Navigating systems ideas for health practice: towards a common learning device

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Abstract

Systems thinking and reference to complexity science have gained currency in health sector practice and research. The extent to which such ideas might represent a mere passing fad or might more usefully be mobilized to tackle wicked problems in health systems is a concern underpinning this paper. Developing the usefulness of the systems idea requires appreciating how systems ideas are used essentially as constructs conceptually bounded by practitioners. Systems are used for purposes of understanding and engaging the reality of health issues, with the intent of transforming the reality into one that is more manageable, equitable and sustainable. We examine some manifestations of the systems idea in health practice and the traditions of systems practice that variously make use of them. This provides a platform for proposing a systems thinking in (health) practice heuristic: a learning device supporting how different tools and methods can address 'wicked problems' in health praxis. The device is built on the use of 'conversation' as a metaphor to help practitioners use systems ideas in tandem with existing disciplinary and professional skills and methods. We consider how the application of the heuristic requires, and helps to develop, human characteristics of humility, empathy, and recognition of fallibility.

Keywords: health praxis, health systems, systems thinking, systems thinking in practice, systems practice, wicked problems

1. Introduction: wicked health situations

Health practice has always been multifaceted and complex: interdependent on the economy, societal development, cultural norms, political upheavals, and environmental perturbations. Contemporary means of improving health care have focused on reducing complexity by extracting actionable evidence about cause and effect (e.g. randomized control trials), and controlling complexity with use of linear tools (e.g. logframes). Whilst helpful, we are discovering that not all problems—particularly human problems around health—are amenable to the type of reduction and control methods which currently dominate policy and practice [1, 2]. Shedding further doubt on the certainty that is pervasive within the sciences is the increasing recognition that our most hallowed approaches to "truth" are themselves inevitably fallible [3]. While recognition of fallibility is growing [4], the insular nature of training, practice, publication, and advancement, in healthcare have stifled efforts to constructively address the recognition of fallibility [5]. While the needs of populations have increasingly required integration and collaboration across and beyond health practice, there is a need to cross the boundaries that separate and insulate professions and sectors; a need for taking more broader and more circumspect approaches to health practice. From within existing silos, p-values and odds ratios proclaim scientific success but mask a system built less and less for the populations it serves. The dominant medical paradigm has become tribal [5], and few have communicated the shortcomings of this reality and reached the public's consciousness more fully than Atul Gawande: arrogance, insulation, and certainty seem to be limiting our collective ability as health professionals to maximize the health of our communities [6].

Health issues from generic inequities of access to health services to more specific issues of alcohol or drug abuse, and child care or dementia support in the North, ending preventable deaths in the South, and sustaining achievements everywhere represent 'wicked problems'. A wicked problem situation is one where the boundaries of the situation are unclear, the overall complexity of issues appears overwhelming, and solutions are not readily available in circumstances of prevailing change and uncertainty [7]. Seeing health as a wicked problem situation [8, 9]—messy situations with complications, complexity and conflict—has invited use of systems thinking tools to help better understand health situations and better navigate strategies for improving situations [10, 11, 12, 13, 14, 15, 16, 17]. But the availability of tools may not be enough given dominant human characteristics associated with fixation on searching for certainty, and incidences of insulation and tribalism in mainstream health practice. Atul Gawande [18] reminds us that even the most specialist of health practitioner is human and subject to human frailties. "Better understanding" is not just paying closer attention, but is about using a different set of lenses to

explore problems and solutions, when traditional ones operate, particularly in the public sector, with enduring and systematic biases or blind spots [19, 20, 57].

This paper does not offer a method applicable to any specific complex health problem. It aims to take a step back to help health practitioners critically reflect and improve on how existing practices and methods may adapt to the context of the 'wicked problems' that they are trying to resolve.

Different historical traditions of systems thinking in relation to health practice are considered to provide context into the various threads of thought contributing to the systems idea. We then present a generic learning device, the Systems Thinking in Health Practice (STiHP) heuristic, to help practitioners avoid traps of using the systems idea, and to help practitioners adapt existing tools and methods of professional engagement with health issues. Finally, we consider how the application of the STiHP requires, and leads to the development of humility, empathy, and acknowledged fallibility.

This paper will draw illustrations from two reputable and independent publications, or 'case studies' of systems thinking in health [21, 22]. Box 1 highlights features of the two papers.

Box 1 Case studies in systems thinking for health

The Alliance for Health Policy and Systems Research (AHPSR) is an international collaboration hosted by the World Health Organization since 1999, focused on strengthening health systems in low- and middle-income countries. The Alliance coordinated a supplement of Health Research Policy and Systems dedicated to Advancing the application of systems thinking in health. Two studies from this supplement are taken for illustration and discussion:

- Uganda: Paina et al. examine the emergence of dual practice (public sector health professionals engaging in 'after hours' unregulated private practice) in Uganda, and use causal loop diagrams to make sense of the findings and lessons from five case studies, based on review of policy documents, extensive interviews with Kampala facilities and policy stakeholders.
- China: Zhang et al. provide an historical timeline review of health policy and health financing reforms through three historic transitions - from socialist planned economy (1949-78) with cooperative medical system (CMS) to market economy (1978-2002); from CMS to the New Cooperative Medical Scheme (NCMS) (2002-2009); and subsequent ongoing adjustments towards integrated universal health insurance coverage - to elucidate the status of development of the Chinese rural health system.

