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PhD Pit-Stop: A Holistic Outcome-based Approach to Design Healthcare Systems

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1 Introduction

The healthcare system is struggling to address the challenges of long-term healthcare and the pursuit of wellbeing and mental health (Tsekleves & Cooper, 2017). Emerging trends such as holistic and community healthcare seem suitable healthcare practices to cope with these challenges. However, these trends require greater support from approaches such as system thinking (Jones, 2013; Peters, 2014). System thinking seems a suitable paradigm to support the complexity of healthcare design and development. System thinking promotes and supports the holistic understanding of the healthcare phenomena as an interrelated and adaptive socio-technical system (Jones, 2014; Carey et al., 2015; Caffrey, Wolfe & McKevitt, 2016).

A system thinking approach requires a holistic system understanding mindset by the different stakeholders of the system. This holistic understanding should permanently assist decision-making while designing systems. However, healthcare stakeholders find constants disagreements due to the conflict of values, goals and outcomes (Haynes, 2018). This lack of consensual agreement has implication even in critical decisions such as defining the purpose of the system. Defining the purpose of the whole system is critical because it provides a high order to guide the design process and offer well-defined goals (Jones, 2014). Therefore, it is essential to explore how to facilitate a consensual agreement about the system purpose, values and meaningful outcomes of healthcare within a holistic perspective.

Some system thinking approaches have applied visualisations to build consensual agreements. System visualisations are graphic representations aiming to map and communicate the complex relationships between the elements of the system (Jun, Kim & Lee, 2011; Jones & Bowes, 2017). In a broader perspective, visualisations have supported the discussion of complex issues and facilitating collaborative and multidisciplinary sensemaking (Crilly, Blackwell & Clarkson, 2006; Comi, Bischof & Eppler, 2014). For example, Cognitive Work Analysis (CWA) is a significant framework that uses visualisation to support the analysis and design of systems (Rasmussen, 1985; Stanton, Salmon, Walker & Jenkins, 2018). CWA provides a five-level structure that includes the system purpose, values and priority outcomes. However, it remains unclear how to build each of the CWA levels from a collaborative perspective.

This research aims to examine how a holistic approach can support participatory healthcare system design. This will be explored by developing and implement a system thinking, outcome-based support. This support should enable the

different healthcare stakeholders to negotiate and build consensus about the outcomes, values and purpose. Visualisations will be used as the primary research/design support to map the healthcare system.

1.1 Theoretical Perspectives in this Research

This research has conducted a literature review of the following main subjects:

1.1.1 Healthcare as a Complex Adaptive System

Healthcare is a complex system that has interdepended connections, multi-disciplinary agents, non-linear processes, continuous changes and unpredictable behaviours with social implications that create new patterns over time (Paina & Peters, 2012; Wilkinson, Goff, Rusoja, Hanson & Swanson, 2018).

- Cognitive Work Analysis: This structured framework has been adopted to guide the development of the support. It provides a systemic approach to analyse and configure the relationships between the purpose and the values and outcomes.

1.1.2 The Holistic Values/Outcomes of Healthcare

Outcomes in healthcare are used to monitor and make informed decisions. This research is proposing a holistic outcome approach that integrates a broad range of attributes from psychosocial aspects such as wellbeing and happiness; to behavioural, quality of care and biometrics, among others. This holistic outcome approach *should* capture meaningful dimensions for all stakeholders. The meaningful dimensions could emerge from peoples' life aspirations, their deepest expectations, and desires.

1.1.3 Participatory Construction of Systems

A participatory perspective will ensure the integration of the different stakeholders during the whole process. This integration should occur by developing inclusive and democratic strategies. Some of the key strategies are:

- Value negotiation: Heterogeneous groups need to build consensus by confronting their meanings and reconciling the discrepancies of their values.
- Visualisations: This mapping and visual strategy facilitates collective sensemaking of complex situations and allows to represent abstract elements of the systems. Visualisations will become a dialectical device (Eden, 1994) to understand, construct and reflect on the system.
- Boundary objects: These flexible *objects* can be a common interface that enables consensus-based interprofessional collaboration. Representation of healthcare outcomes is being used as boundary objects in this research.

1.2 Research Questions

This research aims to answer research questions of two related aspects. This first aspect is about the facilitation method, while the second is about the complex healthcare system phenomenon.

About the method:

1. How can an outcome-based visualisation enable a participatory and holistic system understanding?
2. How to facilitate/systematise the analysis of the visualisations (visual data)?
3. How to control/consider the role of the researcher as a facilitator during the evaluation of the method?

About healthcare system design:

4. How could the most meaningful outcomes be participatory integrated to construct healthcare systems?
5. How to support system-level negotiation and decision-making based on the consensual outcomes of healthcare?
6. How could the holistic outcome be related to other elements/processes of healthcare systems?

2 Research Design and Activities

The Design Research Methodology (DRM) by Blessing and Chakrabarti (2009) has been used to determinate the main structure of this research methodology. The following strategies and methods have been proposed to address each of the four stages (Figure 1):

