Rapid Response Teams: Design for Resilient Performance in Practice

Claudia Guerra Disconzi

Tarcísio A. Saurin

Industrial Engineering Post Graduation Program – Federal University of Rio Grande do Sul

Background

- Resilient Performance (RP) is a **key functional property** of CSSs;

- Emergent character from:
  - People´s self organization;
  - Built-in systems;

- "Design for X": **DFM** ⇨ **DFA** ⇨ **DFX** (Design for Excellence)

Rules, procedures, and methods to guide designers to achieve the "X" requirement with excellence

Background

- **Design for Resilience in the literature:**

Product Design

Technology Design

DfR

Equipment Design

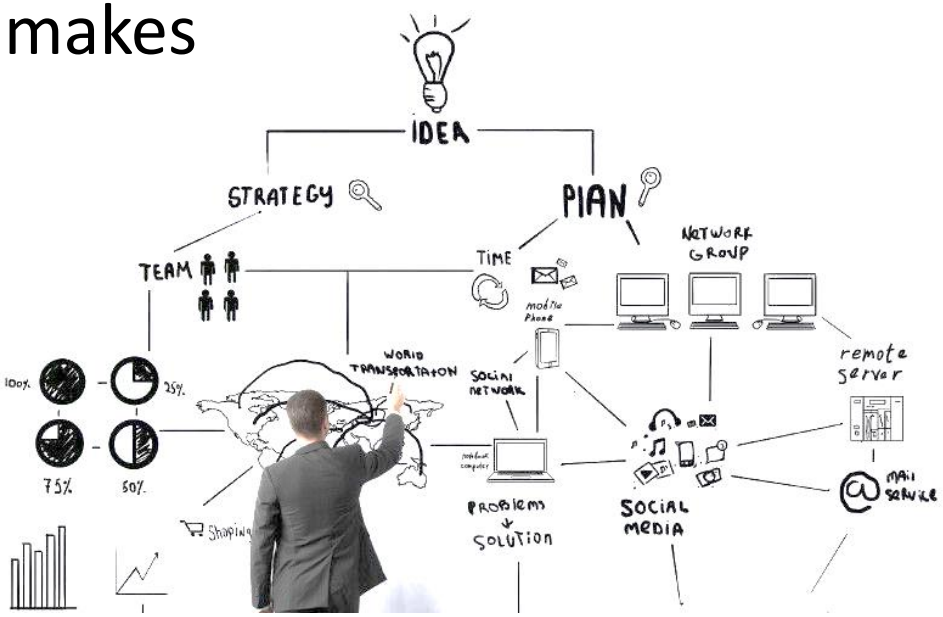
Software Design

- Focus on the **technical part.** Why?

Background

- CSSs of interest for human factors are man-made and therefore built-in resilience, either intentional or not, **is part of their nature**;

- The growing complexity in the 21st century makes even clearer:
    - Emphasis on RP;
    - The need to plan ahead;
    - **Start on the Design phase.**



Research Question

Which are the concept and core principles of **Design for Resilient Performance?** How do they work in practice?

Method Steps

- STEP 1: **Literature Review**
  - 11 Human Factors Disciplines
  - 14 Seminal References

→ **113 Principles identified**

- STEP 2: **Initial Analysis**
  - Check for redundancies
  - Irrelevant principles excluded
  - Unification of similar principles

→ **24 Design Principles**

Method Steps

- STEP 3: **Delphi Method**
  - Selection of experts
  - Round 1 – 24 principles
  - Round 2 – 10 principles
  - Round 3 – 8 principles

→ **DfRP Concept and 7 Design Principles**

- STEP 4: **RRTs Case Studies**
  - RRT Document analyses from 2 hospitals
    - Working protocols
    - Activation parameters
  - Semi-structured interviews
    - 4 Afferent arm
    - 4 Efferent arm

→ **Principles in Practice**

DfRP Concept

DfRP is the use of design principles to support integrated human, technical, and organisational adaptive capabilities.

DfRP Principles

1. There must be functional models of the system;
2. Make variations in performance visible;
3. Use the type of standardization that best fits the nature of the function;
4. Design slack resources and strategies;
5. Design for acceptable performance even under degraded conditions;
6. Design must involve leveraging diverse perspectives;
7. Design to support continuous learning at the individual and organisational level.

