

FIG WORKING WEEK 2019

22-26 April, Hanoi, Vietnam



Presented at the FIG Working Week 2019
April 22-26, 2019 in Hanoi, Vietnam

"Geospatial Information for a Smarter Life
and Environmental Resilience"



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Selection of the Elements for a Continuously Operating Reference Station (CORS) Ecosystem Model

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Content

- Background
- Rationale
- Findings
- Further work

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CORS in general:

- recognised as a positioning infrastructure since the 90s
- changes along the 30 years
 - Technology; IoT, 5G, AI
 - User; knowledge, awareness, expansion (volume & purposes)
 - Institution; law, data policy, custody, business model
- Implementation is still challenging in many countries

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Research Challenge

To propose a suitable CORS access policy for each individual (national) context

How?

Best-practices, considerations, opinions, theses and data from academia and industries are the sources for formulating the conceptual model, then Decision Support System (DSS).

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Findings

- Previous works were in many perspectives(technical, legal, managerial etc.).
- Context is crucial in implementing CORS, many factors are relevant.
- **The concept of ecosystem helps to understand CORS and its implementation.**



CORS, A LIVING THING

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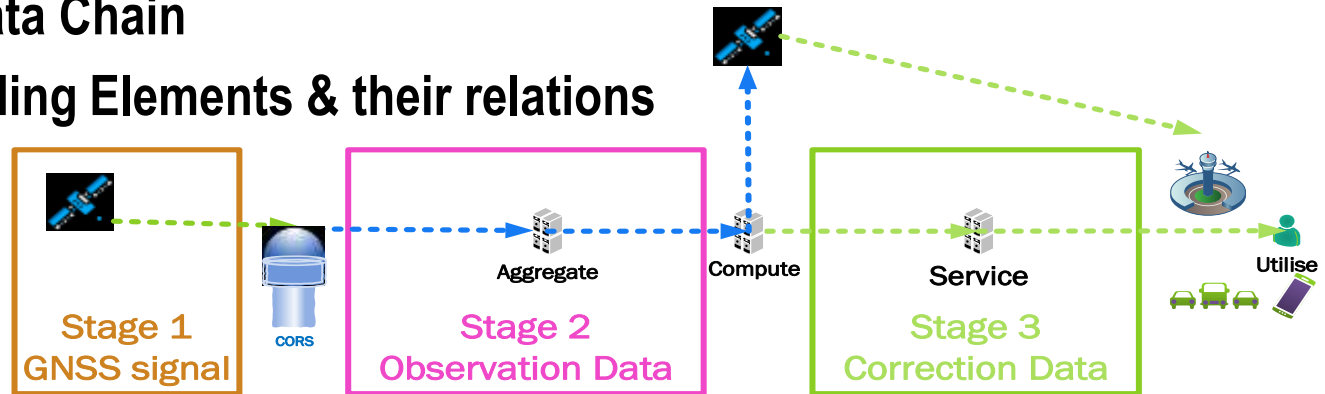
CORS Ecosystem

where CORS can be implemented;

- **establish, maintain and utilise.**

Including;

- **CORS Data Chain**
- **Surrounding Elements & their relations**



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Access Policy Options

- Cost-recovery or Open Data?
- Government controlled or business controlled system?

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Spatial Data Infrastructure (SDI) framework and CORS

- SDI elements (data, people, policy, access and standard) are similar to elements in a CORS ecosystem.
- Sharing characteristics
 - initiatives in spatial data domain (interoperability, utilization)
 - hierarchical characteristics

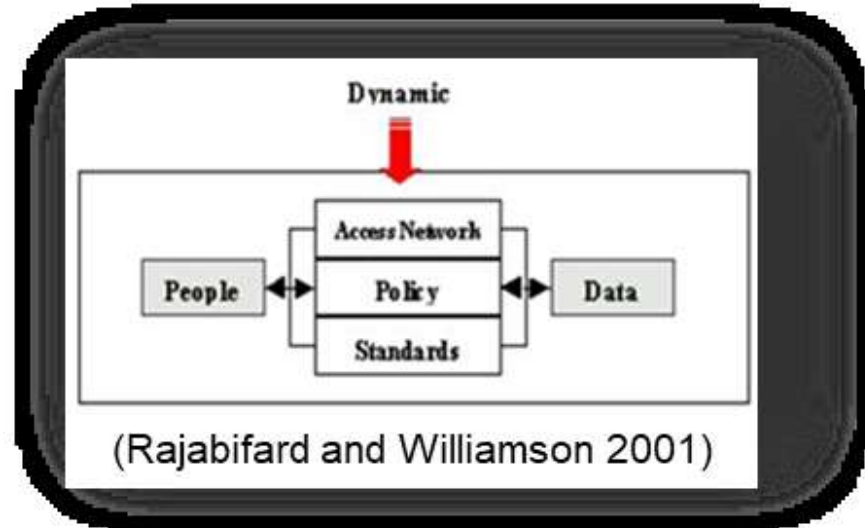




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Applicability of SDI framework to a CORS ecosystem model

