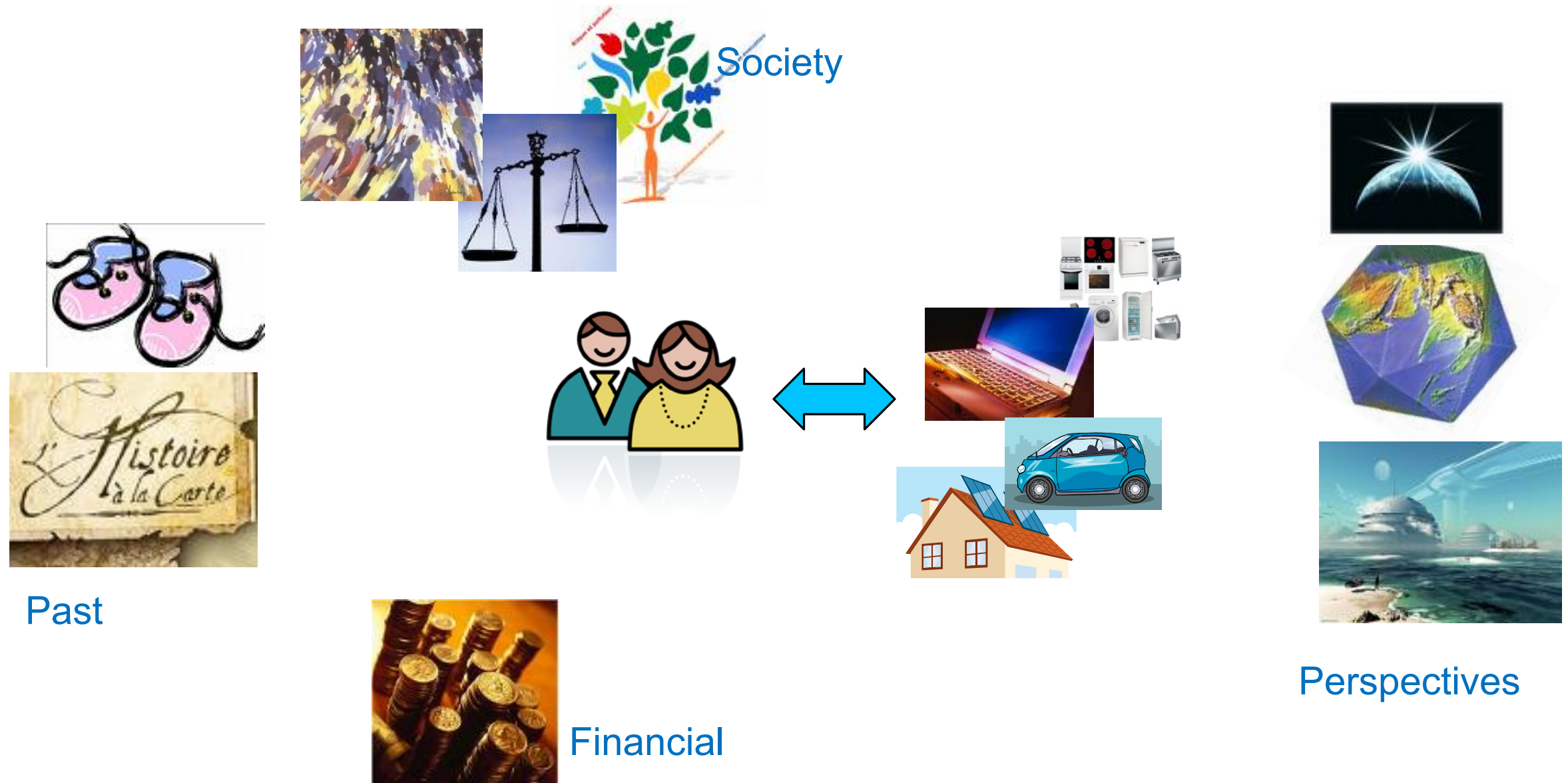
+

Evaluate

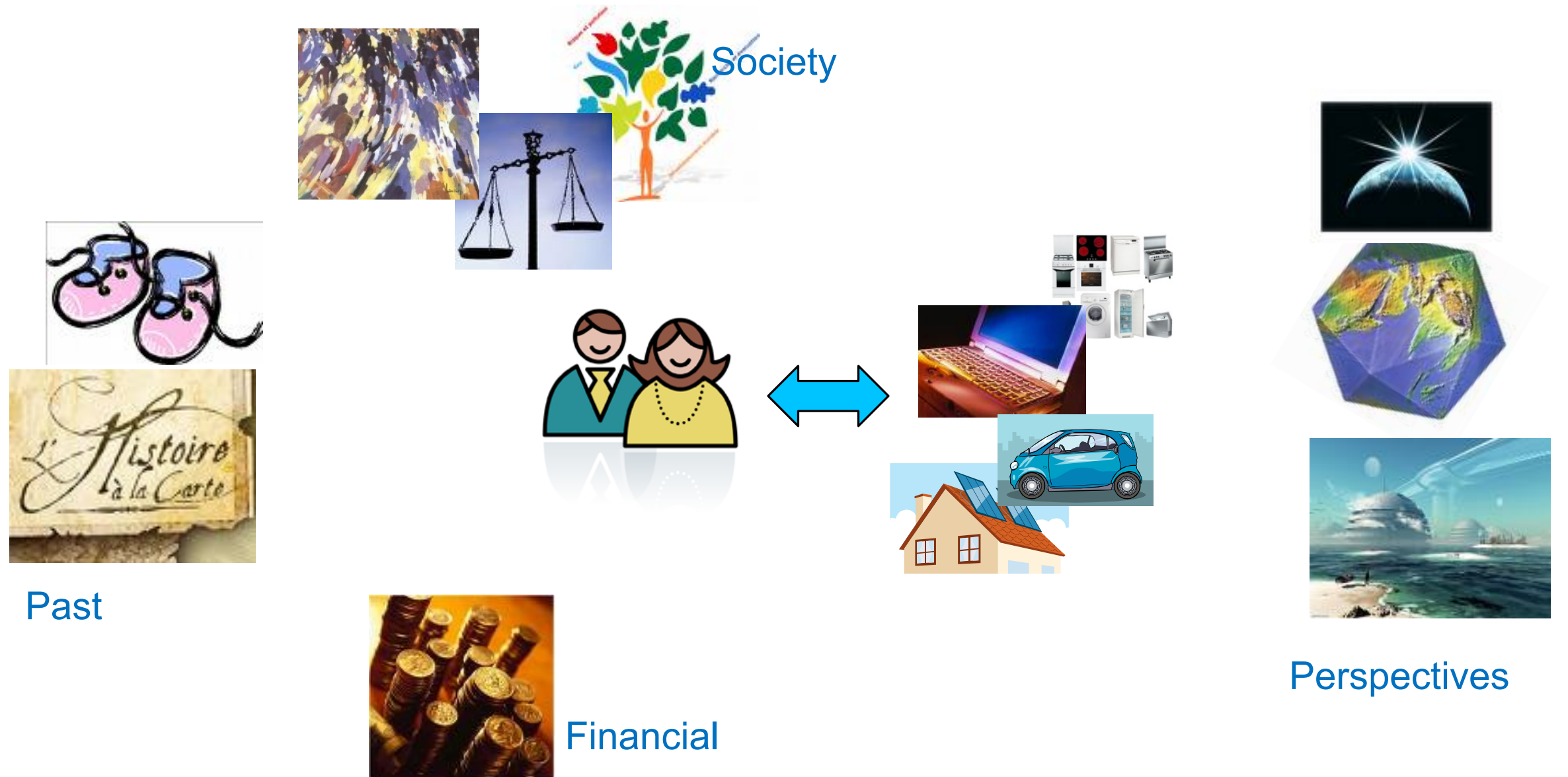
Context and Human



Human and context



Human and context



Increase number of difficulties

Research in computer science specificities

To build and evaluate



an artefact

Research in computer science specificities

A system with users



To build and evaluate



an artefact

Research in computer science specificities

A system with users



To build and evaluate



an artefact

Epistemological « posture » => Benard, Popper, Kuhn, ...

