Towards a proactive safety approach in the design process: The case of printing machinery

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Plan

1. Context, assumptions and the principals postulates.
2. New concepts arising from this work
3. How design should move to proactive safety.

Context and objectives

- A French program: GIPC-PROSPER concerning the design of risky equipment and the taking into account of human factors
- Project which lasted five years and which had two objectives:
  - The scientific one: to develop a theoretical framework and methodological rules .
  - The industrial one : to propose methods and tools, to the designers.
- this study was carried out on the printing sector

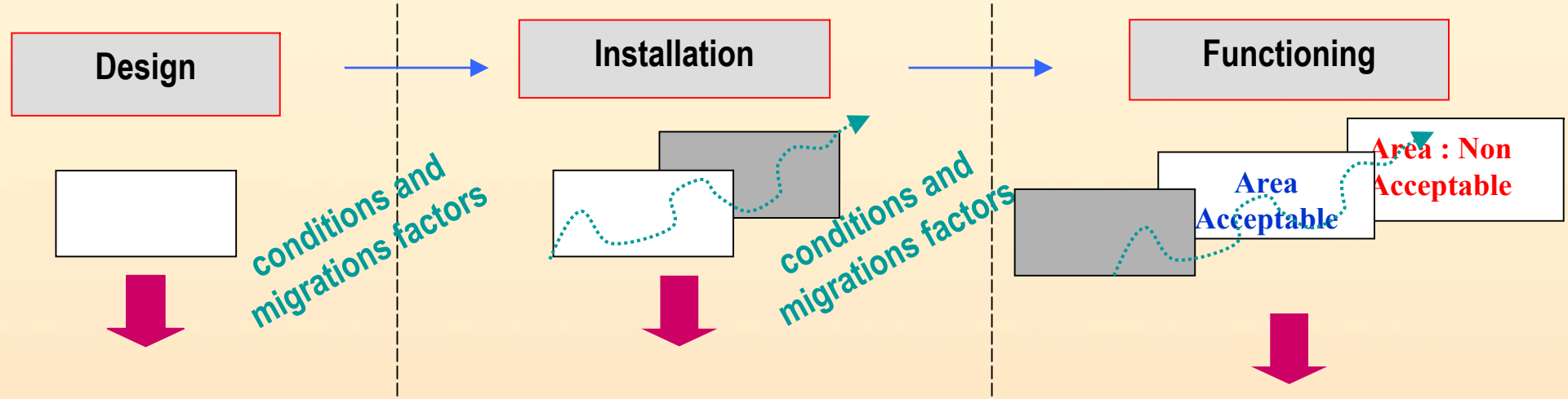
basic postulates

- Re-utilisation of known solutions without an evaluation coming from daily analysis work
- Design scope takes place even in functioning
- Learning from experience is not a systematic process used in the design improvement
- Any system undergoes migrations (drifts transformations, and adaptations) from its design until functioning (Rasmussen 1997, Amalberti 2001)

A natural migration from the design until functioning

The process of design includes 3 principals stages

Model



STEP

Analyses of process and methods of design (methods of integration of safety by the various actors)

Analyses :

- *Activities of the designer, of establishment*
- *identification of conditions and factors of migrations*
- *Process of training of the end users*

Analyse :

- *Activities of uses of the rotary printing-presses (7 customer-users, rotary)*
- *Identification of risks, analyses causal and modelling*

feedback towards the design

Boundary Activities Tolerated during Use (BATU) & Boundary Conditions Tolerated at Use (BCTU)

- Recovery skills & strategies, palliative activities allowing different actors to establish partial compensations
- To cope with constraints & compromises between: « production-safety - quality - competencies - health… »
- Adaptation of the regulations or new regulations constructed in a collective way
- consequences of the BCTU

- BCTU appear as a precursor of the BATU in the different design & management levels
  - Circumstances caused by operational dynamic changes: natural migration
  - Circumstances that could determine working conditions
- BCTU increase uncertainty of the situation by reducing the possibilities of workers' adaptation

- « Border line » because they engender risks & bypass safety barriers
- Tolerated because they improve temporary the system performance, they are totally unknown…

