30.10.2019

IBICI lectures

EPISTEMOLOGY

To the Reader:
I hope these notes will help you. If you have any suggestion, or you don't understand something, please let me know at georgiana.bud@students.unitn.it

What is EPISTEMOLOGY?

It is a branch of philosophy related to acquiring, managing, searching, constructing, verifying falsifying knowledge and especially it is the:

"philosophy of science" → conditions under which scientific knowledge is acquired

↓

it stays above the procedures and theorems of science

Does it exist in the world one epist. or more? Is it an abstract concept which applies to everyone?

↳ More concretely: does a farmer acquire knowledge the same way as a doctor / comp. sci/ engineer?

↓

NO!

Because environment is different, the space in which they operate. Also their (previous) experience is different and the perception

CONCRETE EXAMPLE

Designer - developer

(same environment)

→ Different previous experience ; perception
→ Similar cognition (see, hear...)

But, is the way of acquiring knowledge the same?

No! They also use different sources of knowledge:

-> developer: relevant content eg. algorithms

↳ Takes what he knows and finds of own field, adapts it to own work
(could be exactly the same code)

-> designer: he also uses different sources (books, world, previous experience) and guidelines, patterns

Usually, there are different levels of rigour, usibity and formality on how to acquire and to use knowledge.

Why Epistemology in Innovation? → Good patterns → Successful innovation
→ for finding new innovations
→ for finding new patterns

· Why epistemology in decision making?

With knowledge make informed decision.

Decision making is about choosing a choice among a set of options (one or the best one), which involves EXCLUSIVITY: if one, not another at the same time

eg University, vote, eat, wear

IMPORTANT: HIRING POLICY (who should I hire?)

~~Lecture~~
The lecture will focus on type and difficulty of decision making
- type: instant? time, # opportunities
- difficulty: how long does it take

There are also questions on ~~firing~~ policy: who is allowed to take a (important) decision? WHY to use a process over another?

Eg. search all the internet by hand -> undoable

Keyword: "kritik" (Kant) -> systematic search of limits (find where a decision process does not work)

· Why decision making in Business?

Can lead to losing / gaining / not gaining resources:
- -> money
- -> time
- -> people
- -> network
- -> technology
- -> market share

Also think about THE FUTURE! (5, 10 years)

OPTIMAL DECISION -> adapt, change, understand pitfalls

eg. ° GDPR -> new rules

° Apple -> big decisions eg. computer -> mobiles

Also in the name "Apple computer" -> "Apple"

° IBM -> computers - research

2007: IBM processors in Apple substituted by Intel

° Apple -> Steve Jobs (CE) fired by Apple because of critical problems in managing some products (PDA, Next, Newton)

He owned another company: was then rehired (1 $)

• How does decision-making connect to ICT?

Alan Turing → Turing Machine (used to model computations)
- ↳ infinite tape
- ↳ alphabet of symbols, states
- ↳ a head writes and reads from the tape

→ decryption of Enigma

→ Turing Test → A.I. : test to understand if machine is "intelligence"

IDEA: machine is capable of intelligence ! take general decisions in dialogues

↓

There is a person in front of a PC typing a messages to someone, who replies
The person that writes needs to understand if they are speaking with a human or a machine

Herbert Simon (one coauthor away from A. Turing)
↳ won the Turing Award

HISTORICAL PERSPECTIVE

cultural and philosophical context / understanding about society

These are based on orderly, scientific correlation and CERTAINTY:

→ positivism : science

→ Determinism : predetermined actions and effects

→ Romanticism : human mind conquers everything

→ Rationalism : role of reason

→ Modernism : man takes control

Certainty : "See ! It just works!" See suggested reading

HOW DOES A WORLD OF CERTAINTIES LOOK LIKE?

