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# UNIVERSITÀ DEGLI STUDI DI TORINO

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# GENERATIVE MODELS TO WORK ANALYSIS

## How we can leverage organizational change and support the implementation of (new) technical solutions in complex socio-technical systems, by the use of *infographics*

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### ABSTRACT

#### *Current state-of-the-art*

The project applies to the organizational Human Factors/Ergonomics field of intervention (www.iea.cc, 2012), with a specific focus on the ergonomic analysis of work and processes in complex socio-technical systems. When dealing with complex socio-technical systems and their description and analysis in a view of system (re)design and performance, the question arises on *the way to elicit and promote organizational change*. In the European ergonomic approach to work analysis, systems are studied in their current behaviour with the aim to model the *real* activities operators naturally perform in their current practice, rather than postulating “rational” benchmarks for how workers should behave (Vicente, 1999). These approaches, in particular the Francophone and Italian ergonomic tradition to work study, make a distinction between work prescribed to the operator (*task*) – and thus representative for normative models – and the actions that workers actually perform in their daily practice (*activity*) – and thus representative for descriptive models. Descriptive studies of work share the characteristic of dealing with human work conducted in contemporary and naturalistic settings: the importance of context-conditioned variability and adaptation to the contingencies of the moment (Hutchins, 1995); the social component of work, as the workers are part of a team that must coordinate to achieve their common goals (Clot, 2006; Vicente, 1999); practices and organisational artefacts are means of negotiation and regulation of system goals (Zamarian, 2010) and people relationships (Clot, 2006). Descriptive analyses of current work practices pose some questions on modelling and design to uproot the tacit knowledge of the workers performing the “real” activity, in order to describe it and modelling it. In the Francophone and Italian approach, leverages for change

are promoted by the development of methods to work analysis able to sustain the acquisition of reflexivity by the single operator or groups of operators.

#### *Project Innovation*

The focus moves from *the study of personal experience to the study of the interfaces between groups, and the way to visualize it*. A system is internally structured in groups seeing the same environment in different ways, from different perspectives, usually not complementary. This method challenges the work system perception consolidated within every group, implicitly stating that things are as they are, that what exists is obvious, unchangeable, therefore raising an expectation of continuity (Re, 2001b). At a *generative* level, work analysis points to create a psychological break down to promote system change, sustaining operators to move from an individual or peer-group view, into a capacity to switch over different symbolic representations of the same work system, leading to different kind of requests for intervention (Re, 2008; Re, Occelli, & Micheletti Cremasco, 2008). To simulate the different “vistas” (Gibson, 1979), i.e. the ecological perception that the operators develop while performing their work activities, a generative method challenges to produce a *common cognitive referent*, a multi-prospective *object*, shared by all the actors and functions operating in the system (Re, 2001a). From this perspective, ergonomic intervention is rather a process where the ergonomist helps different groups to take a distance from the implicit comprehension they inherit when joining a work system and its previous story. The ergonomist can use objects eradicated from their everyday logic, or verbal or graphic simulations, as leverage to enhance the process. The simulation represents an effective cognitive tool to develop, within a participatory model, a socially validated rationale of the technical solutions to be implemented in the work system. Flaws between

subsystems interdependencies may therefore be pointed out as affecting the system performance.

The solution to systems modelling in a generative approach has been realised in the present research with the use of *infographics* (Meyer, 1997) to convey the complexity of work systems and phenomena under analysis, believing that they provide a foundation for understanding (Callari, 2012). The graphic representation of the system, the specific subsystems, and the flawed interdependences can be modelled using flowchart diagrams. A flowchart is a diagram that visually displays interrelated information such as events, steps in a process, functions, etc., in structured and intuitive fashion, such as sequentially or chronologically. These diagrams will served as a cognitive tool to move from an *analogical representation of the system* (flaws that are known, but workaround solutions are adopted to solve the problem) to a *digital* one, where the system is shown as a whole, with functions and people in interconnection and interdependency.

