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A Case for a Systems Approach to EdTech

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EdTech is complex

1. High context dependency
    - CAL programs have differential impact (math/language, student quartile etc.)
2. Complex causal pathways
    - Access failed to improve outcomes (gender, socioeconomic backgrounds, integration of tech, teacher professional development etc.)
3. Scale and sustainability challenges
    - Complex set of factors impacting scale and sustainability (government/market, policy, ecosystem etc.)

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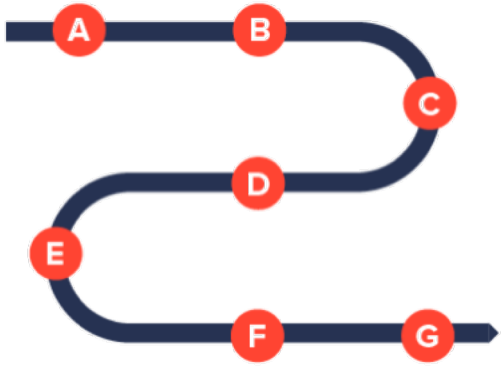
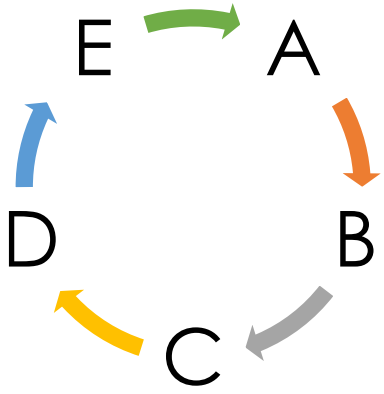
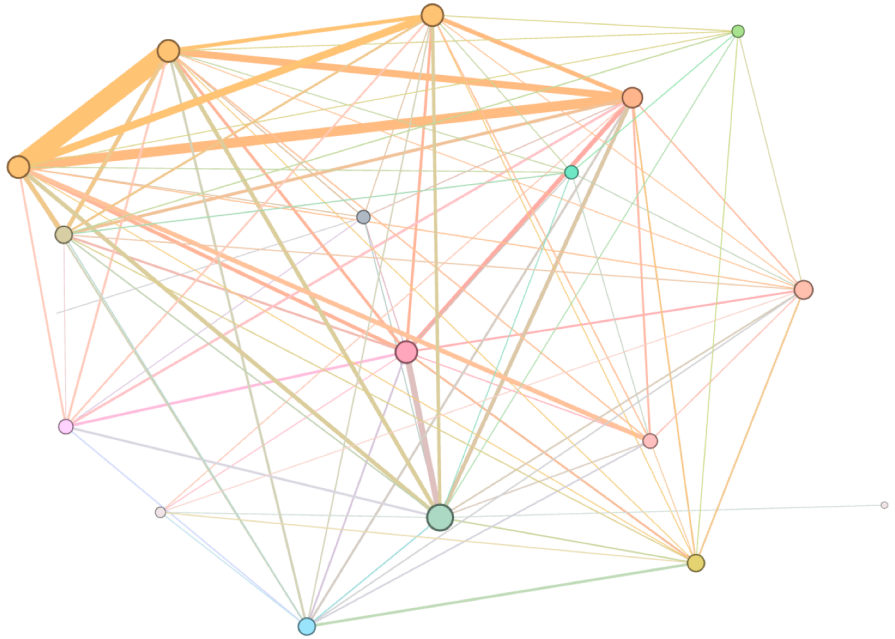
Are linear approaches enough?







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Systems thinking examines problems holistically

Conventional Thinking	Systems Thinking
The connection between problems and their causes is obvious and easy to trace.	The **relationship** between problems and their causes is **indirect and not obvious**.
Others, either within or outside our organization, are to blame for our problems and must be the ones to change.	**System actors have significant control or influence** in solving them through changing our behavior.
A policy designed to achieve short-term success will also assure long-term success.	Most quick fixes have **unintended consequence**s: they make no difference or make matters worse in the long run.
In order to optimise the whole, we must optimise the parts.	In order to optimize the whole we **must improve *relationships*** among the parts.
Many independent initiatives should be aggressively tackled simultaneously.	Only a **few key coordinated changes** sustained over time will produce large systems change.

