

The Research Cycle and LLMs

LWM Hackathon: Enhancing Research Productivity

DFKI, Kaiserslautern, Germany

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Kaisa Väänänen

Tampere University, Finland



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Different research approaches employ a wide variety of different methods

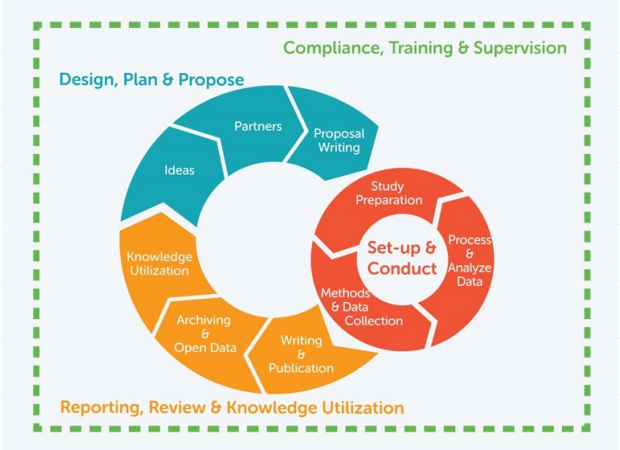
- Experimental research
- Constructive research
- Design Science Research
- Research through Design
- Case study
- Action research
- ...
- Research *methods* vary between approaches
 - Empirical research - theoretical research
 - Qualitative vs. quantitative
 - Experimental, observational, interviews, ethnographic, ...



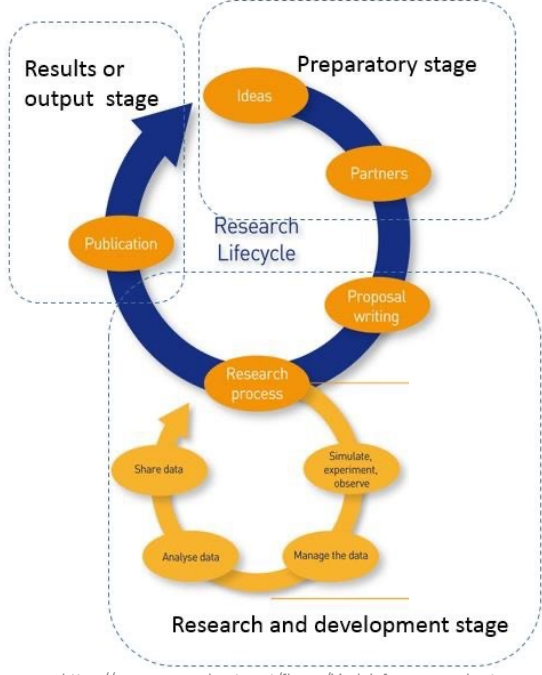
<https://www.5staressays.com/blog/types-of-research-methodology/types-of-research>

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Research cycle models: A broad picture



<https://aph-qualityhandbook.org/research-lifecycle/>



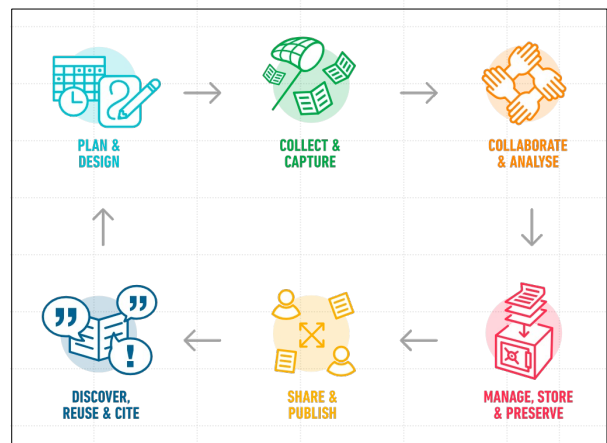
https://www.researchgate.net/figure/Model-for-research-stages-based-on-JISC-Research-Lifecycle-Reprinted-from_fig4_318696225