### Research design

The project made use of the case-study method (Swanborn, 2010; Yin, 2012), as a research strategy when understanding complex real-life events phenomena and data in natural settings. Multiple sources of evidence were used to collect in-depth data to visualize the inter- and intra-organizational flaws in a view of system (re)design, to support data convergence and findings (analytical) generalization. The selected case was a hospital of the Turin province specialised in infectious diseases. To understand the collective processes undertaken in pursuit of organisational and technical goals, three inter-dependent Departments (sub-unit of analysis) were studied. In each, the specific work systems were analysed to uproot the intra-organisational work practices and the inter-organisational interdependences within the hospital departments and services in a view of system improvement. The findings showed flaws in the inter- and intra-organisational processes that lead to suggestions of sustainable leverages for change.

### Project outcomes (generative models)

The results, presented in visual representations of the work systems in analysis, its interdependencies and functions involved, were shared together with the operators and the Healthcare Direction and applied in every studied Department in a view of organizational improvement.

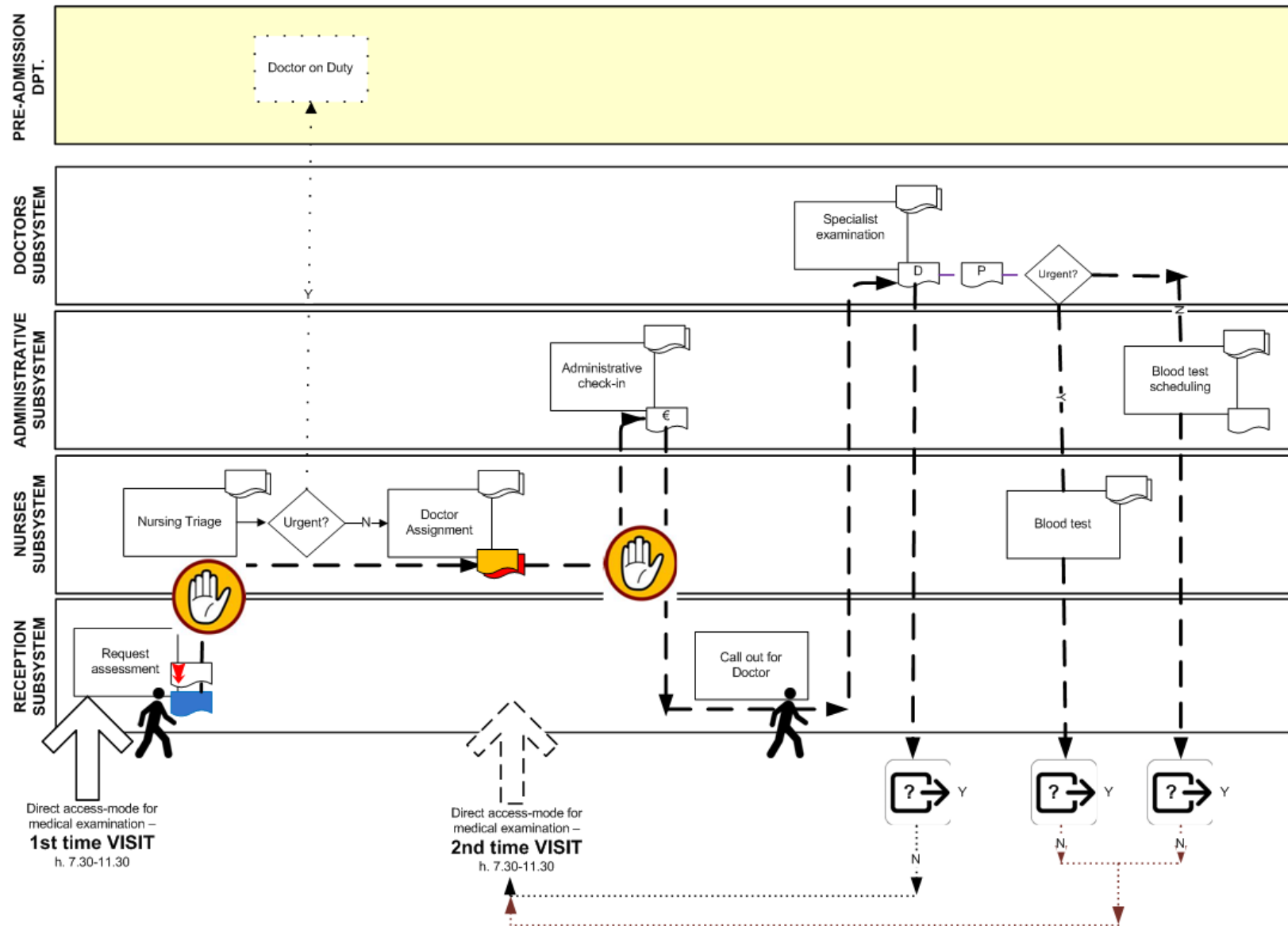
The representations (examples are presented here-after – *Appendix 1*; *Appendix 2*) were discussed with the Healthcare Direction and operators, and helped to convey the complexity of the studied work system and share the areas of improvement to implement the proposed organizational changes.

