

Characterizing complex socio-technical systems: a comparison between emergency departments in Brazil and the USA

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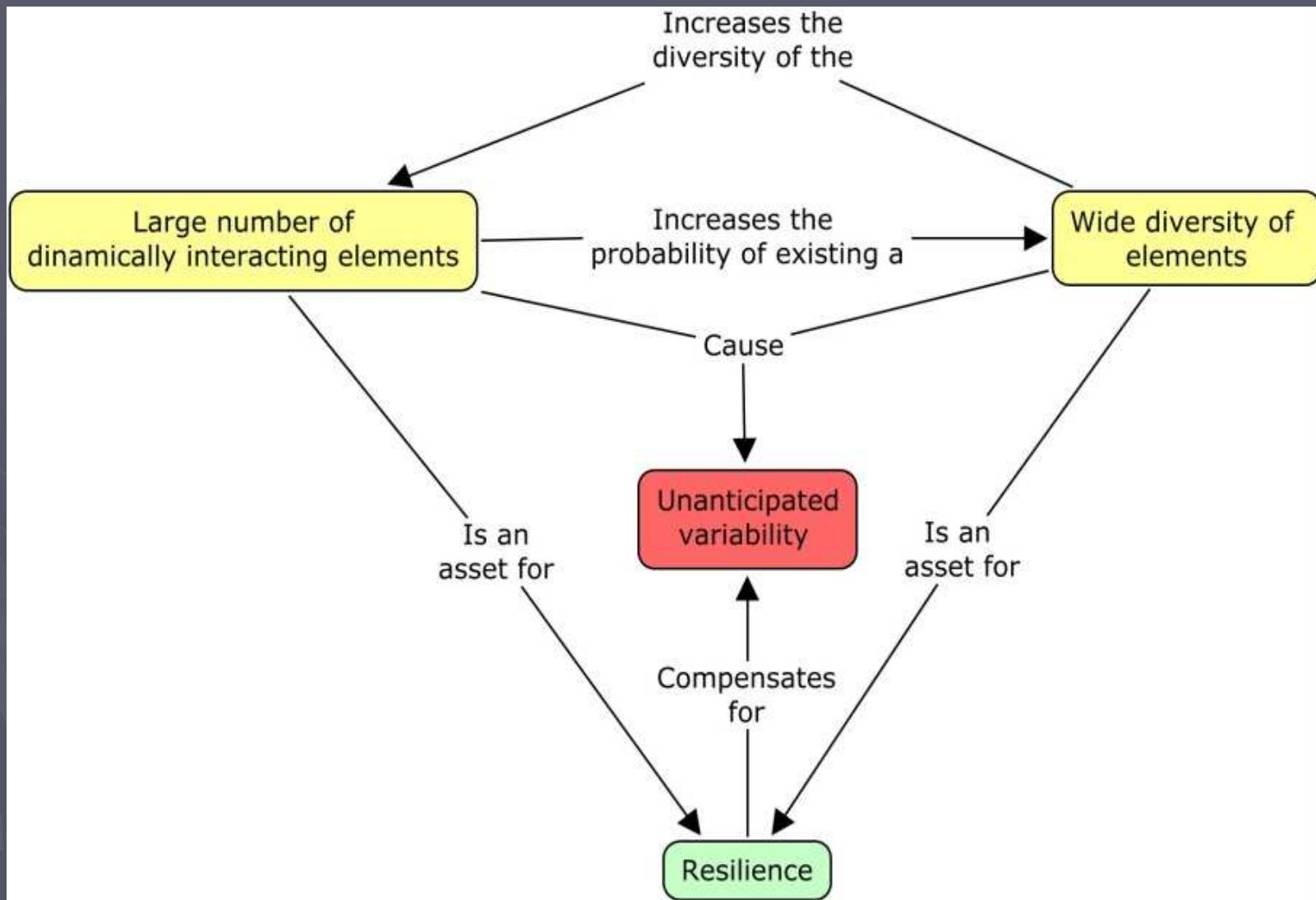


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Background

- ▶ Complexity has a number of attributes with different intensities
 - Description may support system design
- ▶ Lack of methods
 - Not committed to an explicit description of complexity attributes (e.g. FRAM)

What is complexity?