The studies differ in almost all aspects: geography, focus, method, and level of analysis, but both studies consider health systems through the lens of complex adaptive system (CAS).

The Uganda paper [21] is referenced in illustrating systems ideas and traps of systems thinking (sections 2 and 3). The China paper [22] is referenced alongside the Uganda paper in illustrating features of the heuristic introduced (section 4).

2. Types of systems and systems thinking traditions

It is helpful to start by considering three types of systems [19]:

a) natural systems – individual living organisms (patient, bacterium etc.) or wider biophysical entities like ecosystems or planet Earth;

b) engineered (purposive) systems - clocks, vehicles, computers, clinical equipment, etc.; and

c) social (purposeful) systems –organizations (hospitals, community services, etc.), human interventions (the economy, education, environmental management, health, etc.).

The three types can be regarded as root metaphors of the systems idea. Systems are bounded entities. Whereas natural systems are bounded principally by laws of nature irrespective of human agency, engineered and social systems are more definitively human artefacts.[1]

A *purposive* engineered system is designed by an (external) agent with a defined intention (purpose). Regarding dual practice (Uganda example in Box 1) as an engineered system suggests a single fixed, unchangeable, definitive purpose either at an individual or collective level is clearly not helpful in either understanding different stakeholder motivations for dual practice or envisioning changes in practice. Alternatively, regarding dual practice as a *purposeful* social system or human activity system acknowledges the inclusion of engineered *purposive* (sub) systems (tools and prescribed procedures amongst health workers), but makes these ultimately beholden on multiple and variable perspectives (with many and changing purposes) subject to human boundary judgements. Local management practices regarding dual practice in Uganda, for example, varies considerably, providing opportunities for sharing experiences and learning for designing better strategies.

[1] However, the notion of human-independent ‘natural’ systems is also contestable, given, firstly, human agency in ‘natural’ systems, such as climate and genetics, and secondly, human agency in articulating ‘laws of nature’.

Systems thinking traditions have correspondingly had to navigate these three types of systems idea in language both as an ontological and as an epistemological device.

(a) Ontological device ('hard' systems): representations of reality as used in common language, and as used for describing both natural and engineered phenomena; for example, *the* immune system, or *a* hospital system, or *a* system of regulating health work practice.
(b) Epistemological device ('soft' systems): learning (heuristic) constructs, mental perspectives used for understanding and transforming situations; for example, a system *for* reducing infection, or a system *for* secondary health care, or a system *for* understanding or transforming dual practice amongst health workers etc.

A prevailing view of systems thinking directly relates hard systems tools to engineered purposive systems, soft systems tools to human purposeful systems, whilst describing a third critical systems thinking (CST) tradition. CST uses both hard and soft systems tools as a way of interrogating and challenging the boundaries of existing human purposeful systems in order to radically improve them [23, 24]. [2] Using this taxonomy, the evolution of systems thinking can then be based on historic waves of development from hard to soft to critical systems thinking [24].

Figure 1 illustrates an alternative viewpoint of systems thinking evolution by Ray Ison.[25] It shows the large range of methods (associated with what the authors call cyber-systemic approaches) from which tools continue to be adapted. It captures not only the lineages of influences that have shaped contemporary systems approaches (horizontal axis), but significantly elaborates on the relative ontological-epistemological spectrum of using the systems idea (vertical axis).

[2] One possible way of delineating between hard and soft is by reference to thinking-about-systems or 'system-thinking' (when used as a 'hard' ontological device) as distinct from 'systems thinking' (when used as a 'soft' epistemological device). *Systems* thinking underpinning soft and critical systems thinking can incorporate a range of different types of systems ideas, including system-thinking (systems used as ontological devices).

