MISQ Archivist

Provisioning Interoperable Disaster Management Systems: Integrated, Unified, and Federated Approaches

Hong Guo, Yipeng Liu, and Barry R. Nault

Abstract

In this paper, we analyze the choice of interoperability approach for the provision of disaster management systems (DMS) when resources are distributed across districts and, in times of disaster, resources can be shared. The degree to which sharing (a spillover) can be coordinated efficiently depends on resource interoperability. In this public sector setting, we model the provisioning of DMS as the choice between interoperability approaches; in decreasing order of centralization they are integrated, unified, and federated. A unique feature of our setting is that the interoperability approach is a collective decision by districts. Districts choose their own DMS resources and interoperability effort, and face different interoperability efficiency and technology misfit costs depending on the interoperability approach.

We find that any approach can be an equilibrium depending on interoperability efficiency, and that when the social optimum deviates from the equilibrium, the socially optimal approach is more centralized. When subsidies and taxes are implemented, the socially optimal interoperability approach can be achieved with budget balance. When only subsidies can be used, the socially optimal approach can be achieved but only under certain interoperability efficiency and misfit cost conditions is there a net social gain. Having an initial level of interoperability causes the equilibrium interoperability approach to shift toward a less centralized one. Our results generalize to other settings characterized by interoperability concerns, collective decisions, and spillovers.

Keywords: Disaster management systems, interoperability framework, spillovers, centralization, public policy