Objective of this paper

Test a framework for characterizing
complexity attributes



- ▶ University hospital
 - Public healthcare network
- ▶ General practice, general surgery, gynecology and pediatrics
- ▶ 55,000 patients a year; 250 employees; 41 beds; 20 seats





- ▶ University hospital
- ▶ = to Brazil + trauma
 - Higher incidence of life-threatening cases
- ▶ Residence in emergency medicine
- ▶ 86,000 patients a year, 270 employees, 82 beds

Data Collection

- ▶ Observations of work at the front-line
 - 110 hours in Brazil, 65 hours in the USA
- ▶ Analysis of documents
 - SOPs, training programs,..
- ▶ Interviews with employees
 - 20 in each ED
 - Critical decision method

Data Collection

- ▶ Questionnaire to evaluate the intensity
 - 22 statements across the four categories of complexity attributes
 - 120 USA, 79 Brazil; questerview

There is substantial slack in my work environment (e.g., equipment and team redundancy; plenty of time to make a decision; alternatives of medication)

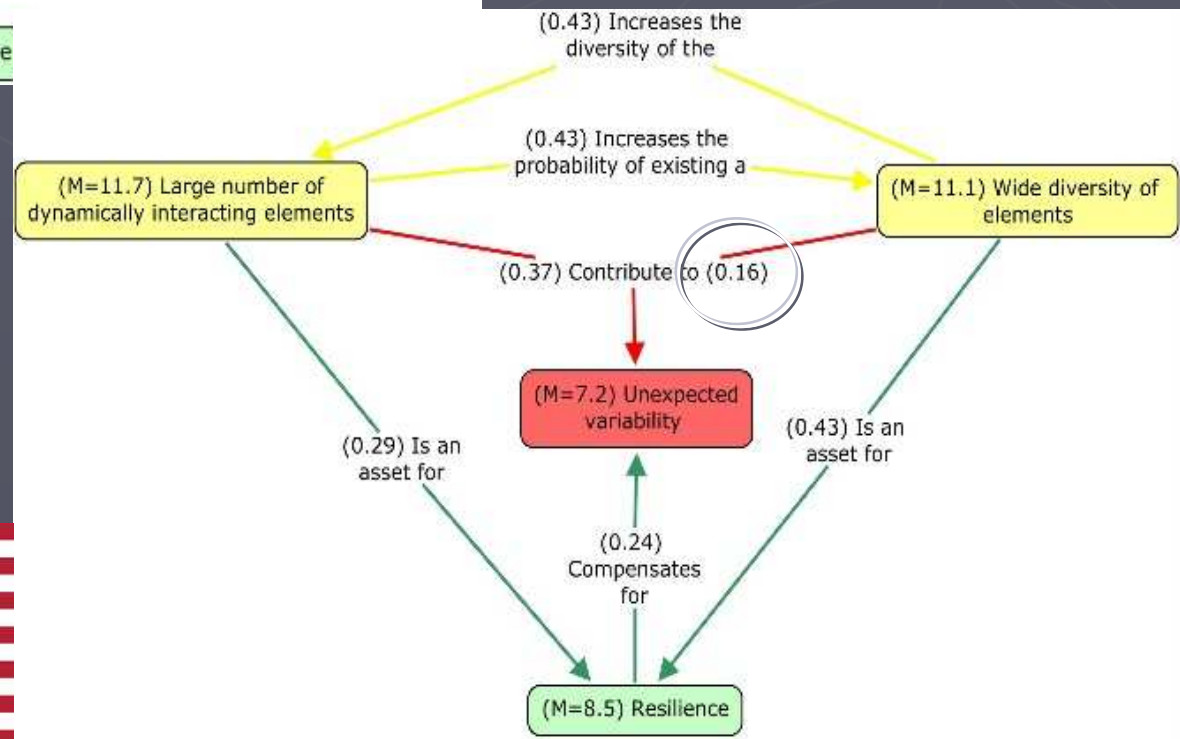
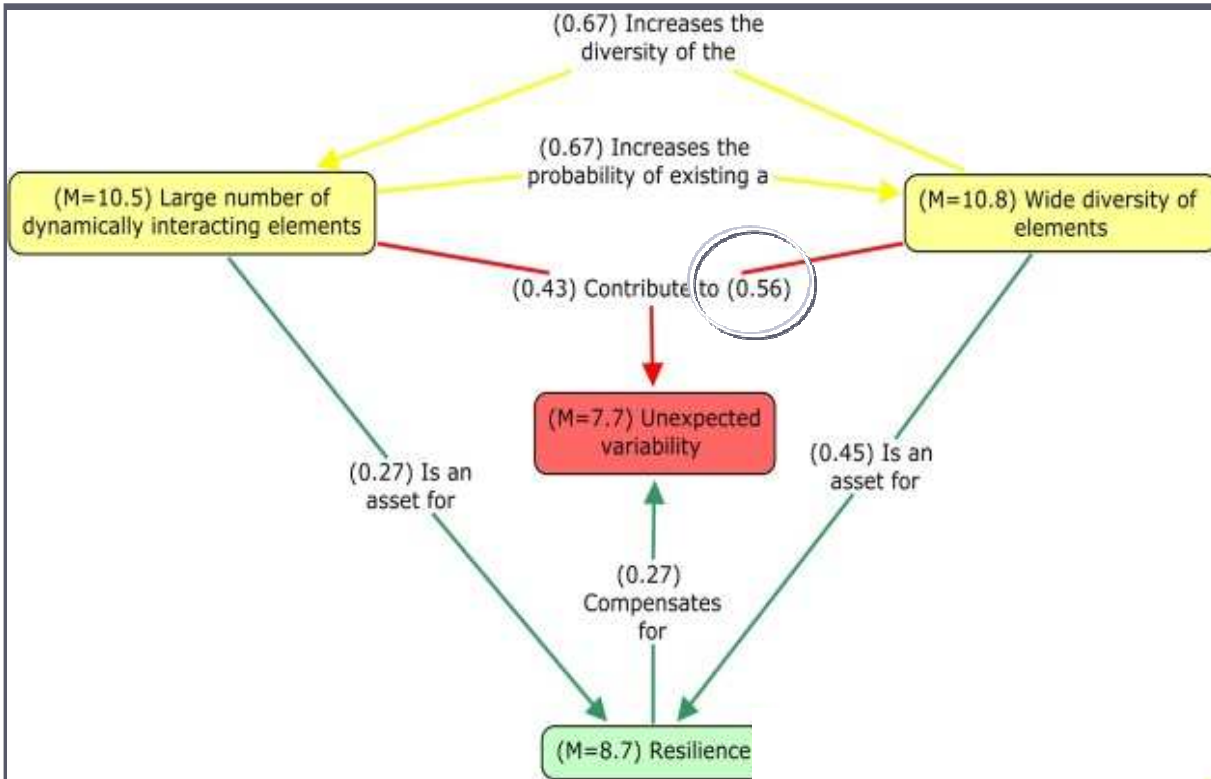
***Totally
disagree***

X

***Totally
agree***

Data Analysis

- ▶ Content analysis; descriptive statistics
- ▶ Description of the four categories of attributes, concept maps, types of complexity



Main Results

- ▶ In the U.S. ED, the diversity of employees' skills matches better the diversity of patients' conditions
 - ▶ Helps to deal with unexpected variability
 - ▶ Residence + wider diversity of RS in the USA
 - ▶ E.g. workarounds involving the use of equipment and materials