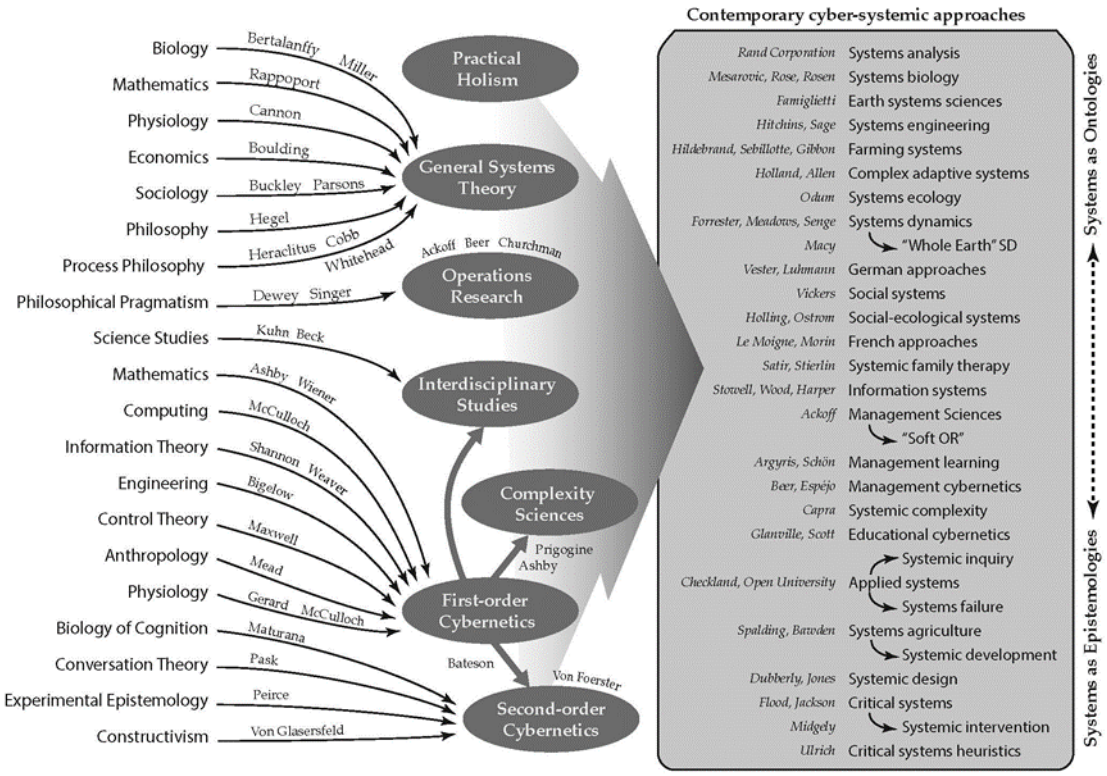


Figure 1 Influences that have shaped contemporary systems approaches and the lineages from which they have emerged (Ison, R., & Schlindwein, S. L. (2015). Navigating through an "ecological desert and a sociological hell" A cyber-systemic governance approach for the Anthropocene. *Kybernetes*, 44(6/7), 891-902)

To appreciate the relevance to health practice, the range of systems approaches depicted in Fig.1 can be distilled into four roughly parallel traditions of systems practice - general systems theory (GST) [26, 27], complexity sciences including complex adaptive systems [28, 29], cybernetics and system dynamics [30, 31, 32], and operations/ operational research (OR) / management sciences [23, 33, 34].

Any attempts to address wicked situations in health practice can draw on multiple sources of systems traditions. For example the prevalence of dual practice in low-income countries like Uganda [21], can helpfully be expressed using ideas of nested systems from GST. Health work practices might for example be rendered as comprising (bounded) part-time practices alongside (bounded) full-time practices, as two component sub-systems of a wider (bounded) 'dual practice' system. Such a system can be regarded alongside other systems where (bounded) full-time practice and (bounded) part-time practice remain independent of each other. The whole (bounded) system might be helpfully seen as nested in successively

wider systems of local and national health care provision support. Similarly, using ideas of complex adaptive systems associated with complexity science, dual practices might be understood as an emergent phenomenon of a low-income economy, dependent on external funding projects providing availability of part-time funding opportunities for skilled health practitioners. Emergence is a key concept when considering complex adaptive systems; characteristics that are not evident in the parts manifest themselves in the whole. Drawing on system dynamics from a cybernetics tradition, government restrictions in Uganda on dual practice can be seen to have generated some migration of health practitioners to private health providers, generating in turn further adverse health outcomes in the public sector. Other system dynamic feedback loops illustrate more positive effects; external research funding generating dual practice opportunities which in some circumstances generating improved job satisfaction and positive public sector health outcomes [21]. Systems modeling is one way to conceptualize the various inter-relationships between actors.

Operations (or 'operational' as used in Europe) research (OR) derives originally from mobilizing mathematical and statistical modelling to improve operational efficacy and efficiency (initially World War II logistic military planning). Subsequently the OR tradition has informed contemporary management sciences, including action research, as well as industry and public sector administration [23]. Systems thinking underpinning contemporary management sciences draws on all other traditions of systems approaches, but is essentially informed by using systems to improve/ transform existing situations [33]. In Uganda, for example, systems ideas are generically used as an attempt to calibrate a better policy approach to dual practice focusing on balancing private and public sector spheres of health care provision, with possible learning from local managing of dual practice through flexible scheduling [21].

GST and complexity science evolved principally from 'natural systems' whereas cybernetics evolved from 'engineered systems', and OR/ management sciences was more directly linked with 'social systems'. Later developments of (second-order) cybernetics and (soft) OR (see Fig. 1) use systems more as epistemological devices, demonstrating that the ontological/epistemological distinction in systems thinking and complexity science practice is rarely absolute. But the distinction is important for gaining clarity on how such ideas are used and the potential for further use. Dealing with health issues through systems thinking involves acknowledging the realities of health situations (using systems as ontological devices), but is subsumed under the wider task of transforming realities for the better (using systems as epistemological devices). Confusing the two uses can generate traps: hindrances that diminish the potential value of applying systems thinking in health practice.

3. Traps in systems thinking for health practice

Because systems thinking in health can borrow from all systems thinking traditions and navigates between systems as ontologies and systems as epistemologies, practitioners need to pay attention to two types of traps or mistakes, which can affect decisions and practice.

