

# Combining Action Research and System Dynamics to facilitate change and improvement processes in healthcare

Akademisk avhandling

Som för avläggande av filosofie doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentligen försvaras i hörsal Arvid Carlsson, Medicinaregatan 3, Göteborg

**Måndagen den 19 december 2022, klockan 09.00**  
**av Paul Holmström**

Fakultetsopponent:

**Susan Howick, professor**

University of Strathclyde, Glasgow, Storbritannien

**Avhandlingen baseras på följande delarbeten**

- I. Claesson M, Hallberg S, Holmström P, Wennberg Larkö A-M, Gonzalez H, Paoli J. **Modelling the Future: System Dynamics in the Cutaneous Malignant Melanoma Care Pathway.** *Acta Dermato-Venereologica*. 2016; 96:181-185.
- II. Sansone M, Holmström P, Hallberg S, Nordén R, Andersson L-M, Westin J. **System dynamic modelling of healthcare associated influenza -a tool for infection control.** *BMC Health Services Research*. 2022;22:709-719.
- III. Holmström P, Hallberg S, Björk-Eriksson T, Lindberg, J., Olsson, C, Bååthe, F, Davidsen, P. **Insights gained from a systematic reanalysis of a successful model-facilitated change process in health care.** *Systems Research and Behavioral Science*. 2021;38:204-214.
- IV. Holmström P, Björk-Eriksson T, Davidsen P, Bååthe F, Olsson C. **Insights Gained From a Re-analysis of Five Improvement Cases in Healthcare Integrating System Dynamics Into Action Research.** *International Journal of Health Policy and Management*. 2022 (In press).

**SAHLGRENSKA AKADEMIN**  
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# Combining Action Research and System Dynamics to facilitate change and improvement processes in healthcare

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## Abstract

Healthcare is complex with multi-professional staff and multiple patient care pathways, making it challenging to implement new policies or procedures. Action Research (AR) can provide engagement and local adaptation of practices. System Dynamics (SD) simulations can lead to shared systems understanding and allows testing new scenarios *in silico* before actualization. Using two research projects and five improvement cases in healthcare, this thesis aims to deepen the understanding of using SD, by itself or combined with AR, to support groups of healthcare professionals and researchers in change and improvement processes.

The research projects used SD methodology to explore disease trajectories and effects by different interventions. Created models were based on data from disease-specific quality registers, scientific publications, and hospital systems. The simulations made it possible to study phenomena, difficult to isolate and examine in reality. It was found that SD is well-suited for policy planning of disease prevention in Swedish healthcare. It is cost effective and allows simulations to be carried out *in silico* without risk to patients or organisational efficiency.

The improvement cases had been conducted using SD integrated into AR and were re-analysed using iterative abductive qualitative methodology. AR contributed to high levels of engagement, the building of confidence in and ownership of results, and ensured that the SD models were adequate, relevant, and rooted in reality. SD provided a coherent and consistent systems overview of the structure of each case and provided causal rigor and opportunities for reality checks. All cases went through divergent and convergent phases leading to shared points of reference with the two methods deeply integrated in experiential learning processes. It was found that this combination achieved useful, comprehensive, and robust outcomes, calibrated to local needs. Simulations increases certainty about expected results and speeds up the problem-solving process.

Healthcare change initiatives need to find cost-effective and safe pathways to merge top-down needs with local prerequisites. The investigated (combined) methodologies support working across multiple professions to create any such “new normal”.

**Keywords:** healthcare, improvement, change, implementation, action research, system dynamics, simulation

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