Links between BATU and BCTU

BCTU

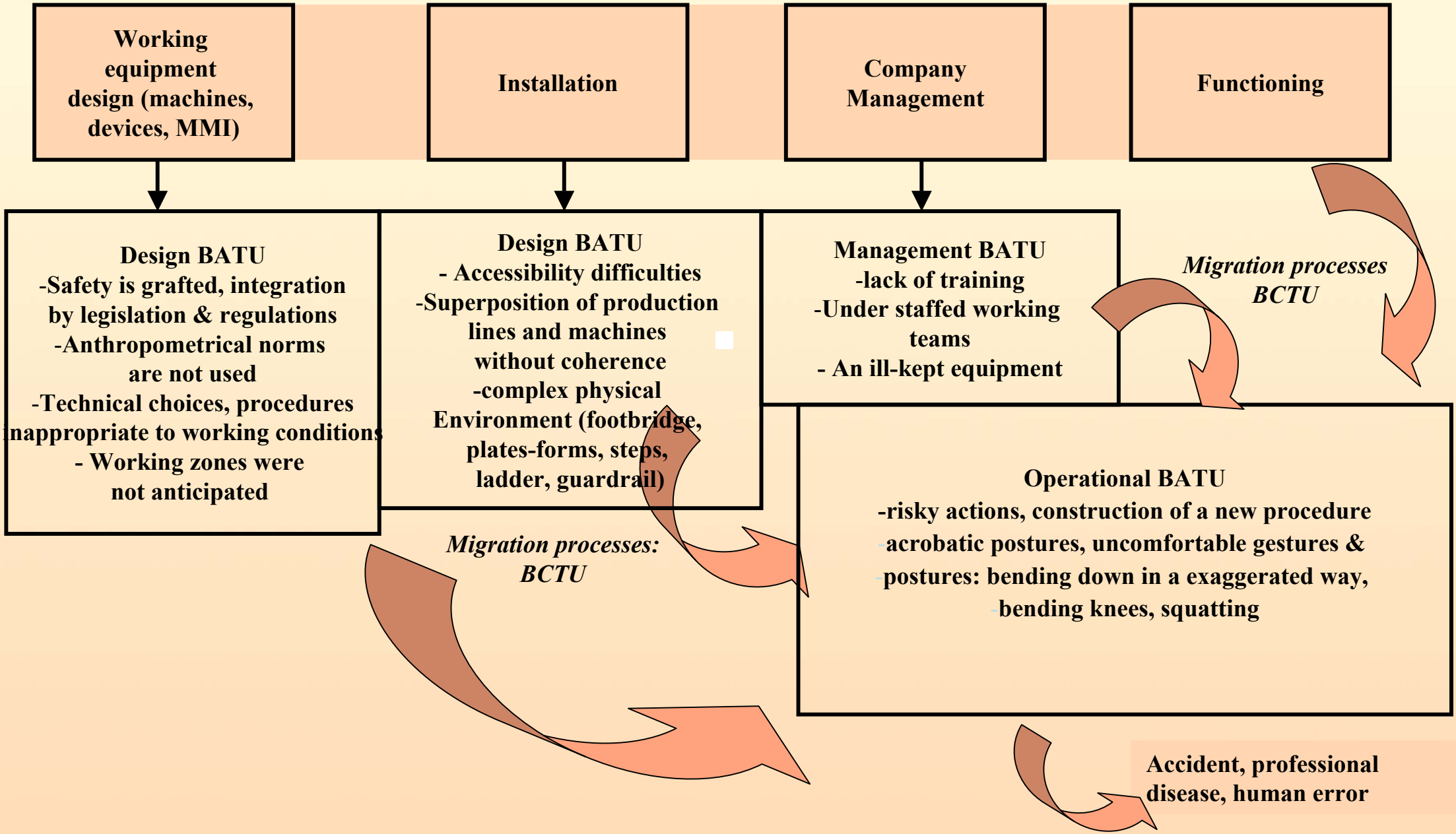
The analysis of the design processes & the functioning processes highlight the links between BATU & BCTU

BATU

Statute of the prevention in the design

- The occupational safety has a particular statute :
  - lawful obligation ,
  - Generally based on the technical standards
  - never clarified in specifications
  - Choices based on individual knowledge
  - Safety is integrated in opposition to production
  - Safety integration becomes a constraint (designers and users)
  - Safety can become a problem to be solved and it's grafted
- the manifest lack of safety specifications do not underline the lack of designers needs and designers difficulties on the matter.

Main results: a lack of safety & health specifications into design projects



Towards a new proactive approach to design

Proactive safety can be defined as the combined studies, analyses and projected integration options implemented *in foresight* with respect to the critical event.

Based on an ecological approach centered user :

- To reduce the asymmetry between the technical and human elements :
  - Usability
  - Designing for error
- To support the construction of an adequate representation and nearer to the reality of use of the work equipment :
  - Management of the interferences and of the common reference frame
- To identify :
  - Rules of use ,
  - Criteria and the uses which it will firstly be necessary to integrate
- To know the daily situations , factual and accidental to be able to anticipate them :
  - Which risks for the total safety of the system ?
  - Like, for the health of the operator is necessary it to anticipate ?
  - Which safety barrier ?

Conclusion

Some recommendations for a better risk control at the design

- "production system" and "work system".
- role of the "prescriptions".
- learning from experience approach.
- organisational aspects.
- participative approach
- to articulate the approaches resulting from the social and engineering sciences.

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