A Model-Driven Method for the Systematic Literature Review of Qualitative Empirical Research

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Structure:

Context: Evidence-Based Practice (EBP)

Systematic literature reviews (SLRs) for EBP

Limitations of conventional SLRs for IS

New method: Model-driven SLR

Example of a model-driven SLR

“What factors influence the effective use of BPMN in business organisations?”
Context:
Evidence-Based Practice (EBP)
What is Evidence-Based Practice?

- Empirical research
- Systematic literature reviews
- Collections of SLRs
- Dissemination & knowledge transfer

Inform practitioner decisions

Theories & methods

Local context

Values

Resources

Habit

Local context
Emergence of EBP

EB Medicine – 1990s (e.g. Sackett et al 1996)
Practitioner decisions - based on what?
… Lack knowledge of relevant research?

Values, assumptions, gut feeling

Resources

Decisions

EVIDENCE
Elements of research for EBP

- Empirical research
- Systematic literature reviews
- Collections of SLRs
- Dissemination & knowledge transfer

EB Medicine: “One of the 15 greatest medical milestones since 1840” (Montori & Guyatt 2008)

Theories & methods
Elements of EBP

Dissemination & knowledge transfer

Collections of SLRs

Systematic literature reviews

Empirical research

Theories & methods

Examples ...
Welcome to the EPPI-Centre

The Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre) is part of the Social Science Research Unit at the Institute of Education, University of London.

Since 1993, we have been at the forefront of carrying out systematic reviews and developing review methods in social science and public policy. We are dedicated to making reliable research findings accessible to the people who need them, and supporting the use of evidence in policy, practice or personal decisions.

The EPPI-Centre offers support and expertise to those undertaking systematic reviews and those who are interested in finding out or using research evidence. Please see our working with the EPPI-Centre page if you would like to work with us.
Evidence-Based Software Engineering

Welcome to the web site for Evidence-Based Software Engineering (EBSE). If you are new to this website, or wish to know more about EBSE, click here for more information.

EBSE is concerned with determining what works, when and where, in terms of software engineering practice, tools and standards. It draws its inspiration from the success of the evidence-based paradigm as employed in clinical medicine (and other disciplines), adapting the evidence-based practices to meet the rather different characteristics of Software Engineering, and the consequences that these characteristics have for empirical studies.

This website is maintained by researchers who are interested in EBSE and its purpose is to act as a resource for members of the wider Software Engineering community. Everyone is welcome to use the material it provides, and are invited to contribute further material for use by others. The site is intended to provide material for practitioners, researchers and policy-makers, whether new to EBSE or otherwise.

Page last updated on 14 March 2009.
Evidence-Based Social Policy

“What Works” - UK Evidence Centres for Social Policy (March 2013)

… evidence that is rigorous, accessible and appropriate.
… connect to a global community of individuals and organisations from a range of sectors and backgrounds,
… gain access to stimulating debate, publications and events

(Set up 2011?)
Systematic literature reviews (SLRs) for EBP

Limitations of conventional SLRs for IS
Calls for EB Practice in IS

• Atkins and Louw (2000), at ECIS, called for:
  – Equivalent of the Cochrane Collaboration for IS
  – Massey University, New Zealand to host website

• Moody (2000, 2003) called for:
  – Cochrane Collaboration-type knowledgebase for IS
  – Joint venture: Monash University, Australia + Australian Computer Society to host website

• Evidence of progress?
  – From AIS elibrary (2010)
# EB Practice in IS - AIS eLibrary:

<table>
<thead>
<tr>
<th>Abstract includes</th>
<th>No.</th>
<th>Papers</th>
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<tr>
<td>evidence*based information systems</td>
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<tr>
<td>evidence*based practice</td>
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<td>Atkins and Sampson, 2002</td>
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Why lack of interest in EBP in the IS research community?

- Potential mismatch between existing EBP paradigm
  - as practised in medicine and health care, software engineering, ...
- and Information Systems?
1. **Define** research question.
2. **Define** traceable, repeatable strategy for searching the literature.
3. **Search** the literature for primary studies.
4. **Decide** which candidate articles to include or exclude, based on explicit selection criteria.
5. **Assess** quality of the research studies found and hence validity of their findings.
6. **Extract** and process the data from each high quality study (e.g. the intervention, size of population, findings).
7. **Synthesise** the studies, using statistical meta-analysis where possible.
8. **Write** report and disseminate.
## Difficulties Transferring EBM Model to Other Disciplines

<table>
<thead>
<tr>
<th>EBM</th>
<th>Non-EBM</th>
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<tbody>
<tr>
<td>RCTs are “gold standard”</td>
<td>Few/no RCTs in other disciplines</td>
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<tr>
<td>Emphasis on quantitative, positivist approach and “what works”</td>
<td>Range of philosophies and approaches Especially in IS (typically qualitative)</td>
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<tr>
<td>Primary studies combined in SLR as set of repeated experiments or their survey samples are regarded as subsets of a larger sample</td>
<td>Primary studies contextually based Little ‘cause and effect’ identifiable</td>
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Difficulties of EBM model in Information Systems

• Outcomes (effect) less consistent
  – Sometimes successful
  – Sometimes unsuccessful
  – Sometimes a bit of both

• So
  – Turn to qualitative methods
  – Turn to interpretive paradigm
    • “What works” has different meanings for different people
Criticisms of EBM Model for IS

Any information system or tool is inserted into pre-existing conditions comprising people, perceptions, relationships, culture, organisations, politics and structures.