Rapid Response Teams

- The concept emerged in the 1990s in Australia as **a plausible measure to identify and act rapidly in the face of deteriorating clinical conditions.**

- RRTs are also known as:
  - Medical Emergency Team (MET);
  - Medical Response Team (MRT);

- The RRT system is divided into **two arms***:*

Afferent Arm

Efferent Arm

Rapid Response Teams

- The **composition of the teams varies** widely: doctors, nurses, nursing technicians and physiotherapists.
- This team acts on early detection of respiratory, neurological, or cardiac deterioration by monitoring vital signs:

-Systolic BP
-Respiration rate;
-Oxygen saturation
-Any supplemental Oxygen
-Temperature;
-Heart rate;
-Level of consciousness;

- RRT can be activated in **2 different ways**:
  - Dichotomous Triggers
  - Early Warning Scoring (EWS)

RRTs Case Studies

- **Hospital A**
  - Since 1970
  - 800 beds
  - RRT since 2014
  - Team: physician + nurses
  - Response time: 5 min
  - Activation: dichotomous triggers

- **Hospital B**
  - Since 1969
  - 180 beds
  - RRT since 2015
  - Team: physician + nurses
  - Response time: 5 min
  - Activation: NEWS

RRTs Case Studies

RESILIENT HEALTH CARE SOCIETY

- **Hospital A**

Medical Emergency Team

Call it whenever the patient* has at least one of the criteria below:

*adult patients only

Airway

- need for intubation

Breathing

- respiratory frequency < 8 or > 35 movements per minute
- oxygen saturation < 90%

Blood circulation

- heart rate < 40 or > 140 beats per minute
- systolic blood pressure < 80mmHg
- systolic blood pressure between 80 and 90 mmHg and worsening the clinical condition

State of Consciousness

- decrease in Glasgow coma scale > 2 points
- repeated prolonged or seizure (> 5 minutes)

- **Hospital B**

National Early Warning Score (NEWS)*

PHYSIOLOGICAL PARAMETERS	3	2	1	0	1	2	3
Respiration Rate	≤8		9 - 11	12 - 20		21 - 24	≥25
Oxygen Saturations	≤91	92 - 93	94 - 95	≥96			
Any Supplemental Oxygen		Yes		No			
Temperature	≤35		35.1 - 36.0	36.1 - 38.0	38.1 – 39.0	≥39.1	
Systolic BP	≤90	91 - 100	101 - 110	111 - 219			≥220
Hearth Rate	≤40		41 - 50	51 - 90	91 - 110	111 – 130	≥131
Level of Consciousness				A			V, P, or U

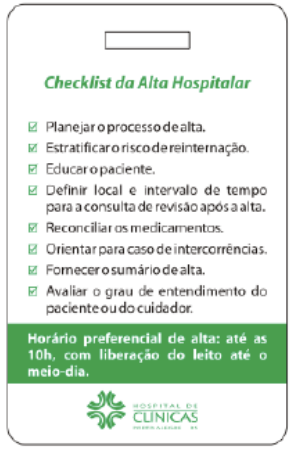
A: Alert *V: Verbal* *P: Pain* *U:Unresponsive*

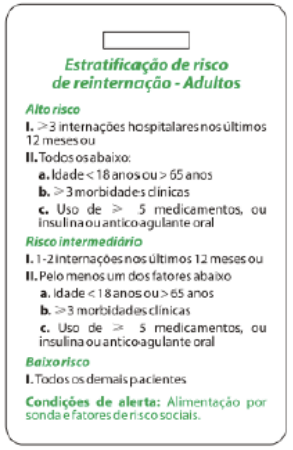
There must be functional models of the system

- The functioning of the system, both under normal and degraded conditions, must be explicitly modeled so as it can be influenced through design.

  - **SOPs:** team responsabilities, response time, parameters of activation, situations of system variability

  - **Visual Management Practices:** cards and posters



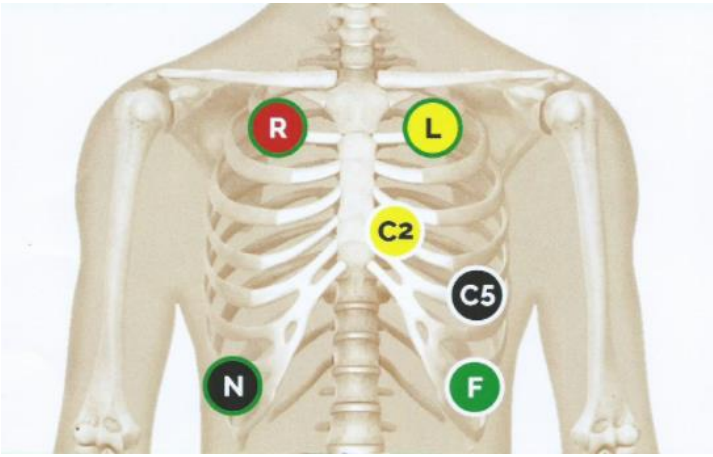


Make variations in performance visible

- In complex systems, variations in performance are inevitable. Gathering and sharing this information in real-time is vital to understanding complex systems, which change quickly.