The first trap is mistaking the system for a situation or, using an old adage, to "confuse the map for the territory" [35]. Given that the underlying goal of applied systems thinking is to deal with (make simple…) situations of complexity [36], the health *situations* rendered as systems are arguably always a mixture of the complicated, complex and conflictual [37]. Incidences of dual practice in low income countries are complicated in having many interconnections, complex with associated multiple perspectives, and conflictual in generating disruption, disharmony, and general dysfunctions of health support. Such situations might be referred to as "wicked problems" [8] or "messes" [38]. In this case, we use systems as tools for understanding messy situations, or for creating a function for improving the mess. One example is the idea of a complex adaptive system (CAS), which has gained considerable traction in health systems research and practice [10, 13 , 14 , 39].

The CAS idea derives from a tradition of natural systems, but applied to (social) health systems. It is a helpful metaphor for a complex situation, comprising many inter-related parts and defined by multiple agents. Complex adaptive systems often demonstrate significant resistance to change. The system will fall back into its original status once the external energy added (the intervention for change) is discontinued unless the changes are structural, or profound. This phenomenon is much more common when only parts of the system are changed. Hence, an ontological complex systems perspective is valuable: it helps us to identify leverage points for long-term change. Whilst being helpful for understanding situations, confusing real-world situations (wicked mess) of health practice for a (natural) system can sometimes lead to viewing outcomes of practice as being somehow 'natural'; inevitable, uncontrollable, events to which human agency might be absolved. Common notions of 'systemic failure' can consequently be evoked in terms of being fatalistic, other worldly events [12]. Dual practice, for example, might be regarded as either an inevitable outcome from prevailing 'natural' tendencies of privatisation of health care controlled by external agents or, more helpfully, a phenomenon that can be understood at different levels to help policy makers and health managers steer more purposefully the balance between public and private spheres.

The second trap is mistaking a purposeful system for a purposive (engineered/mechanical) system, or otherwise applying the wrong metaphor to understand the system. Treatments of a complex health system as an engineered mechanical system are good examples of this type of trap. For example, commenting on the problems of the National Health Service (NHS) in the UK, Polly Toynbee reflects: "*Peer into the*

heart of the NHS, and the sheer complexity of a financial machine created by serial re-disorganisations is revealed. […] its cogs and pistons disconnected by the 2012 Health and Social Care Act – only dedicated mechanics keep it working" [40](p16). The analogy works well in depicting a messy situation. But extending the mechanistic metaphor might be risky in giving a misleading impression of how factors and actors actually interact in health practice. Paul Plsek for example saw the prevailing management of the NHS as similar to steering a passenger ship: a technical mechanistic process likened to tying a bird's wings, weighting it down with a rock, and then throwing it in order to gain some certainty and control over its trajectory [39]. As Jake Chapman observes in reference to the Plsek paper: *"this is more or less what policy-makers try to do when using a scientific management approach, based on a mechanical model, to try to control the behaviour of a complex system for which they are devising policy… To the degree that social and organisational systems, like the NHS, show adaptive behaviours they are better regarded as similar to live birds than lumps of rock."* [19](p140). In health practice, using a mechanistic engineering root-metaphor can be helpful in depicting bad or malfunctioning practice. For example, mechanisms for regulating dual practice amongst health workers in low-income countries like Uganda through punitive measures may have consequences on staff morale that exacerbate the (wicked) problem situation [21].

Our objective is far from trying to discourage anyone to use systems thinking ideas, merely to be aware of some of the challenges, which any conceptualization or method will have to face. The concept of 'system resilience' drawn from natural systems, for example, can be helpful in signaling positive states of protective wellbeing amongst individuals and/or helpful institutional structures, as well as signaling over-rigid pervasive structures of health practice that may need challenging. What is perhaps required is to learn to cultivate habits of the mind to find complementarity between different uses of the systems idea [14]. In the next section, we present a dynamic process— an approach not a methodology, centered around three types of 'conversation'—to help health practitioners as systems thinkers check on how their practice is helping them address wicked problems and avoid the two traps discussed above.

4. Systems thinking *for* health practice

> "*Systems thinking adds to the theories, methods and tools we otherwise use in global health, and provides new opportunities to understand and continuously test and revise our understanding of the nature of things, including how to intervene to improve people's health. And for those who value thinking and doing in global health, that can only be a good thing*" [21].

Statements like this, echoed by Carey et al [10], need to be taken as encouragements for future practice to engage more with the wider set of systems tools beyond recent positive advances with bringing system

dynamics and complex adaptive systems to the field of health systems practice. We believe these encouragements echo a wider shift from thinking about health management towards managing *for* health [41], and/or World Health Organization concerns regarding moving health governance towards more purposeful governance *for* health [42].

We present now a way to address and manage systems thinking for health through a generic learning device, to guide the practitioner through the use of approaches and tools of her choice. The systems thinking in practice (STiP) heuristic was developed by Reynolds and colleagues at the Open University, UK [12, 33, 43, 44], building on identification of three core systems thinking concepts—inter-relationships, perspectives, and boundaries—established with colleagues in the Evaluation field [45]. The heuristic offers a simple manageable way of thinking about systems through a series of steps that we refer to as *conversations* [46].

Conversation is helpful as a metaphor in surfacing the dynamic attributes of a learning journey – taking (listening) and giving (talking) – leading to new insights and perspectives, which in turn can lead to transformations (transforming the context of the conversation and enabling action to change situations). The metaphor underpins health practice as praxis – theory-informed-action, or the interplay between understanding (thinking) and practice associated with, for example, other research traditions: in organizational learning [47], participatory action [48], and embedded research [49].