Certainties : death, life, takes ; mathematical proofs ; sun rises from the east ; fire burns
↓
Things that we see in time ; observe a behaviour

Is the decision making procedure of a peace from where to see the sun rise difficult?
↳ NO, because you know it must be a place looking east

The process is instantaneous

Preference —formulo→ Goal —lead to→ Actions —have necessary→ CONSEQUENCE

Problem: assuming we are in certainty (but if the assumption is correct, there is no problem)

Risk: 60% works

Casino → decide if to bet knowing probabilities

If the risk is high and you have limited resources
⇒ decision is difficult

If the resources are unlimited
⇒ decison is easier

the limits determine the choice

Here

Actions → CONSEQUENCES with some probabilities

Uncertainty

"The truth is out there: it's up to you to find it"

eg. stock exchange: unknown, but prediction based on past

↳ assume there is a logic and reduce uncertainty to a risk ← Not easy! Not everybody can do it

You need → knowledge
→ algorithm (procedure - machine power
→ time

PROCEDURE + TIME + INFRASTRUCTURE

DfD: boundary on number of die

lower upper

As players invest time and resources by playing, narrow down the interval between lower and upper limit

COMPLEXITY OF DECISION MAKING

Procedural -> loop : spend time to find / refine decision

optimization -> any algorithmic procedure that dissipates uncertainty

Examples of Procedural innovations (with convergence to optimality)

- Versions of smartphones -> improved over time, not best since the beginning
  - -> local optimum after finding resources
- Price setting: starting from guess and then searching for similar products
- ICT
  - Machine learning -> initial guesses of weights - parameters and optimize based on data
- Searching for a good place for Erasmus
- Office procedures

KEY POINTS

Limited resources // time, money, CPU, cognitive capacity

POINTS OF FAILURE

- Assuming certainty when we are actually not certain
  - problem? HASTY GENERALIZATION
- If I am a business, being sure that I am going to grow & investing in resources which then seem to be wrong for the fact of continuing growing
- Induction fallacy -> Farmer and Turkey
- 2008 crisis: real estate market
  - -> Risk, but also reward : risk => reward

RISK & REWARD

Also the contrary works : if ∃ reward => there was a risk

Die with 1000 faces : ~~anything but one~~ →

Hit 1 : 1/1000 ; probability of anything but 1 is high : I bet on anything but 1.
If I increase the number of faces, I decrease ~~the~~ the probability of hitting 1, so my bet is safer.

I also increase the amount of time I roll the die every minute.
↳ Also, when the 1 will come out, ~~I~~ I will be screwed !

=> More on how what happened with the 2008 crisis.

- RISK AVERSION

Being skeptical of risk, afraid — eg. exam on history of art

↳ Fallacy when limited resources

eg. Bet on die

1-4 → better, more probabilities ; ~~also~~ NO bet will 1€ on accou
5,6

- UNCERTAINTY INTOLERANCE

Exam: know about it — few info — vs knowing more

you will want to know

there will be on exam ... on what? how?

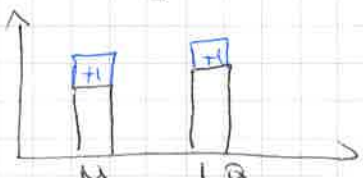
2 questions, chose 1 ...

Solutions -> ask questions, gather info, reduce uncertainty & intolerance
-> study everything possible (raise thresheld of intolerance)
-> wait for someone else to ask -> invest time somewhere else
↳ risk : resource will be limited
-> Learn from past exams / lectures

DIFFERENT OPTIMUMS

Nash Equilibrium -> 2 peayers, 2 buttons { defect / cooperate } combinations give different result
↳ Every actor will chose the best for himself (aka always defect) - Prisoners' dilemma

Pareto optimality -> equilibrium, where you optimise 2 variables together : overall score has same level (money - lunch)



LAW OF BIG NUMBERS

Unknown unknowns -> parameters still to be discovered

↓ how to address them ? Not known

ROULETTE

-> certainty -> always win or always lose -> all tiles are black (one color)

-> risk -> normal roulette, fair because you know probabilities

-> uncertainty -> unknown numbers (covered), but after every spin see them

The master manipulates the roulette ; who is playing doesn't know anything