  - The afferent arm **constantly monitors vital signs** according to patients' condition

  - Use of **Telemetry**



Design slack resources and strategies

- Slack resources (e.g., equipment, time, money, etc.) reduce tight couplings, slowing down the propagation of variability and supporting adaptation.
  - TRR can be classified as a form of **standby slack**
  - Helps the system to be **loosely-coupled**

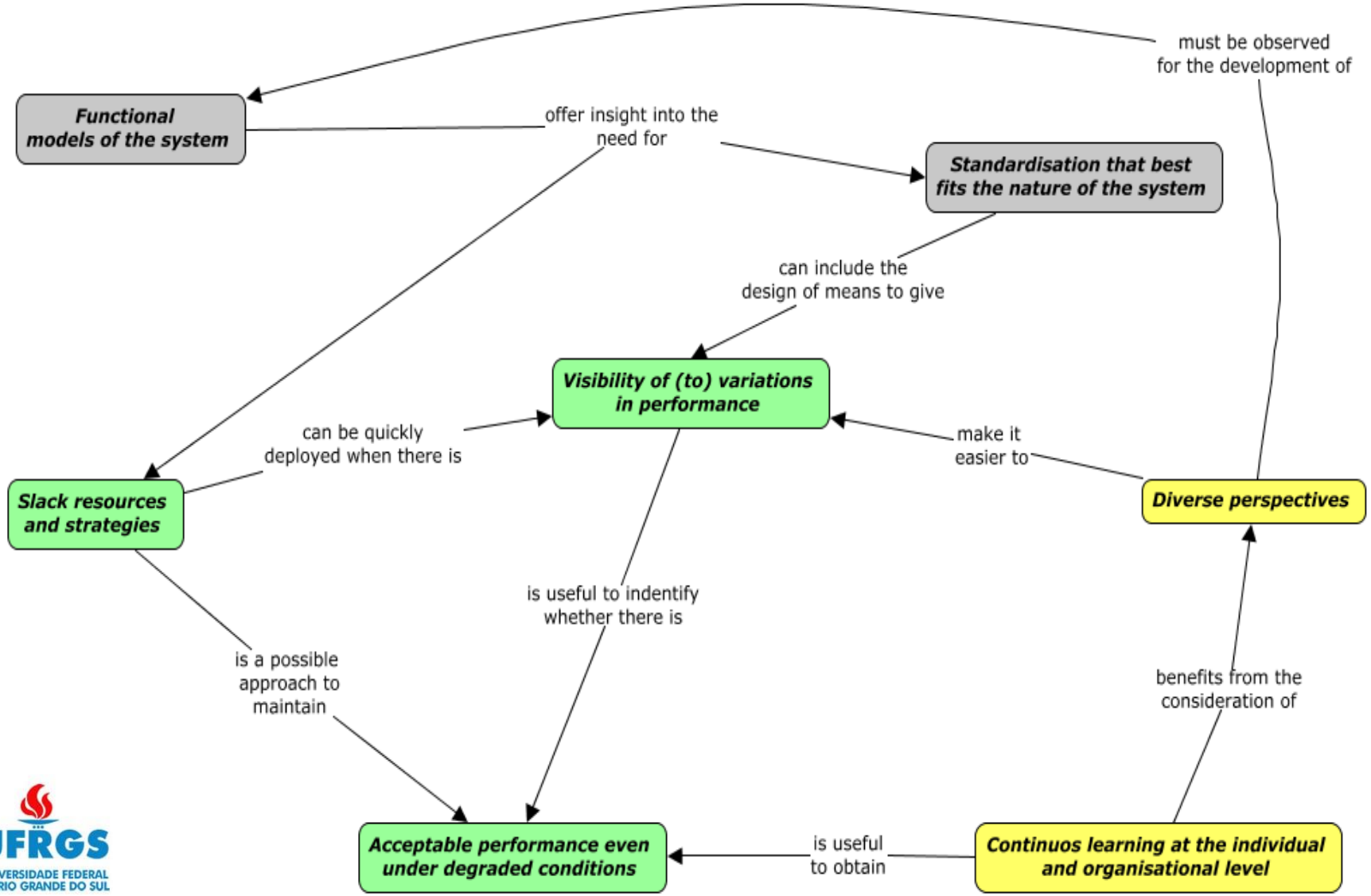
Design must involve leveraging diverse perspectives

- This principle is applicable both to the design process and to the system resulting from design.

  - **Multidisciplinary Teams:** physicians, nurses and nurse technician

  - Enables **joint decision-making**

Relationship among the principles



- mostly socially-oriented prescriptions
- mostly technically-oriented prescriptions
- prescriptions that allow social-technical representations of the system

Conclusion

- **The literature review and the Delphi method** allowed us to build a concept and list of principles;

- **The assessment of the RRTs:**
  - Shed light on their strengths and weaknesses;
  - Helped to validate the concept and the principles;

- The principles are **helpful to evaluate** the existing system, helping for a **possible redesign**. Even though, some can be **intrinsic** to the system.

- **Next Steps:** apply this protocol in other healthcare systems.

Thank you!!!

- **Claudia Guerra Disconzi**
- **Tarcísio Abreu Saurin**

claudiaguerraep@gmail.com

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