The systems thinking in practice heuristic is based on ideas of praxis [50]. The device is used for guiding practice amongst a range of professional practitioners from different sectors, including health practice, wishing to get a handle on adapting systems ideas for professional practical support.

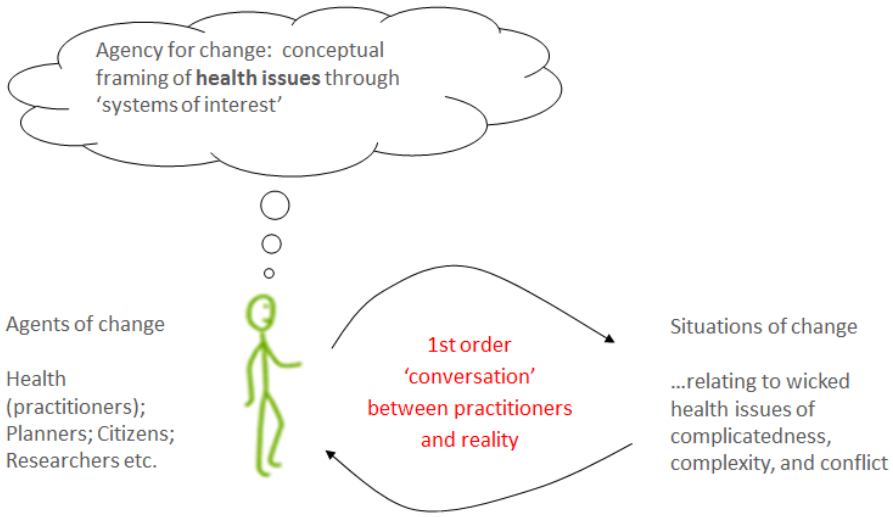
STiP is underpinned by three generic imperatives or orders of conversation:

(i) 1st order: Understanding inter-relationships or interdependencies (a way of thinking about – and developing humility toward - the bigger picture)

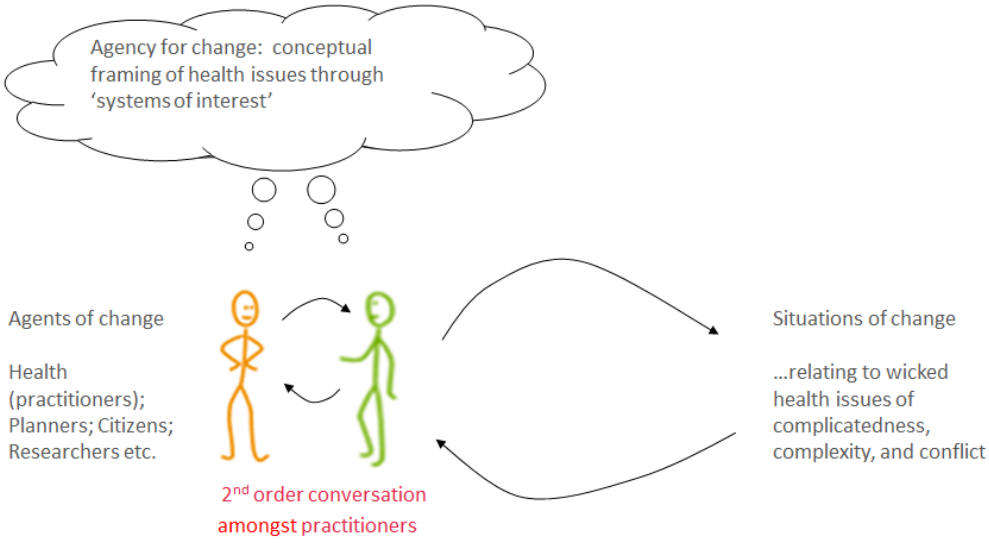
(ii) 2nd order: Engaging with multiple perspectives (the practice of joined-up thinking, and developing empathy for others)

(iii) 3rd order: Reflecting on boundary judgments (the praxis of thinking *in* practice and recognizing inevitable personal fallibilities)

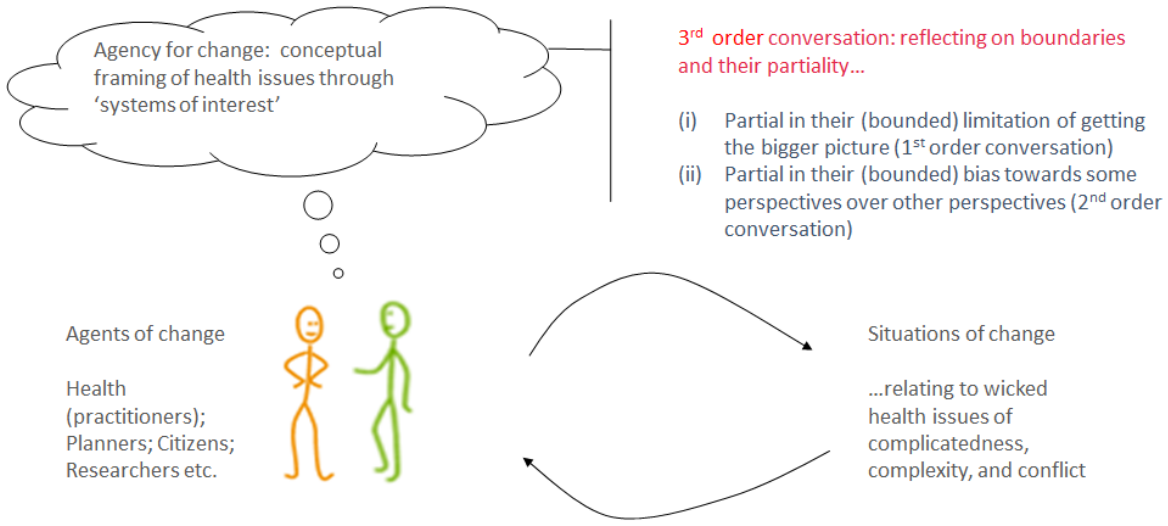
Figure 2 illustrates the three consecutive orders of conversation making up the heuristic (the full heuristic is illustrated in Figure 3).



