When drivers are not sure that their bus will stop... Trust and mistrust in technical devices through the concept of instruments systems

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1. Empirical Situation
2. Instrumental genesis framework
3. Discussion

PLAN
1- EMPIRICAL SITUATION

- Missions of the company & Context
- Demand of the CHSWC
- Activity at the approach of a commercial stop: Trust or mistrust in brake devices and motionlessness
Empirical Situation

Missions of the company & Context (1/3)

• An urban transport company (France)
  – 40 different lines of bus
  – For an agglomeration of 25 municipalities
  – 1,000 commercial stops
    • several in the downtown
  – 17 millions of customers per year
  – More than 200 bus drivers
  – Etc.
Empirical Situation
Missions of the company & Context (2/3)

• The work situation of city bus drivers
  – They must obviously drive their bus
  – And... they monitors:
    • Traffic (pedestrians, other vehicles, traffic laws, etc.)
    • Interior of the bus
    • Operations of the bus (noise, alarms, etc.)
    • Travel time ("theoretical/real" gaps) and schedules
    • Etc.
Empirical Situation

Missions of the company & Context (3/3)

• A fatal accident
  – Several pedestrians were crushed by a bus
  – At a commercial stop of THE line of the city center
  – The FAE (Frein d’Aide à l’Exploitation = Operating aid brake) in cause
  – Etc.

• But why?
  – Human error?
  – Or technical failures?
  – A long and painful history...
Empirical Situation
Demand of the CHSWC

• Demand of CHSWC (Committee for Hygiene Safety and Working Conditions)
  • "In the suite of this fatal accident, there were several returns from drivers regarding strange behaviors of the buses, involving the brake devices and motionlessness
  • And many of them no longer trust in these technical devices
  • Are there real risks?"
Empirical Situation
Activity at the approach of a commercial stop

• Activity at the approach of a commercial stop
  – Drivers observed pedestrians nearby to identify:
    • If they wish to get on the bus
    • Some specific needs (disability, the elderly, etc.)
    • Etc.
  – At the stop, they also look:
    • Passengers entrances and exits (and doors)
    • People approaching the stop (elderly people, who run, with pram, etc.)
    • Etc.
Empirical Situation

Brake devices and motionlessness

• Technical approach
  – 3 devices combined

• Activity approach
  – Braking and immobilizing his bus
Empirical Situation

Activity at the approach of a commercial stop: trust or mistrust in brake devices and motionlessness

• Braking and immobilizing his bus
  1. Use of the FAE?
     • For brake:
       – by noone! presently...
       – And before by all drivers! Without other devices simultaneously
     • But in fact presently by everyone! Due to the automatic associated function « open the door »
  2. Brake pedal
     • A majority of drivers keep the foot on the brake pedal, without pressing on it
       – "otherwise it pulls" (for biomechanical reasons: limit the postures maintained)
     • A minority of drivers press on the brake pedal with the foot
       – "Not for all the stops"
       – "it depends on the slope or affluence"
  3. The parking brake is used by a very small minority
     • "It is not planned for that"
     • "It is poorly positioned for intensive use"
2- INSTRUMENTAL GENESIS FRAMEWORK

- Systems of instruments/resources & FMRS Method
- Emergences of the systems of instruments/resources: Redundancies, Complementarities and Values
Instrumental genesis framework

Systems of instruments/resources & FMRS Method

• **Instrumental genesis framework** (Rabardel, 1995) & **Systems of instruments** (Rabardel & Bourmaud, 2003; Bourmaud, 2006, 2010)
  – The concept of « Instrument »
    • Activity mediated by instruments
  – Theory of systems, for thinking the concept of « Systems of instruments »
    • « the whole is greater than the sum of its parts » (Pascal)

– **FMRS Method**
  • Failures Methodology and Resources Substitutions (of functions)
  • Data collected, by observations or interview on the modalities of performing the activity during the failure of an instrument (with another)
Emergences of the systems of instruments/resources: Redundancies, Complementarities and Values

- As results of FMRS Method, in a system of resources there are emergences (Rabardel & Bourmaud, 2003; Bourmaud, 2006, 2010):
  - Redundancies and Complementarities of functions
    - This double characteristic contributes simultaneously to
      - the system’s robustness
      - and the flexibility and adaptability of its mobilization in relation with the variability of circumstances
  - and Values, or System of values
    - Each function also involves the attribution of a relative value
      - as « more/less practical », « slower or faster », etc.
      - or « more/less sure »
3- DISCUSSION

- Trust or mistrust as emergences of the systems of instruments/resources
- Systems of resources / values and Occupational risks
Discussion

Trust or mistrust as emergences of the systems of instruments/resources

• Back to the empirical situation
  – The operators must necessarily trust in their devices, but yet...
    • Different events can occur that will alter it...
  – With the FRMS we know the operators realize a value judgment on their systems of instruments/resources
    • Trust is not an absolute but relative value
    • A low or a negative value will lead to the mistrust and the exclusion of the resource from the system
  – The challenge of rebuilding trust
    • « Trust can not be decreed, it is built » (Karsenty, 2013)
**Discussion**

**Systems of resources/values and Occupational risks**

- Discussion about two other situations
  1. Another Example of Serious Accident:
     - Trust or mistrust in technical devices

The installed aluminum plate transmitted a false message: "the zone is secured", whereas it was not.

The old plaque conveyed a just message: "the area is dangerous"

Chute de hauteur (± 6 mètres) dans la fosse BVI en passant à travers le deuxième trou de la plateforme lors du nettoyage, la plaque d’obturation ayant basculé en marchant dessus.

**Principales causes:**
- l'En mono diamètre 1 seul trou utilisé, le deuxième est obturé par une plaque
- Les taquets de centrage n’empêchent pas la plaque de se déplacer lorsque du béton passe dessous et donc de pivoter lorsqu’elle est décalée ;

**Actions correctives:**
- Vissage de la plaque au sol (immédiat);
- Étude d’une plaque facilement escamotable

Au travail la chute de hauteur = 2ème cause d’accident mortel et 3ème cause d’incapacité permanente.
Discussion

Systems of resources/values and Occupational risks

• Discussion about two other situations
  
  1. Another Example of Serious Accident:  
     • Trust or mistrust in technical devices  
       – A strong or positive value will, on the contrary, contribute to including this resource in the system, but yet...

  2. Another Example of Driving Vehicles:  
     • Religious Beliefs as an item of the systems of Values
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Thank You!