Pandemic System-of-Systems Framework

Corrêa de Sá, System (Gestalt) Thinker, Consultant

correa_de_saa@hotmail.com

Introduction

The aim of this article draft is to present to the members of the C19WG, of the SCSC, the actual version (version 2.1) of a Pandemic Framework, based on System-of-Systems modelling, so it can be discussed, improved and updated; And, in this way, one hopes, help to attain the objectives of the Group, in particular, to provide a general schema of a pandemic, and to pin-point critical-systems for future study.

Before presenting the Framework, one will make a comment about modelling. As everybody knows, a model is always a simplification of reality, with a specific intention, and, as so, any conclusion or decision based on a model must consider the existing simplifications. But, even being a simplification of reality, a model must reflect the complexity of the reality modelled, but, it, also, must consider the human limitations (per example, in terms of knowledge and cognition), the technical limitations (per example, in terms of time and technology), and intention. As so, it might be said that, the evaluation if a model is too complex or too simple is subjective – but, in either case, it has an implication for its assurance and validation. To conclude, one would say that the "as simple as possible" principle must always be considered in modelling.

A System-of-Systems (Engineering) approach was used since it allows to frame, understand, and discuss the complex relations between (critical) systems, including: its (relevant and necessary) systems, relationships between its systems, (complex and remote) causal relations, (resulting) emergent properties, evolutionary behaviours; compare assumptions, adjust mental models; and gain insight of the consequences of a (policy) decision.

The Framework, presented here, is intended to be a general pandemic model. As so, it must be adapted and adjusted to each pandemic factor, population and scenario.

Model

The Pandemic System Dynamics Model is presented in Figure 1, and each element of the model will be presented and defined/explained in the following lines.

First, when the Pandemic Factor becomes part of the Population system an emergent property, Symptoms / Health Problems; emerges [1].

Second, the relation between the Population system, including the Pandemic Factor sub-system; and the Transport, Urbanization, and Infra-Structures / Activities systems leads to an emergent property, Transmission.

Third, the emergent property, Communication; emerges from the relation between the emitter systems, Emergence and Political / Technocrat; and the receiver system, Population; conditioned by the transmitter systems, School and Media.

Fourth, the emergent property, Contra-Information / Panic / Populist Policy; emerges from the relation between the systems, Health, Emergency, Legal, Political / Technocrat, School, Media, and Population.

Fifth, the emergent property, Pandemic, emerges from the relation between all systems.

Assumptions and Comments

The systems included in the system-of-systems are all themselves systems-of-systems, which each need a particular framework [2].

The inclusion of the Specialists sub-systems, in particular in the Academia / Industry system was intentional.

Conclusion

The Framework presented here, being a general pandemic model, should (if "correct" and "complete") allow several endeavours. First, it allows to apprehend

[1] When all is known about the action of the virus in humans, then it can be considered a characteristic of the human System.
[2] One has included some relevant and critical systems and emergent properties which need to be considered.

all the systems involved. Second, it allows to apprehend all the variables involved. Third, it allows to identify all the necessary and relevant information. Fourth, it allows to identify, and evaluate all the uncertainties relative to the information. Fifth, it allows to identify (complex) causal relations. Sixth, it allows to define, and assure [3] which information should be considered in (policy) decision making. Seventh, it allows to evaluate decision making. Eighth, it allows to develop, assure, validate, and evaluate scenario modelling, including in pandemic planning, and for pandemic (policy) action.

One hopes that, this article draft will lead to a discussion which will allow the framework (and the article) to be improved and updated, and C19WG to attain the objectives, provide a general schema of a pandemic, and to identify its critical-systems.

Bibliography

…

[3] When included in a Policy Assurance Case.

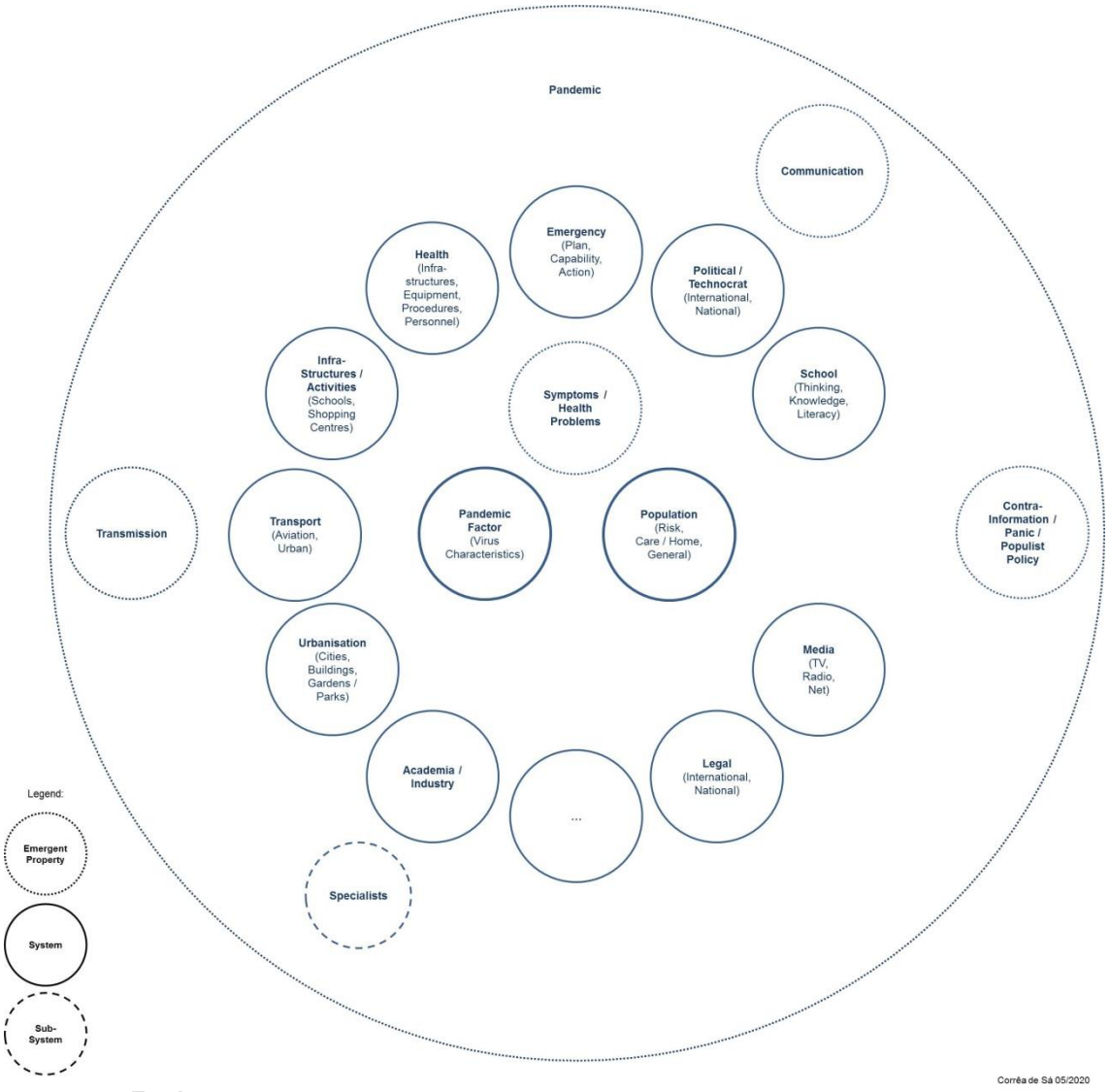

Figure 1: Pandemic System-of-Systems Framework.