(a) 1st order conversation: understanding inter-relationships with humility



(b) 2nd order conversation: engaging multiple perspectives with empathy



(c) 3rd order conversation: reflecting on boundaries embracing fallibility

Figure 2. Three orders of conversation with Systems thinking in (health) practice associated with principles of humility, empathy, and fallibility © 2017 Martin Reynolds

At the heart of systems conversation is the acknowledgement that systems are themselves conceptual constructs, not to be confused with the real world situations of which, and to which, they speak.

Table 1 provides an example of applying the three aspects of the heuristic to the two examples of systems thinking in health practice (Box 1). The table focuses not so much on the subject of the evaluation – the *evaluand*, but rather the systems thinking approach used by the study – the *evaluation* process itself.

Table 1 Three orders of systems thinking in practice (STiP) 'conversation' exemplified in relation to selected features of two evaluations of health systems: (i) 'dual practice' amongst health workers in Uganda [21] and (ii) rural health service provision in China [22].

Orders of conversation		**(i) Uganda – dual practice (DP)**	**(ii) China – rural healthcare (RH)**
1st order of conversation Understanding inter-relationships	Strong features	DP seen as an emergent, adaptive phenomenon of health practices rendered as a CAS with historic complex interdependencies. Three causal loop diagrams (CLD) used to project inter-related influences on DP; pre-independence (1960s), 1970s-1980s, and 1990s. A further CLD focused on relationships between factors influencing unintended consequences (balancing feedback) of government restrictions on DP beginning in 1970s.	RH seen as an emergent, adaptive phenomenon of national health policy initiatives rendered as a CAS with historic complex interdependencies. CAS projected in narrative format. Narrative explores relationships between choices and constraints in the evolution of the health systems, as well as both policy and negotiation-based change. Path-dependency as relationship between earlier choices, interconnected events, and future options.
	Further questions on inter-relationships	Analysis possibly skewed towards urban practices? Are there inter-relationships (emotional attributes etc.) perhaps not captured by CLDs? Are 'causes' the same as 'influences'? How do policy makers relate to the conflicting motivations of DP outside of their public role?	Analysis possibly skewed towards (over) reliance on formal documentation in capturing interdependencies/ relationships? What might be the role of power and interest group relationships in creating or limiting options? How might knowledge generation relate to policy makers in terms of opportunities and in terms of constraints?
2nd order of conversation Engaging with multiple perspectives	Strong features	Confronting perspectives of providers and policy makers within case studies. Diagrammatic representations – CLDs and a helpful timeline of critical events - provide quick snapshot of issues potentially provoking questions and discussion, including exploration of leverage points for further action.	Combines perspectives of official policy documentation, with in-depth interviews with historical observers and participants. Strong 'insider perspective' provides legitimacy amongst peer readers in national policy domain. Narrative format likely to be accessible to key stakeholders traditionally involved with health policy making. Language of 'resilience' associated with CAS likely to have resonance in historic context of China
	Further questions on perspectives	Might the language and symbols of CLDs vary in meaning to different people? Possible need in explaining to those unfamiliar to whom influence is needed; possibly alienating to those not practiced in diagramming or generally less spatially-cognitive? How might perspective of policy stakeholders evolve based on lessons from the study? Perspective of clients?	How might language of CAS– emergence, non-linearity etc. – be less alienating in policy domain? How might perspectives differ on both historical trajectory and resulting situations, based on position in the health system and political status? What are the dominant perspectives of users and clients?
3rd order of conversation	Strong features	Study challenges the space for regulation by the formal system and the space for compromise with informal practices, based on 'natural experimentation' of less	Notion of 'experimentation' in RH emphasised in national government support for piloting NCMS and universal health insurance coverage at county

Reflecting on boundary judgements		formal (less-bounded) local experiences of DP	levels; prompting/ encouraging a national learning approach to health policy interventions.
	Further questions on boundaries	Possible legitimacy given to private for-profit providers as equal players with public sector provision? Does the evaluation prompt wider normative discussion on boundaries between public and private spheres of health provision?	Does the emphasis on 'resilience' possibly reinforce / over-emphasises notion of system stability as against system transformation? Does the evaluation prompt questioning of existing national hierarchical system over autonomy of counties?