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Research cycle models

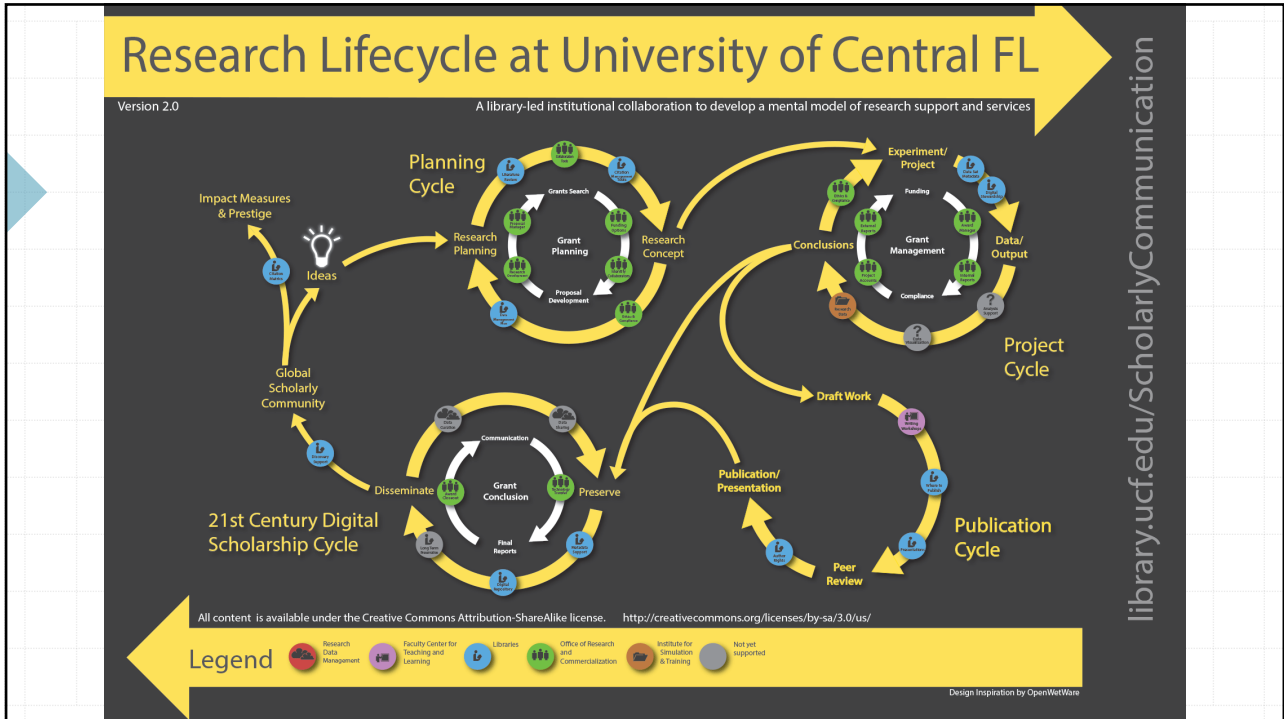


<https://library.ethz.ch/en/researching-and-publishing/data-management-and-policies/research-data-management/research-data-life-cycle.html>

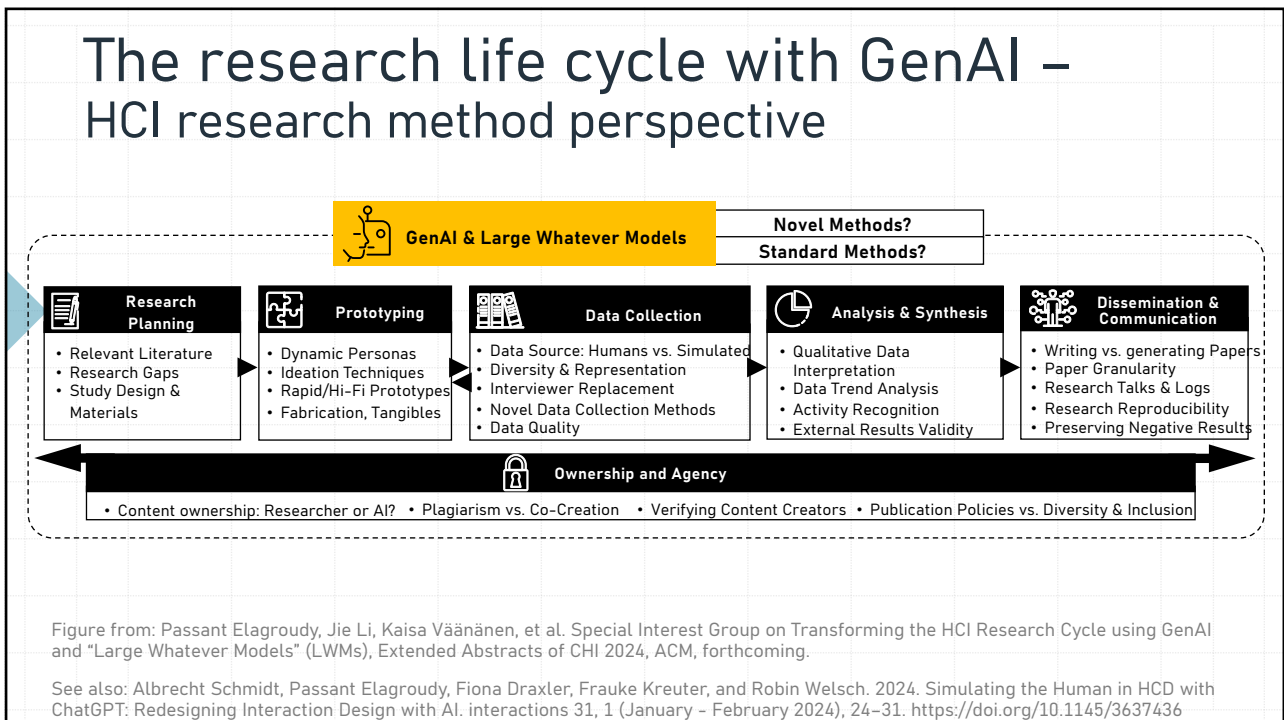


<https://blogs.gwu.edu/himmelfarb/2021/11/06/the-research-lifecycle-video-tutorials-from-himmelfarb/>