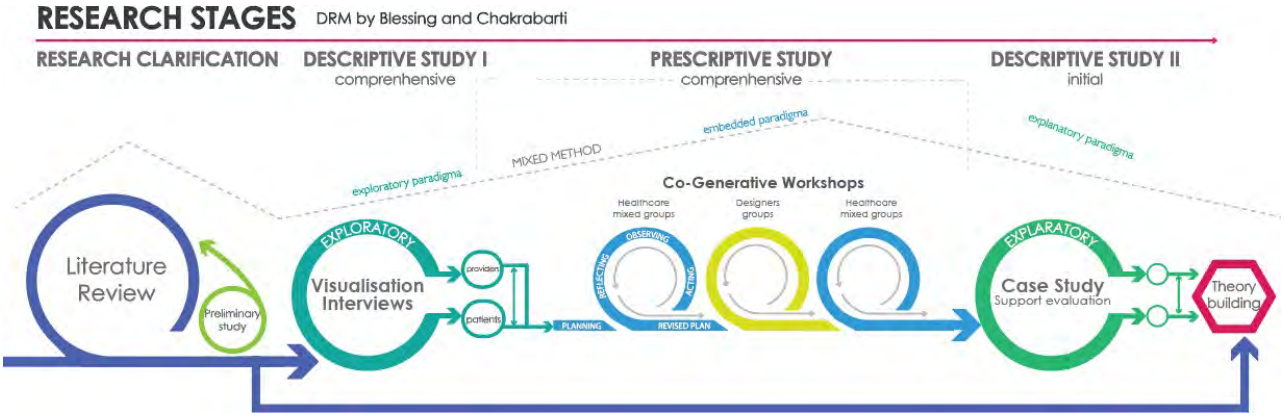

Figure 1. Methodology for this research.

2.1 Completed Phases

The Research Clarification (RC) and Descriptive Study I (DSI) has been completed. For the RC, a preliminary study was conducted. The preliminary study was a workshop to explore how designers visualise complex system interaction using healthcare outcomes (Landa-Avila, Jun, Cain & Escobar Tello, 2018). The DSI consisted of outcome-based visualisations interviews with patients and providers. DSI has the following objectives: 1) to identify the most meaningful outcomes for the different stakeholders, 2) to explore how outcome-based visualisations enable the construction/mapping of healthcare systems and 3) to test and adapt the outcome-based visualisation tool.

2.1.1 Methods and Tools

Some tools were prepared to facilitate the visualisation sessions of the completed phases. Among these tools are the outcome cards (Figure 2a). The outcome cards present a variety of healthcare outcomes. The outcomes were selected based on a comprehensive literature review, but the list of outcomes and the physical interface are under revision and refinement as the research is progressing. For the DSI phase, an individual visualisation tool was created (Figure 2b). This interactive tool included outcome tokens and other system elements representations, such as places and people. This tool helped to generate individual visualisations of the healthcare system with patients and providers.

Figure 2. An example of an outcome card (2a), and the tool used for the interviews (2b).

2.1.2 Data Analysis Approach

During this research, two main types of data are being collected. The first type is outcome-based visualisations. This graphical data is a type of system diagrams that contain related and grouped elements. The visualisations are being explored as a stand-alone piece of data, and a potential graphic analysis is being considered. However, there is a lack of literature about diagram analysis that supports the development of a reliable data process. Therefore, until now, the analysis of the visualisations is being conducted supported by the *narratives* of the participants.

The second type of data is the oral answers from interviews and the narratives of the visualisations. Both of them are being analysed using an inductive and critical realist perspective (Braun & Clarke, 2006). This perspective preserves the experiences of the participants in the limits of reality. An open thematic analysis has been conducted using nVivo software.

2.2 Future Phases

The Prescriptive Study (PS) and Descriptive Study II (DSII) still need to be completed. For the PS, a series of participatory sessions with different stakeholders are planned. During these sessions, the stakeholders will need to construct an outcome-based healthcare system and to propose interrelated strategies to achieve the agreed outcomes. The objectives of the PS are 1) to explore how different healthcare stakeholders negotiated discrepancies around healthcare outcomes meaning, value and purpose, 2) to identify outcome-related strategies for healthcare system design, and 3) to refine the visualisation facilitation strategy for healthcare system design. Finally, an initial evaluation of the framework will be conducted on the DSII phase. The objectives of DSII are 1) to evaluate how the proposed outcome-based framework has an impact on healthcare system design, and 2) to evaluate the impact of the proposed tools.

3 Expected Outcomes

This research expects to achieve the following outcomes:

- A holistic outcome-based framework that supports the design of healthcare systems. This framework should promote a better understanding of the differences among the meaningful outcomes and promote a system thinking visual thinking. This framework will be strengthened with different tools and strategies to engage the different stakeholders.
- A graphical data analysis protocol. Due to the intensive amount of visual data, it is expected to provide a protocol to analyse the visualisations. This protocol should cover academic and practical practices.

3.1 Implications of the Research Area

First, the outcome-based approach could promote the adoption of a system thinking approach in healthcare development. However, it remains unclear how much support will be needed to escalate, disseminate and sustain the strategies. Also, the inclusion of psychosocial aspects as critical dimensions in healthcare could promote a human lens mindset placing prevention and wellness on the top rather than illness. This research will also attempt to strengthened other well-establish system thinking approaches such as CWA. The facilitation strategy could encourage the adoption of CWA in healthcare design.

3.2 Contribution to Knowledge

This research will advance knowledge about how to how to map healthcare systems. This contribution will be made by 1) defining how to use outcomes as a *mean* to trigger the mapping process and 2) how to negotiate the conflict of values. The mapping process will be completed by related outcomes with other system elements. Also, a holistic understanding of the healthcare system will be provided by revealing the prioritised outcomes and values of healthcare. It is expected to clarify the meaning of social dimensions such as wellbeing, happiness and dignity within the healthcare system.

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About the Researcher

I. Cecilia Landa-Avila Cecilia is a PhD student at Loughborough Design School. Her research interest is focused on humanising healthcare services by gathering approaches such as system thinking and social innovation. She currently explores participatory mapping methods for healthcare system design aiming to trigger meaningful discussions, to support negotiation of value trade-offs and to encourage a complex system awareness.

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