Research in computer science specificities

A system with users



To build and evaluate



an artefact

Epistemological « posture » => Bernard, Popper, Kuhn, ...

Methods of production of data => Qualitative and Quantitative

Research in computer science specificities

A system with users



To build and evaluate



an artefact

Epistemological « posture » => Bernard, Popper, Kuhn, ...

Methods of production of data => Qualitative and Quantitative

Measures and tools of measures

Research in computer science specificities

A system with users



To build and evaluate



an artefact

Epistemological « posture » => Bernard, Popper, Kuhn, ...

Methods of production of data => Qualitative and Quantitative

Measures and tools of measures

Design of experiment // Protocol Measures and tools of measures

Research in computer science specificities

A system with users



To build and evaluate



an artefact

Epistemological « posture » => Bernard, Popper, Kuhn, ...

Methods of production of data => Qualitative and Quantitative

Measures and tools of measures

Design of experiment // Protocol

Methods of treatment of data // qualitative or statistics

Qualitative or quantitative approach

In our opinion, what are differences between these two approaches ?

Qualitative approach

chinese portrait

- If holidays were an animal ? which one ? why ?
- If holidays were a main dish ? which one ? why ?
- If holidays were a color ? which one ? why ?

Qualitative approach

- It is useful
 - To understand, to explore
 - When we have not specific ideas to address problem
 - To identify a phenomena
 - Even if phenomena is unusual or confidential

Qualitative approach

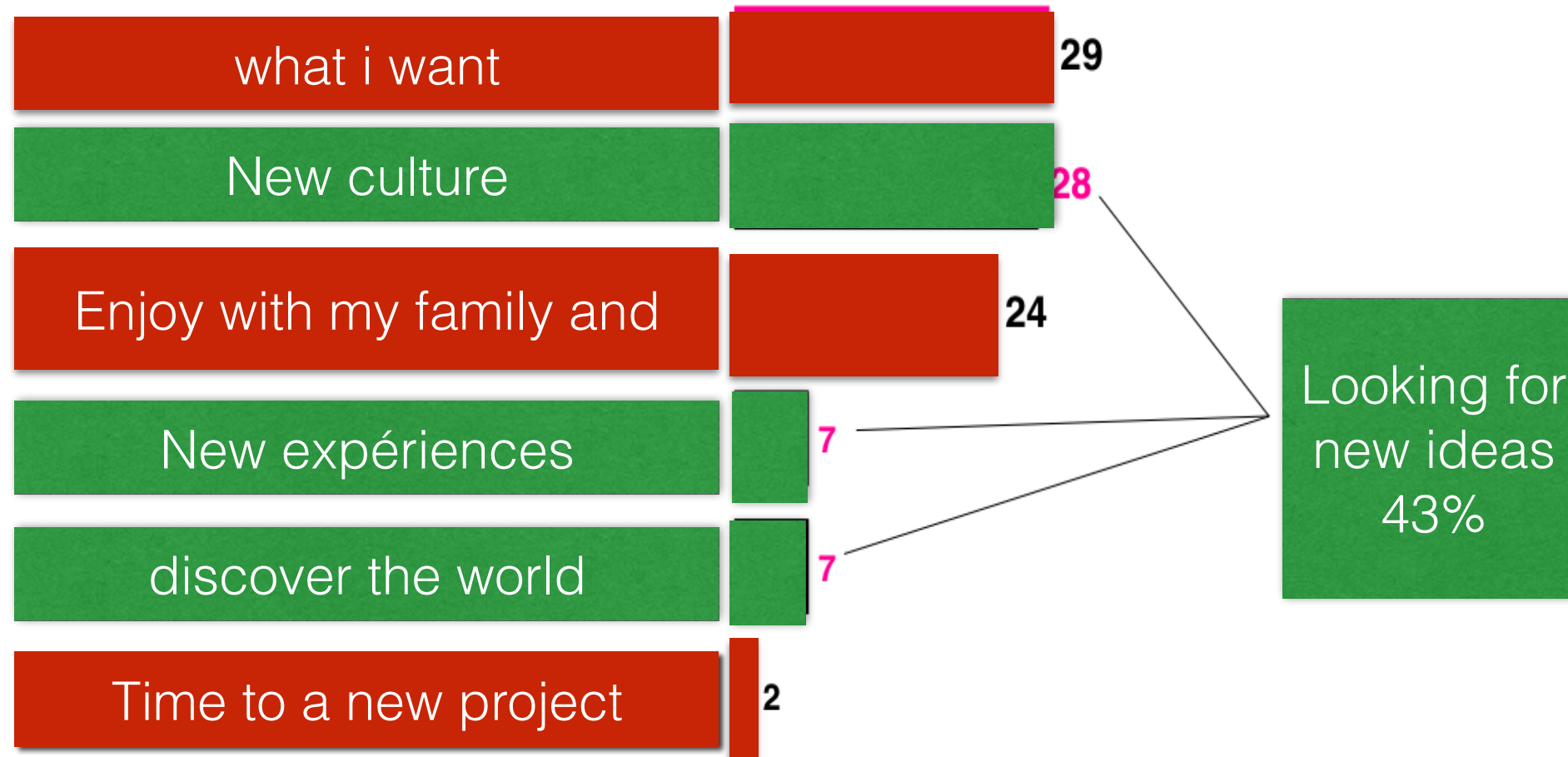
- Only few people is necessary
- No sampling theory
- Because
- Goal => Obtain maximum of different ideas, opinions, facts, ...