First-order conversation involves using systems to make sense of the reality with a drive towards *thinking* holistically, whilst *practically* acknowledging that in our interconnected world no system can incorporate *all* inter-relationships. The conversation requires humility in recognizing the inevitable partiality of systems. Systems thinking isn't about including everything but being very smart about what to leave out [51]. *Understanding* inter-relationships requires humility in appreciating that our *practical* mapping can never mirror the situation.

For example, in Table 1 the two case studies clearly have different ways of projecting important inter-relationships – diagrammatically for Uganda and narratively for China – and both have associated biases in the limits of representation. Claims are often made in health practice towards thinking more holistically about economic and social circumstances (getting the bigger picture) as against focusing on, say, just clinical/ biomedical concerns. Examples of more holistic representations include community health analysis[52] and ecosystem approaches to health and well-being [53]. Notwithstanding such holistic endeavours, the first-order conversation between *systems* used in such approaches and *situations* being represented requires constant humility in avoiding the trap of mistaking the system for the situation.

Second-order conversation involves using 'systems' to engage purposefully with other stakeholders – including other professionals and public representatives. It contrasts with the fixed idea of purposive (engineered) systems, where a single system is seen to operate according to one particular ascribed purpose. Whilst *purposiveness* stops with the thought-out purpose, *purposefulness* invokes possibilities of change in values: theory-in-action or thinking-in-practice. Such purposeful conversation in the practical domain requires openness and *empathy* to other perspectives whilst accepting the built-in bias of any one perspective. *Engaging* with multiple perspectives requires empathy in dealing with other framings. STiP does not discount tools and ideas from other traditions whether labelled as 'systems' or not. From a STiP perspective, systems can be valued as *both* ontological *and* epistemological devices that enable purposeful improvement in a situation.

For example, in Table 1 strengths and limitations might be associated in conversing with others using different formats and different languages. Questions arise in both case studies – Uganda and China – regarding the use of diagram or narrative and also, for both, the use of systems thinking terms with those unfamiliar with complex adaptive systems. Calls are periodically made towards being more participatory in public health decision making; developing better (joined-up) relations amongst a plurality of stakeholders, in addition to listening to professional medical staff. This does not come from general altruism and democratic instincts, but from the necessity of "working out" relationships and perspectives to find workable and adaptable solutions to health issues. Examples include reviews on social accountability in the health sector from HEART: Health and Education Advisory Support Team [54], and the CORE group [55]. Second-order conversation between stakeholders with different perspectives develops empathy in avoiding the trap of mistaking purposive systems for purposeful systems.

Third-order conversation is an integral part of the two other conversations. Systems are essentially bounded constructs, the boundaries of which are constructed by people either implicitly or, as with systems practitioners, more explicitly. Boundaries in STiP comprise of purposes—a system *to* enhance wellbeing is a different bounded notion of health practice compared with, for example, a system *to* reduce outpatient waiting-time, or a system *to* enable optimum capacity of medical staff etc. Bounded systems may have variable bounded sub-systems, associated with, for example, measures of success (targets, etc.), available resources including finance, or relevant competencies and skills etc.

For example, in Table 1 the evaluations as interventions themselves may have consequences in the way health systems are bounded in Uganda (regarding public and private spheres of supporting health care) and China (regarding the 'resilience' of hierarchical system of national health care decision making). Many new and existing tools in global health have built-in iterative cycles of boundary reflection, continually iterating between the *doing* of health practice and revised *understanding* of health issues. Examples include the Checklist manifesto [56] and Sustainability Framework [57]. Reflective third-order conversation between idealized boundaries (systemic desirabilities; including, say, practicing humility and empathy) and actual real world constraints (cultural feasibilities) can help in recognizing human fallibilities in our practices, and the need for experiential and experimental learning. Conversing between bounded thinking (theory) and bounded practice (action) promotes good praxis. In health *practice*, slavishly following (bounded) 'targets' or 'best practice' set up for some prior albeit well-intended (bounded) purposes focusing on some aspect of patient wellbeing may generate dire consequences (systemic failures) when not *thinking* through the knock-on effects of such practice [58].