- CORS as part of SDI—*CORS data can be legitimately considered as a dataset in SDI*
- An approach: Planetary Spatial Data Infrastructures (PSDIs)
- **Some adaptations**
 - Data is combination between CORS (stations) and data chain
 - The integration between policy and institutional framework
 - The inclusion of technology and other infrastructures

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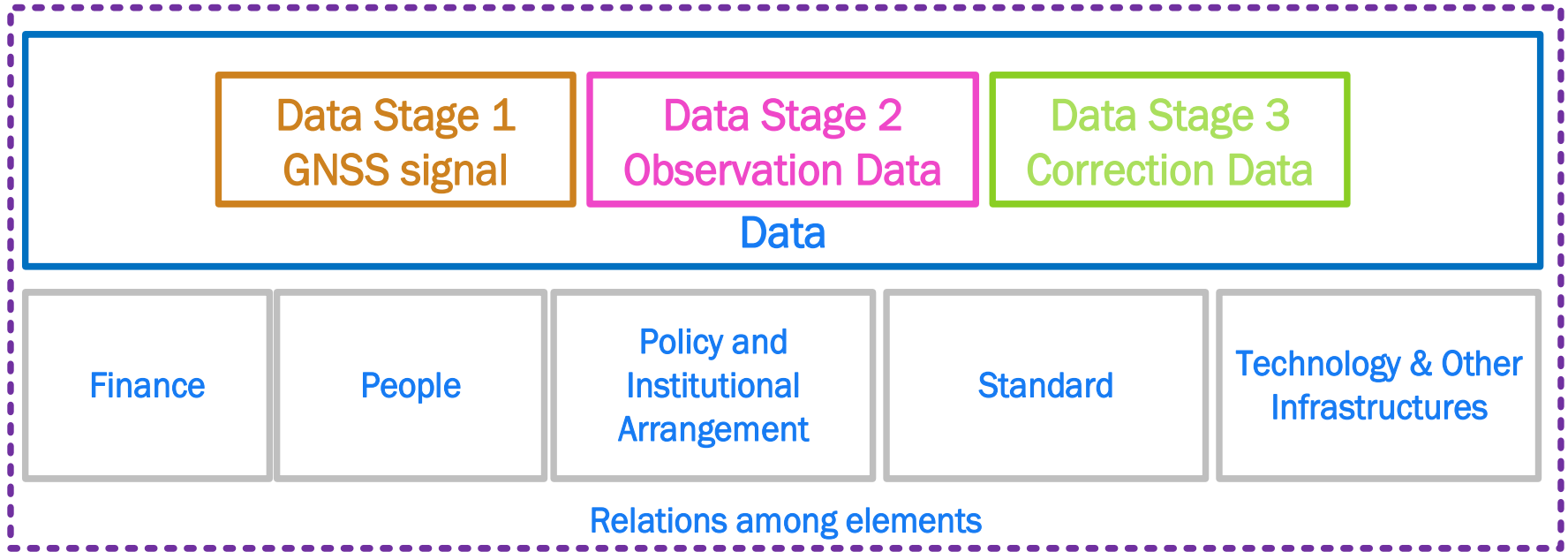
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A CORS ecosystem conceptual model: SDI approach



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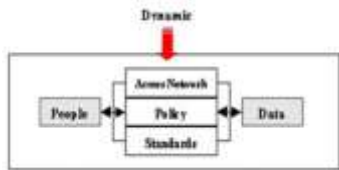
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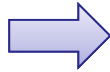


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SDI



(Rajabifard and Williamson 2001)



(van Loenen 2009)



SDI Element	Financial Resources	Institutional Framework	Human Resources	Technology	Standards	Data
Financial Resources	Availability of Funding is critical for all part of CORS data chain.	Institutional Arrangement determines sources of funding.	Funding resources are based on human decision. Awareness will lead to soft money, commitment to continuing	Funding is important for technological accessibility. Technology also boosts the growth of funding.	Financial Resource can be a constrain for CORS standard maintaining.	Budget constrain also influences data characteristics. Produce/distribute/store [17, 18]
Institutional Framework	Law, Policy, Institutional Arrangement are fundamental establishment of the implementation of CORS.	What organization(s) /stakeholders will do what? Custodianship/ownership/regulator etc [19] Institutions, policies, and financial resources decide who exactly collects and gathers what information and who may use it [16].		Policy is designed based on the technological advancement.	Standard support interoperability between organizations [20]	Policy and organizations determine the data characteristics, purpose, quality, efficiency and Timeliness [16, 21, 22].
Human Resources		Collector, aggregator, regulator, distributor,		Technology support human activities in the data chain as well as other indirect activities affecting the data chain.	Standards provide cooperatives between people. It boots the human productivities [17].	Human require/produce/store spatial data for a purpose(s).
Technology				Science and methods used to achieve CORS implementation goal(s).	Technology determines CORS standard both data, hardware and software [16].	Technology facilitate CORS data chain. It also determines demand, specification, data collection, processing and utilization
Standards					CORS standards are issued by many organizations from global to national. It can be seen from CORS hierarchy which classifies CORS in different tiers [23]. CORS Data is standardized according to the tier. CORS Data standard: data in each stage has standard both open standards and manufactory standards. Communication Standard: By influencing the primary element, standards also influence other elements.	defines data format, quality, characteristics etc.
Data						CORS aims to support correction data. Different data types exist in the correction process. CORS Data Chain is the primary element in CORS ecosystem. The data in each CORS data chain can be considered as spatial data itself and data-framework.