Quantitative approach

- Objectives measures -1- => « standard measures » such as meter => numériques variables
- Objectives measures -2- => measures without standard such as performance, précision => numériques variables
- Subjectives measures => opinions, ideas, facts => survey => categorical variables
 - example : Gender => Man or woman

Quantitative approach

What définition of your holidays ?



Base : ensemble de l'échantillon

Quantitative Approach

- It is useful
 - To quantify, to evaluate
 - When hypotheses can be formulated
 - When measures can be made

Qualitative approach

- Require sampling methodologies such as « quota sampling » or « random sampling method ».
- Because
- Goal => statistical representativeness
- Authorize => use of statistical method such as tests and modelization

Qualitative

Quantitative

Explore / Understand

Quantify

Tools of measure

Data produced

Data Analyses

Qualitative

Quantitative

Explore / Understand

Tools of measure

Interviews
Focus groups
Observation

Data produced

Audio
Videos
Schemes/ Drawings

Data Analyses

Qualitative analysis
-Thematic
-discourse analysis
-Semantic analysis
-Comparison of scheme
...

	Qualitative	Quantitative
	Explore / Understand	Quantify
Tools of measure	Interviews Focus groups Observation	Surveys Quantitatives measures Traces
Data produced	Audio Videos Schemes/ Drawings	Numeric variables Categorical variables
Data Analyses	Qualitative analysis -Thematic -discourse analysis -Semantic analysis -Comparison of scheme ...	Quantitative analysis - Descriptive - Tests - Regression - Clustering ...
Build	> 80 %	< 20%
Evaluate	< 10%	> 90 %

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Tools of measure	Interviews Focus groups Observation	Surveys Quantitatives measures Traces
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Data Analyses	Qualitative analysis -Thematic -discourse analysis -Semantic analysis -Comparison of scheme ...	Quantitative analysis - Descriptive - Tests - Regression - Clustering ...

Exercise

- Create a new interface to assist ski instructors ?
 - Which approaches ?
 - Which measures ?
 - Which data ?
 - Which analyses ?