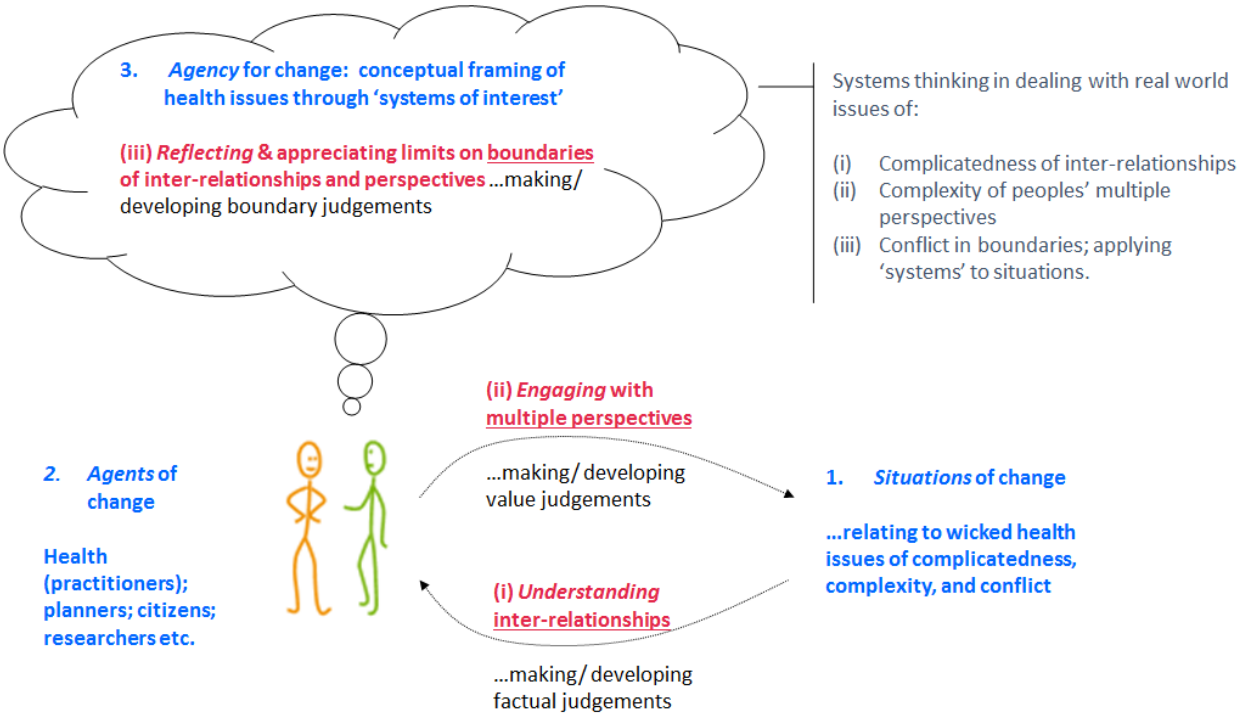


Figure 3. Systems thinking in health practice (STiHP) heuristic adapted from Reynolds [44]
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The STiHP framework (Fig.3) is not so much a device for displacing other frameworks of practice but rather for heuristically appreciating the potential of existing tools and practices that may be developed, with a concern to enact better systems thinking for health practice.

5. Conclusion: systems for wicked health situations

Using the metaphor of 'conversation' might be a helpful way to convey systems thinking in practice as praxis: an expression of active triple-loop learning [46]. The overall purpose of 'the conversation' is to produce intelligence (contextual-awareness, collective self-awareness, risk-awareness), learning, reflection, meaning, and more purposeful action. The STiHP challenge for any one health intervention is to mobilize all three conversations. The challenge does not necessarily require overhauling existing practices, but rather mobilizing and adapting skills and tools for more effective STiHP conversation.

Given the rich methodological history and influences and recent interest regarding systems thinking in health practice, it is perhaps easy getting confused by the diversity of schools of systems thinking traditions. We propose a heuristic tool (STiHP) which can help guide the user to different methods, which draws attention to 3 imperatives: understanding inter-relationships, engaging with multiple perspectives,

and reflecting on boundary judgments. It's not the end of systems thinking but it seems like a very robust stepping stone into the use of rich and diverse methods.

As noted above, systems are partial—not only in the sense of representing only part of the universe (inviting our *humility*), but partial in the sense of being inevitably biased towards particular values (inviting our *empathy*) informing the boundary judgments. Systems thinking is, therefore, necessarily *fallible* and therefore always provisional. If certainty can be achieved, we are likely dealing with less relative complexity, and references to systems thinking, even in the use of expert tools to achieve complicated outcomes may be an overstatement. Atul Gawande recognizes openness to fallibility as a positive cornerstone of good medical practice [56, 59]. Recognising and reflecting on the inevitable fallibility (based on the partiality and provisionality) of boundaries might be helpful in fully realising the potential wealth of system ideas (including natural systems and engineered systems used as bounded metaphors) alongside other (inevitably bounded) ideas from different traditions and disciplines.

Some important points to remember include:

i. Not to confuse the map (system) for the territory (situation)— we may not always have our ontological root metaphor of a system right, but, with a sense of *humility*, our epistemological use of 'purposeful system' can guide us in how best to use natural and mechanical systems.
ii. As stated by Edward Morin [60], dealing with complexity forces us to push against the boundaries of our technical area / science. Ultimately, every conceptualization is value-based. And we hope that *empathy* can guide the ongoing development of perspectives.
iii. Managing / harnessing complex systems requires accepting some loss of control [61]. STiP helps us better navigate that loss of control (as opposed to hubris and the illusion of control), but it carries with it the unavoidable necessity of occasional failure—*fallibility*—as a tool for learning. We can claim infallibility and fail bigger, or accept fallibility and succeed more. We can't have both.

The holistic idea of a system comprising inter-connected parts, with the whole providing something more than just the sum of its parts, has clear resonance and traction with health professionals—researchers and planners as well as frontline medical staff—struggling to deal with complications in providing health support. Moreover, the language of systems potentially provides a helpful medium for cross-disciplinary interaction (amongst different traditions of professional health practice) and trans-disciplinary interaction (between professionals and the public). Yet, what hinders the take-up of systems thinking is often the practicality in applying systems ideas. Part of that problem lies in the muddle and confusion of using the system idea in our various interactions. Using the practical metaphoric imperative of *conversation* is

perhaps a useful device for bridging the divide between systems thinking and (health) practice, through a range of methods available to us and yet to be developed.

Incorporating principles of humility, empathy, and fallibility also makes for a more interesting, playful, and honest on-going conversation regarding systems for health.

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