### Keywords

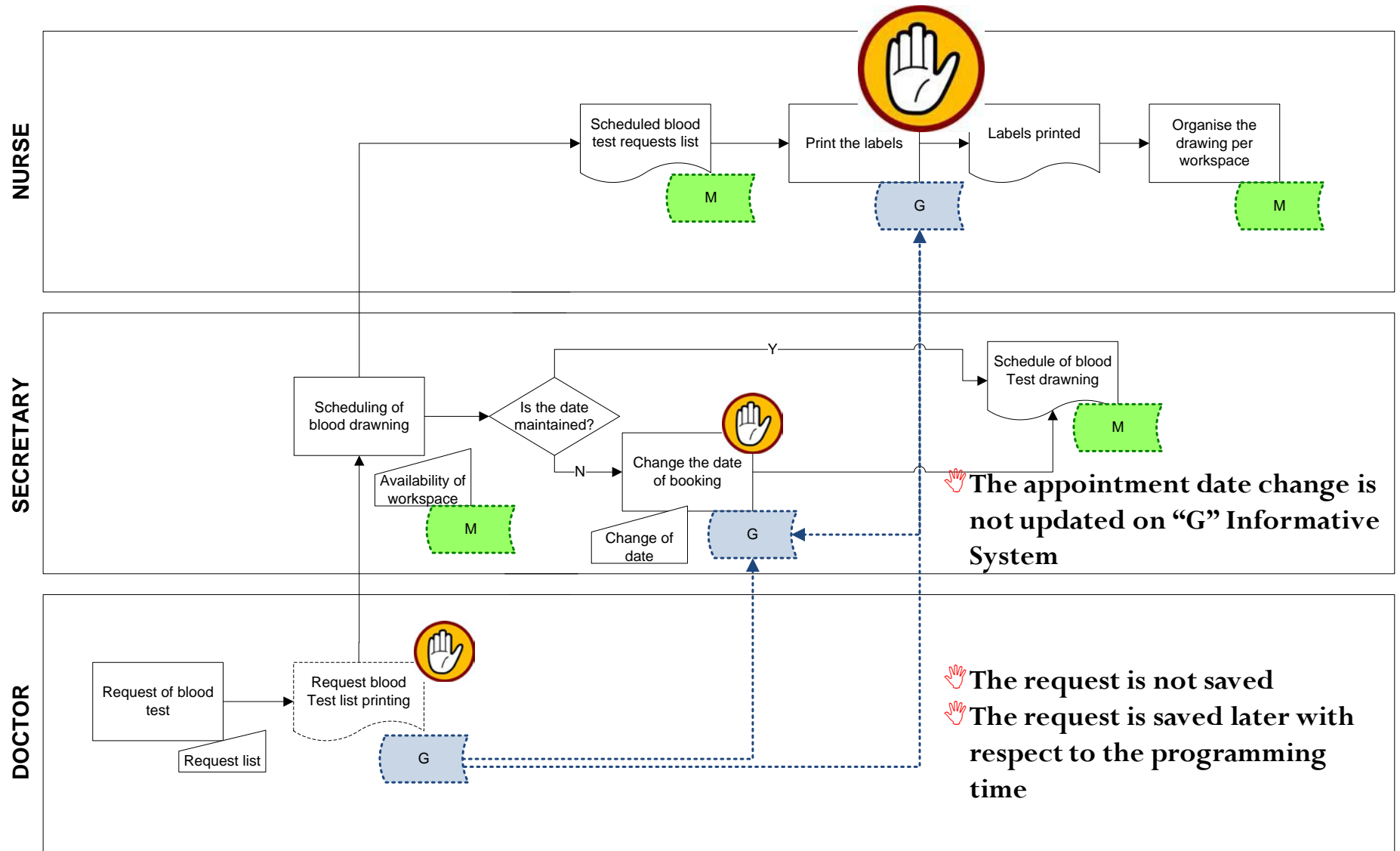
Methods to work analysis, generative models, cognitive models, systems modelling