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Conclusion and Further work

- To determine a suitable CORS access policy for CORS implementation, the entire CORS ecosystem should be considered—individual context is very important.
- SDI framework can be used as the basis for modelling the CORS ecosystem.
- Further work
 - Validate and transform the concept into a model
 - Construct a Decision Support System

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Thank you for attention,
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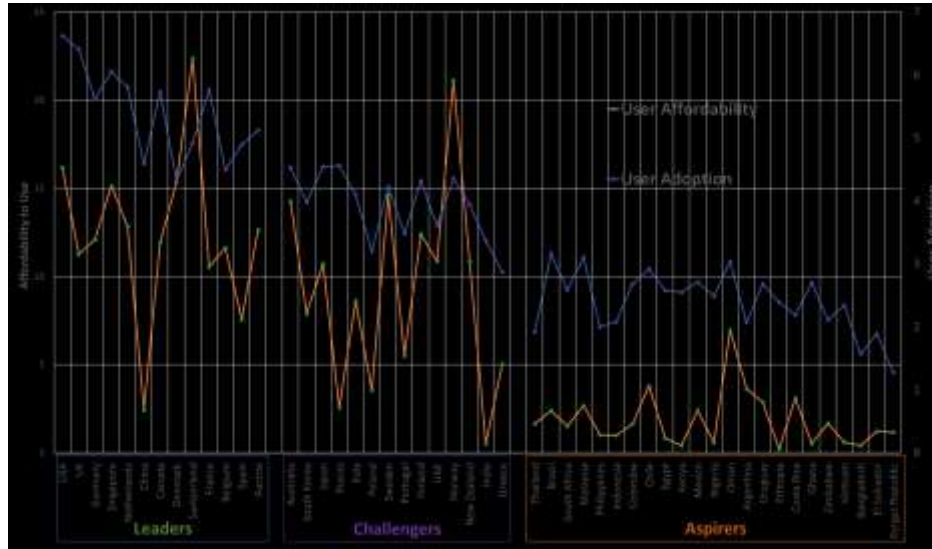


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The trends of user affordability and adoption are similar in the three groups.

The low-cost equipment can be still too expensive for people in many countries in all groups.

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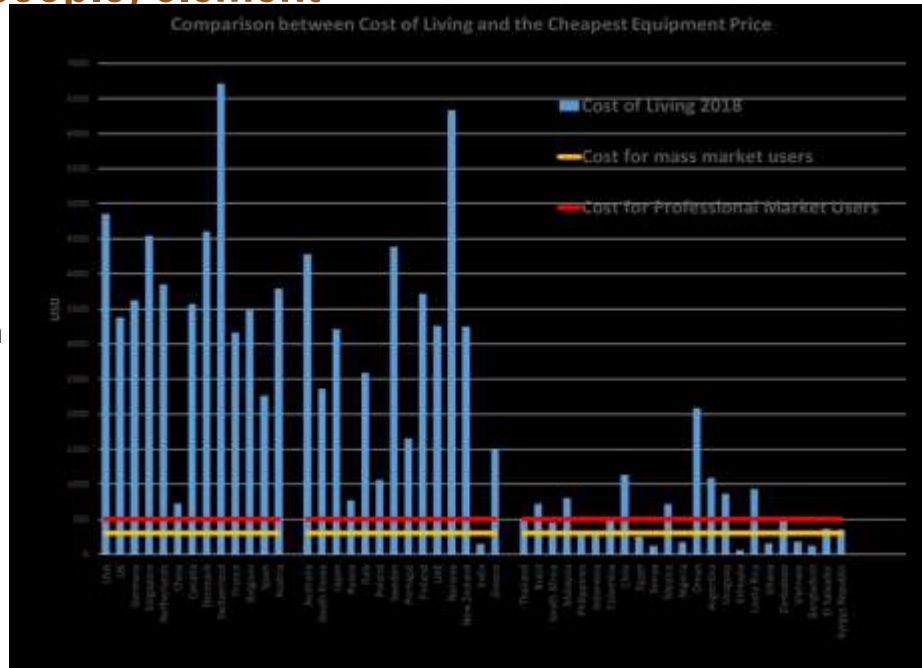
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An example in user (people) element

- User Capability
 - Knowledge/awareness
 - Affordability

The mass market user costs in many countries are higher than the costs of living. It will be even more when looked at the cost of professional market users.



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