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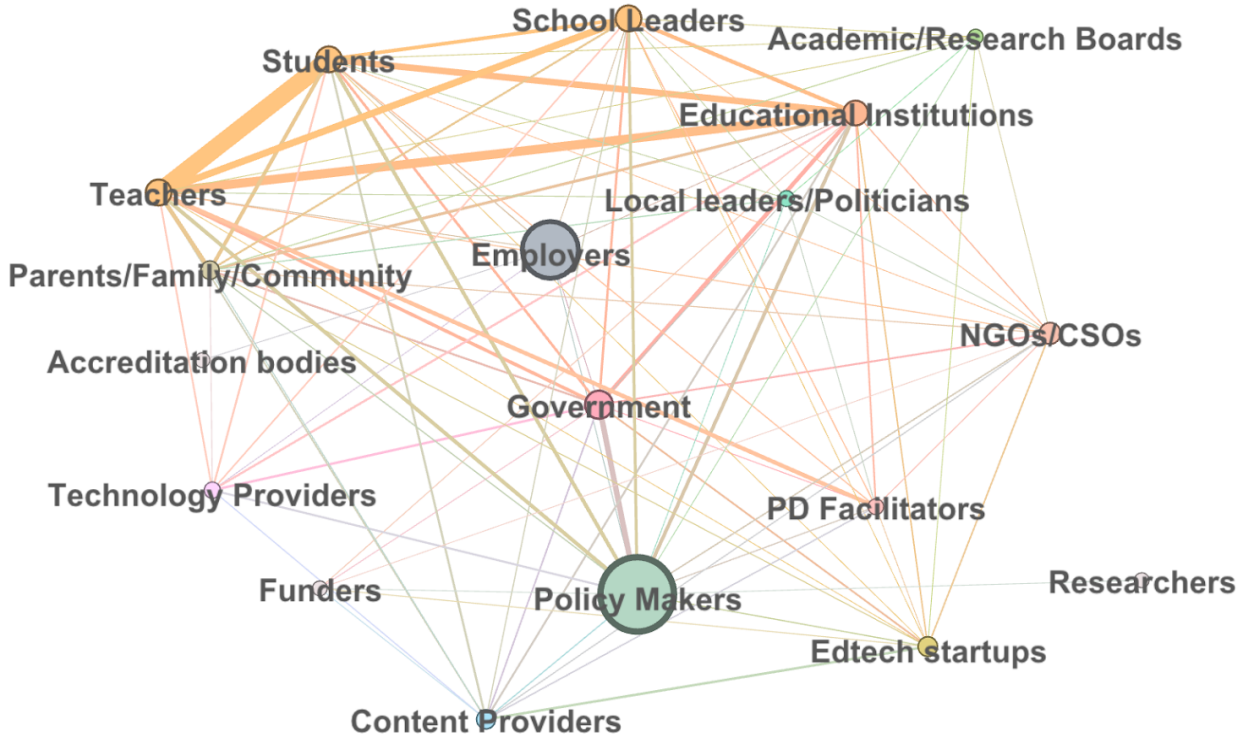
The EdTech network



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Summary of the EdTech network

- High interconnectedness
- Central nodes
  - Policymakers, government
  - School leaders, teachers, students
- Influential nodes
  - Policymakers, employers
  - Accreditation bodies!

- Limitations
  - 1 mode network
  - Theoretical
  - Needs validation

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Thank you!

Annex Slides

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Limitations of EdTech frameworks

- Linear approach
- Not all take into account context
- Very specific purpose
- Limited focus (macro/meso/micro)
  - Macro: SABER-ICT, UNESCO
  - Meso: Holistic Integration Framework, ICT4E
  - Micro: TPACK
  - Multi-level: Omidyar

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Systems approaches provide new tools and insights for research

- Allow for the structuring of many variables into meaningful patterns
- Enable the observation of interactions and patterns not necessarily visible using linear approaches
- Add a repertoire of mathematical tools such as game theory, linear programming and matrix theory to traditional research methods (Stowe, 1973)

Applying systems approaches to EdTech research

- **Redefine research questions**
  - What governance structures do we need to create to improve data use in education? would become: How can we enhance and utilise the structures, resources, and processes already present to improve the equity and effectiveness of education?
- **Redesign research methods**
  - Causal Loop Diagrams, Social Network Mapping
- **Additional analytical methods**
  - Game theory, Matrix theory etc.
- **Possible systems theories for EdTech**
  - General Systems Theory (Bertalanffy, 1969)
  - Ecological Systems Theory (Bronfenbrenner, 1977)
  - Complexity Theory (Mason, 2008)

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Mapping the EdTech network: Methodology

1. Literature review to identify 17 EdTech frameworks
2. Review of education stakeholder literature
3. Codebooks of stakeholder characteristics and interactions developed from literature and expert inputs
4. Coded EdTech frameworks using codebooks
5. Generated code co-occurrence matrix
6. Created knowledge graph of EdTech stakeholders