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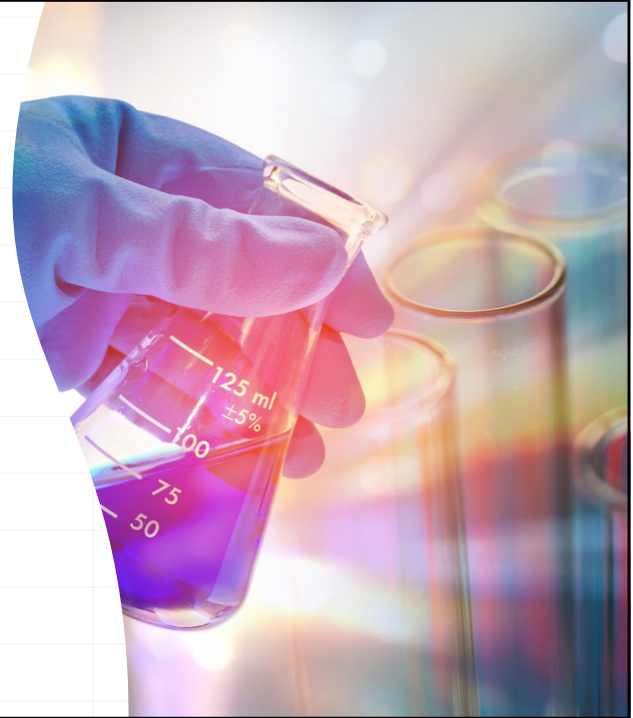
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Why use GenAI for research?

- **Enhancing research productivity**
- Efficiency, scale
- Innovation boost
- Democratising research; access to research tools
- ...



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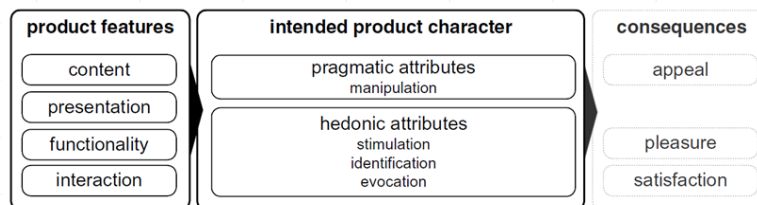
Why NOT use GenAI in research?

- Risks in AI model bias, responsibility, transparency, ...
- Sense of authorship, loss of agency, ...
- Can improved productivity be “bad” in some ways?
- What do we *learn* when we do research? What do researchers *enjoy*?
- ...

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Experience design perspective

- User experience (UX)
 - Users' emotions, preferences, perceptions, comfort, behaviours and accomplishments...
 - ...that occur *before, during and after* use of a product/system/tool
- *Pragmatic* features = Things that help get practical things done; expected features; fluent interaction, usability
- *Hedonic* features = Things that give users meaning; how they feel about a product



Hassenzahl, M., 2003. The thing and I: understanding the relationship between user and product. In *Funology* (pp. 31-42). Springer. ISO9241-210 definition: <https://www.iso.org/obp/ui/#iso:std:iso:9241:-210:ed-2:v1:en>

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Experience design of novel tools

Focusing on *target experiences* to drive the design vision

- Researchers are the **target users** of your developed solutions
 - What are their skills, research experience level, etc.?
- Think about their **expected experience**, i.e. Researcher EXperience (REX 🧐)
 - What is most satisfying about research? Vs. what is "boring" or dissatisfying?



<https://www.funkydesignspaces.com/plex/> https://www.funkydesignspaces.com/plex/PLEX_Cards.pdf

Olsson, T., Väänänen-Vainio- Mattila, K., Saari, T., Lucero, A., Arrasvuori, J. Reflections on Experience-Driven Design: a Case Study on Designing for Playful Experiences. Proceedings of Designing Pleasurable Products and Interfaces, DPP13, ACM, 2013.

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The proposed solutions should tackle one or more of the following domains [From the hackathon web page]

1. **Literature Review and Summarization** (e.g., assist by summarizing research papers and stay up to date with the latest research)
2. **Hypothesis Generation** (e.g., suggest new hypotheses or research directions)
3. **Experimental Design** (e.g., suggesting methodologies, potential variables to consider, statistical analyses)
4. **Data Analysis Assistance** (e.g., assistance in data interpretation, and potential correlations)
5. **Drafting Research Proposals and Papers** (e.g., help with writing process and structure)
6. **Grant and Funding Manager** (e.g., identify potential funding sources, help grant writing)
7. **Collaboration Facilitation** (e.g., find potential collaborators by analyzing research trends or identifying researchers)
8. **Ethics and Regulatory guidance** (e.g., preliminary guidance on ethical considerations and IRB submissions)

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