

Bounded Rationality in Humans and Agents. State of the Art

First Research Report of the PhD Thesis titled:

Bounded Rationality in Agent orientation – “Just-In-Time”

Visual Pattern Recognition

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R. D. Fabian, 2010**

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References

- the thesis targets should be sustained by a recent, wide-ranging, and trans-disciplinary bib- and webliography,
- focused on complex services provided by bodiless agents in uncertain and rapidly changing environments, via user-centred applications developed from a holistic perspective.
- references used: 83, are split into 4 lists:
 - References 1 (State of the art) – 37
 - References 2 (Source of ideas) – 23
 - References 3 (State of the art) – 10
 - References 2 (Source of ideas) – 13

1.1. Objectives. Report Roles

- 1. Filter for (mainly exploratory) research**
- 2. Starting point for developing the thesis ideas**
- 3. Stem cell for the third chapter of the thesis**
- 4. First infrastructure for the experimental model**
- 5. Exercise in heutagogic metalearning through self-recursion**

1.2. The Sieve



- ***Incremental research*** - The paramount restraint.
- ***Industrial society (or era)*** - The research is rooted in and dedicated to the post-industrial (service-based) society.
- ***Conventional CSIT paradigms*** - As cardinal restraint since in Europe, and in Romania even more, the agent is still considered to be rather a *program* than a *process*.
- ***Pattern recognition*** - As a most natural field where BR reveals itself pattern recognition was chosen as test field also because there are several widespread benchmark pro-grams enabling in-dis-putable validation of the research results.
- ***Computer vision***
- ***Principles of subfields the thesis is strongly related to*** -Despite its osmotic interference with other fields the thesis is *trans-* not *multidisciplinary*.

1.3. The Magnifier



- **Locality in time (Moore's Law).** To show that its effects are not limited to IT but tend to become a Zeitgeist component.
- **Locality in space (ODUE).** Equally important, since it delineates the validation setting for the re-search results.
- **Holistic approach.** Approaches based largely on right-brain style are welcomed to supplement the limited left-brain algorithmic approaches.
- **Transdisciplinary perspective.** For CSITAO *anthropocentrism* (as target) and *transdisciplinarity* (as means to achieve it) are *sine qua non* requirements entailed by the very nature of services. The pre-fix “*trans*” insinuates, that modern complex service providers have to cooperate seamlessly.
- **Architecture vs. structure.** Architectonic aspects are far more pertinent than structural details.

2. Basic Concept: Boundedly Rational Agent-Oriented Systems

- search expression like "Bounded Rationality" + Agents + Optimization, giving 86,100 results – any scope extension being irrelevant for the chapter and counterproductive for the exercise
- the **focus** was on authors of seminal papers (Simon, Gigerenzer, Selten, Rubinstein), newness (except sources of ideas) and impact (e.g., more than hundred citations).

2. Basic Concept: Boundedly Rational Agent-Oriented Systems

2.1. *Bounded Rationality Instead of Optimization* - deals with the concepts themselves. Only optimization is ignored because of “Instead” (its connotations are the ordinary ones as set up by etymology, definitions in mathematics and use in IT).

2.2. *Necessary Condition (To Fight Cognitive Complexity in Architecture)* - explores bounded rationality as necessary condition, i.e., as confining anthropocentric research effectiveness to acceptable cognitive complexity (vital for learning strategies involved in the E2020 program).

2.3. *Sufficient Condition (To Fight Structural Complexity in Implementation)* – addresses implementation-oriented exploring of bounded rationality as sufficient condition, i.e., as efficient mechanism to reduce structural complexity in the experimental model.

3. Basic Paradigm: “Just-In-Time” Service or Failed Service

- “Bounded Rationality” + “Just-In-Time”, giving 10.100 - since concept evolution was not a target anymore, the search could be focused successively on Google Scholar
 - (anytime) with 5,100 results
 - (since 2007) with 360 results. five results from LBUS

3.1. “Just in Time” as Response Time (in Architecture) - explores “Just-In-Time” as response time, i.e., as cardinal architectonic feature. From a slightly different perspective “Just-In-Time” is regarded as main current connotation of “real time”, reflecting the shift from products to services, crucial for the thesis setting.

3.2. “Just in Time” as Agent-Oriented Mechanism (in Implementation) - is again implementation-oriented exploring JIT as lever to exploit bounded rationality, i.e., as key mechanism to simplify the experimental model.

4. Application Domain: Visual Patterns

"boundedly rational" + "visual pattern recognition" - 9 results, none relevant

4.1. *Bounded-Rationality Recognition*

- Search results: 5 – none of them relevant

4.2. *“Just in Time” tailored transmission*

- "just in time" "tailored transmission" - 0 search results
- transmission is today closely tied to compression
- even lossy compression techniques transmit images as whole, unaware of semantic content or JIT user tailored transmission

4.3. *Conventional Benchmarks*

- In the field of the application *conventional benchmarks* are test images widely used in digital image compression/transmission and generally in image processing and computer vision.
- **Lena**, Baboon, Barbara, Lighthouse, Photographer

5. Conclusions

1. The present report is a consistent, solid, ample groundwork as well as road map indicator for the thesis it has to serv.
2. Moreover, the report proposes a new framework for a roadmap reconsidering the status of exploratory research for theses anchor in the look and feel of postindustrial society.
3. The “look and feel” of the post industrial society expressed inline with the requirements of a PhD thesis in the main domain with the bold and unavoidable risky perspective of an exploratory research (the subdomain of Agent Orientation).
4. Specifically the assertions above are illustrated in the report by defining the sieve (to diminish the risks) and the magnifying glass (to amplify the newness).
5. From a transdisciplinary perspective the report could be of great consequence since it innovates the Romanian computer terminology – proposing for the key concept of “Just-In-Time”, the first term based on the Dacian substratum of the Romanian language that should enter scientific terminology.