Stakeholder code correlation matrix

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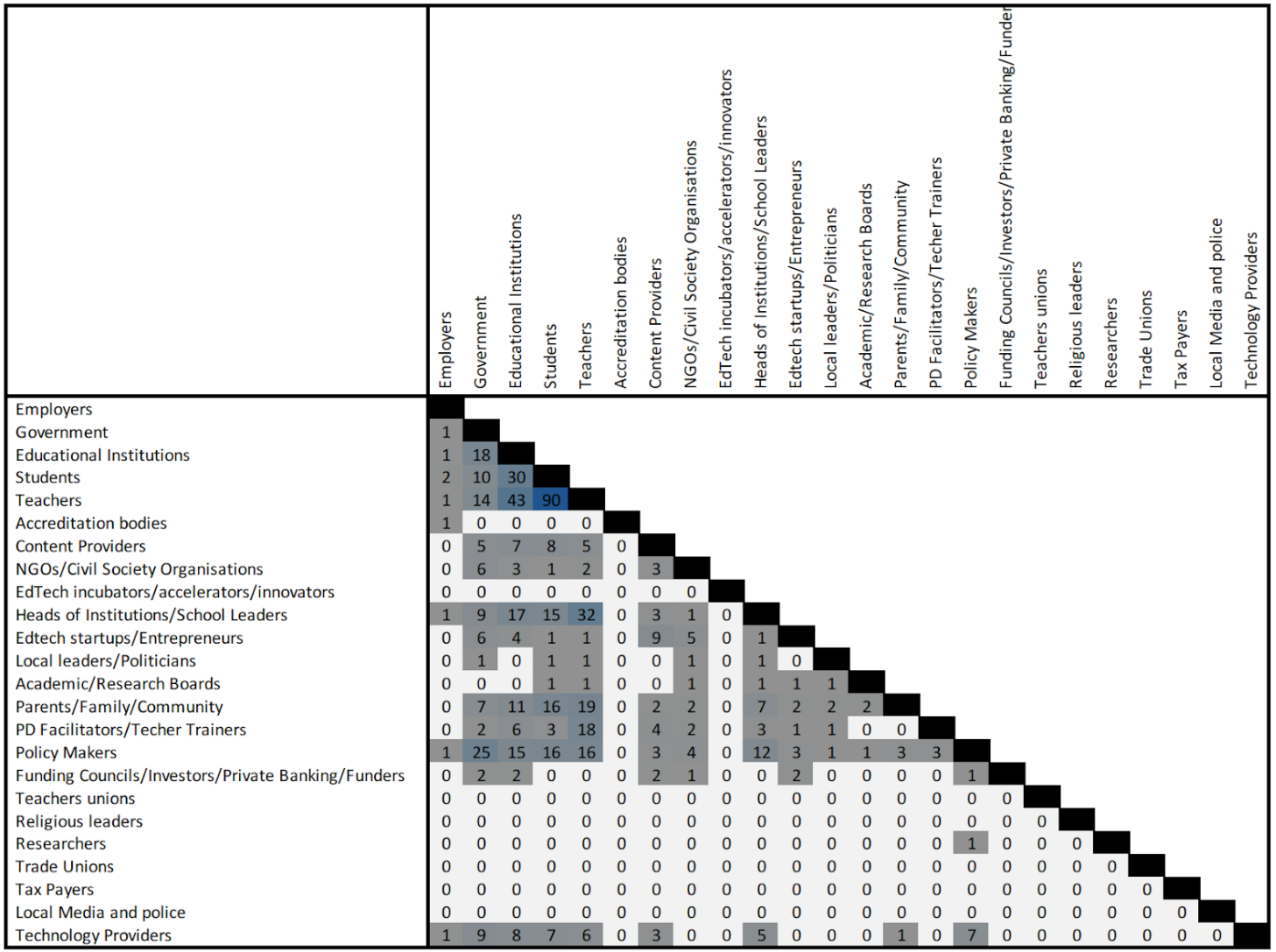

	Employers	Government	Educational Institutions	Students	Teachers	Accreditation bodies	Content Providers	NGOs/Civil Society Organisations	EdTech incubators/accelerators/innovators	Heads of Institutions/School Leaders	Edtech startups/Entrepreneurs	Local leaders/Politicians	Academic/Research Boards	Parents/Family/Community	PD Facilitators/Techer Trainers	Policy Makers	Funding Councils/Investors/Private Banking/Funder	Teachers unions	Religious leaders	Researchers	Trade Unions	Tax Payers	Local Media and police	Technology Providers
Employers																								
Government	1																							
Educational Institutions	1	18																						
Students	2	10	30																					
Teachers	1	14	43	90																				
Accreditation bodies	1	0	0	0	0																			
Content Providers	0	5	7	8	5	0																		
NGOs/Civil Society Organisations	0	6	3	1	2	0	3																	
EdTech incubators/accelerators/innovators	0	0	0	0	0	0	0	0																
Heads of Institutions/School Leaders	1	9	17	15	32	0	3	1	0															
Edtech startups/Entrepreneurs	0	6	4	1	1	0	9	5	0	1														
Local leaders/Politicians	0	1	0	1	1	0	0	1	0	1	0													
Academic/Research Boards	0	0	0	1	1	0	0	1	0	1	1	1												
Parents/Family/Community	0	7	11	16	19	0	2	2	0	7	2	2	2											
PD Facilitators/Techer Trainers	0	2	6	3	18	0	4	2	0	3	1	1	0	0										
Policy Makers	1	25	15	16	16	0	3	4	0	12	3	1	1	3	3									
Funding Councils/Investors/Private Banking/Funders	0	2	2	0	0	0	2	1	0	0	2	0	0	0	0	1								
Teachers unions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
Religious leaders	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Researchers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0					
Trade Unions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Tax Payers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Local Media and police	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Technology Providers	1	9	8	7	6	0	3	0	0	5	0	0	0	1	0	7	0	0	0	0	0	0	0	

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Mapping the EdTech network: network density and diameter

Network Metrics	Number
Nodes (Stakeholder)	18
Edges (Number of interactions)	93
Graph Density	0.60
Maximum Distance (Diameter)	3
Average Distance	1.45
EdTech Frameworks Analyzed	17