### REFERENCES

- Callari, T. C. (2012). *Ergonomic Analysis of Processes and Work Practices in a Hospital: an Embedded Single-Case Study*. Doctoral Thesis in Human Sciences, Applied Psychology and Ergonomics Programme. Università degli Studi di Torino, Torino.
- Clot, Y. (2006). *La funzione psicologica del lavoro* (L. Scheller, Trans.). Roma: Carocci. (Original work published 1999).
- Gibson, J. J. (1979). *The ecological approach to visual perception*. Boston, MA: Houghton, Mifflin and Company.
- Hutchins, E. (1995). *Cognition in the wild*. Cambridge, MA: MIT Press.
- Meyer, E. K. (1997). *Designing infographics*. New Jersey: Hayden Books.
- Re, A. (2001a). L'analisi dell'errore per il miglioramento di qualità dell'organizzazione *Proceedings of the 7th Convegno Nazionale di Ergonomia "L'Ergonomia nella società dell'informazione"* (pp. 54-58). Firenze: Leoni ed.
- Re, A. (2001b). Une nouvelle perspective pour la compétence ergonomique dans l'analyse du travail. *Paper presented at the Séminaire international Analyses du travail et Formation*.
- Re, A. (2008). Competenza ed errore nell'analisi del lavoro. In Soro G. & D. Acquadro Maran (Eds.), *Competenze relazionali nelle organizzazioni* (pp. 1-23). Milano: Edizioni Cortina.
- Re, A., Occelli, C., & Micheletti Cremasco, M. (2008). From action to reflexion: use of a multi-perspective system representation to support a health care system improvement. *Proceedings of the Activity 2008: Activity Analysis for Developing Work* (pp. 72). Helsinki, Finland: Pekka Koukka.
- Swanborn, P. (2010). *Case Study Research: What, Why and How?* London: SAGE Publications.
- Vicente, K. J. (1999). *Cognitive work analysis: Toward safe, productive, and healthy computer-based work*. Mahwah, NJ: Lawrence Erlbaum Associates Publishers.
- Zamarian, M. (2010). Le routine organizzative tra dimensione operativa e dimensione generativa: modi di riproduzione dell'agire organizzativo. *Rassegna Italiana di Sociologia*, 51(2), 233-253.
- Yin, R. K. (2012). *Applications of case study research* (Third ed.). Thousand Oaks, CA: Sage Publications.



Appendix 1 – Work system of the ambulatory path for examination, from the out-patient's point of view



Appendix 2 – Work system for blood test scheduling