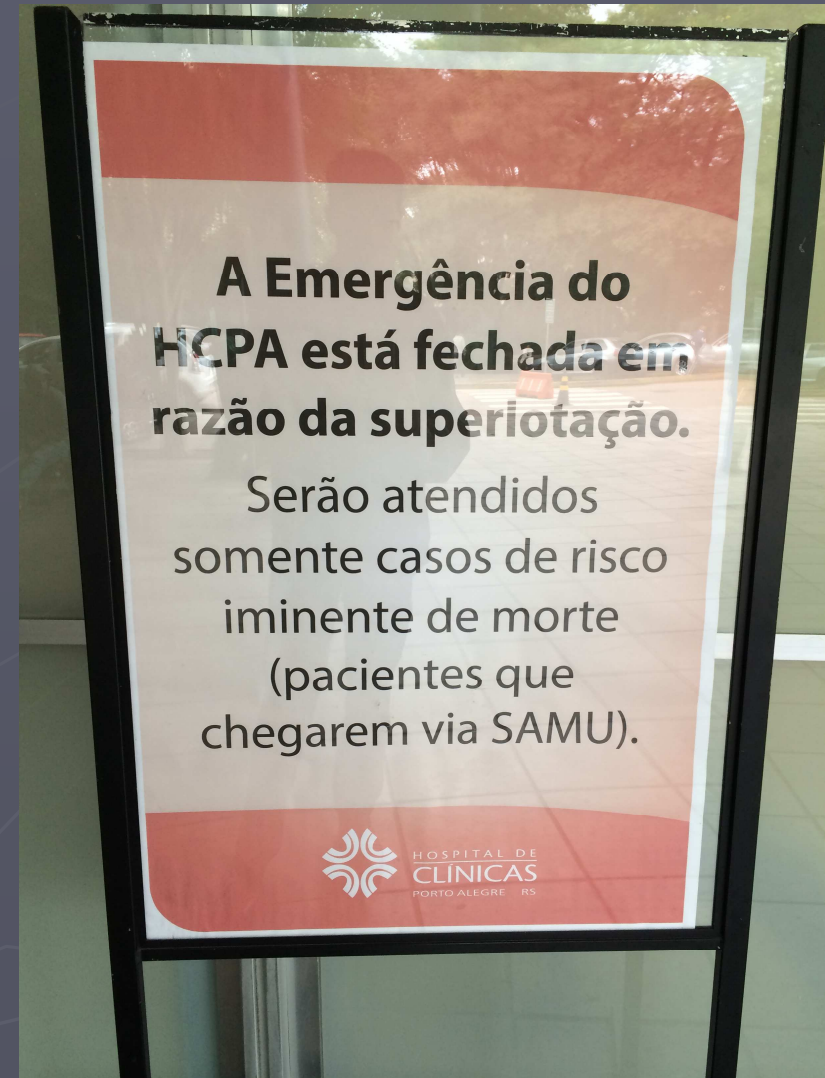
Types of Complexity

Complexity Type	Liability	Asset
Unmanageable	Some uncertainties arising from the external environment – e.g. diversity of patients, overcrowding,....	Some uncertainties arising from the external environment – e.g. new technologies, new possibilities of funding,...
Manageable	e.g. inefficient internal processes, waste	e.g. diversity of skills of employees

1

Not manageable / Liability

- ▶ Number and diversity of conditions of patients
- ▶ Overcrowding





2

Manageable / Liability

- ▶ Prescriptions delivered to the pharmacy once a day, for the following 24 hours of treatment
 - Reduces interactions physician – pharmacy
 - Increases time pressure and number of interactions pharmacist – medications
 - Smaller batches could increase resilience capacity

3

Manageable / Liability

Looking for medications and patients



Conclusions

- ▶ "Attribute view" of complexity
 - Quantification and description of complexity
 - Objective and relative account of complexity
- ▶ Impact of some complexity attributes is ambiguous
 - Types of diversity

Conclusions

- ▶ Manageable/unmanageable is negotiable
 - Which control measures are realistic?
 - Unmanageable: resilience for *compensating* variability
 - Manageable: resilience for *preventing* and *limiting* variability
- ▶ Complexity characteristics were similar
 - Do they evolve similarly? Why? How?

Thank you for your attention!