The intervention changes the people, perceptions etc.

At the same time, the intervention is shaped and modified by the people who implement it or who are affected by it.

Hence trying to find out “what works”, is too simplistic an approach.

(Adapted from Pawson, 2006 – social policy expert).
New Method: Model-Driven SLR
Model-Driven SLR process

1. Devise tentative model
2. Define traceable and repeatable search strategy
3. Search for relevant primary studies
   - Articles’ repository
4. Assess article’s relevance to part(s) of the emerging model
   - Candidate articles
   - Rejected articles

Iterative process
5. Assess the quality of evidence in papers for supporting/contradicting the emerging model.
   - Relevant articles
6. Analyse the data for elements pertinent to specific parts of the emerging synthesised model.
7. Synthesise the studies into a refined model
8. Write up and disseminate.
Model-Driven SLR Approach
(based on Pawson 2006)

• Aim to discover
  “what works for whom, in what circumstances, in what respects?”

• Start: tentative theory/model:
  – how/why an intervention might work
  – E.g. draw rich picture, different actors & factors

• Use relevant primary studies found in literature search (case studies) to evaluate and modify the initial theory

• ‘multi-grounded theory’ approach
Model-Driven SLR Process

- Process of searching, selecting, evaluating *still made visible*
- Process of testing, adapting & modifying the theory *also made visible:*
  Process iterative *stages revisited* as evidence from each study is analysed for how it affects initial/emerging theory
- Each study evaluated for rigour of evidence it offers to support/contradict *parts* of the emerging synthesised theory
SLR Synthesis

• Generates a refined theory/model:
  – increases our understanding of how, for whom and in what circumstances an IS intervention may or may not work.

• Often 4 possible types of focus:

  1. Identifying typical weak points/barriers in implementations studied
  2. Adjudicating between 2 rival theories
  3. Contextual factors → intervention likely to be effective or not
  4. Comparing “official” (e.g. managers’/vendors’) intervention theory with what happens in practice
## Comparison

<table>
<thead>
<tr>
<th>Conventional SLRs</th>
<th>More nuanced SLR (MD-SLR)</th>
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<tbody>
<tr>
<td>- Primary studies as series of experiments</td>
<td>- Primary studies as set of case studies</td>
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<tr>
<td>- Summative verdict</td>
<td>- Richer understanding</td>
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<tr>
<td>- Prescriptive</td>
<td>- Informative</td>
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<tr>
<td>- Linear process</td>
<td>- Iterative process</td>
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<tr>
<td>- Suited to cause-effect research</td>
<td>- Suited to more complex situations</td>
</tr>
<tr>
<td>- Suited to quantitative, positivist research</td>
<td>- Suited to qualitative, interpretive research</td>
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Model-driven SLR process

• Process of searching, selecting, evaluating, synthesising made visible (as in all SLRs)
• Also visible: process of exploring, adapting & evolving a model
• Process more iterative – stages revisited as evidence from each study is analysed for how it affects initial/emerging model
• Each study evaluated for rigour of evidence it offers to support/contradict parts of the emerging synthesised model
Example of a model-driven SLR

“What factors influence the effective use of Business Process Modelling Notation (BPMN) in businesses?”
Objectives of BPMN

“To provide a notation that is readily understandable by all business users”.

Business analysts (create the initial process drafts)
Technical developers (implement the technology that performs the processes)
Business people (manage and monitor the processes).
1. Devise an initial tentative model (or ‘theory’) about how the intervention might be effective

Model derived using rich picture from experience and collaborative discussion
What factors influence the effective use of BPMN in businesses?

**Barriers**

- Decision to do BPM
- Choice of tool
- Actors & roles

**Enablers**

- Choice of BPMN method
- Adoption & use
- Achievement of objective

Oates, Edwards & Wainwright, ICIS 2012
2. Define a traceable and repeatable strategy for searching the literature.

- Limit the review to papers written in English
- Limit bibliographical databases to electronic ones covering
  - IS
  - Business and Management
  - Computing and Engineering,
- Limit bibliographical databases ones accessible to at least one researcher
- Use search terms:
  - BPMN or
  - “business process model*ing notation”,
- Examine title, abstract or keywords.
<table>
<thead>
<tr>
<th>Database</th>
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<tbody>
<tr>
<td></td>
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<td>Business Source Elite</td>
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<td><strong>TOTAL</strong></td>
<td><strong>402</strong></td>
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</table>
3. Search the literature for primary studies, looking for empirical evidence to test the model, supplement it and refine it.

4. Decide which candidate articles to include or exclude based on their relevance to one or more parts of the emerging synthesized model.
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5. Assess the quality of each research study for the strength of the evidence it offers to support or contradict parts of the emerging model.
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<tr>
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**Analysed papers containing empirical organisational BPMN data**

20 Distinct EO papers found

12 case study / experience reports

Used in our SLR, but generally poor quality case studies
6. Analyse the data looking for which bits of data are pertinent to which parts of the emerging synthesized model (i.e. each empirical article found is treated as a case study for the emerging model).

7. Synthesise the studies into a refined model which increases our understanding of how and in what circumstances an intervention may work (or not).
<table>
<thead>
<tr>
<th>Paper</th>
<th>Objective</th>
<th>Achievement of Objective</th>
<th>Decision to do BPM</th>
<th>Choice of BPMN method</th>
<th>Choice of tool</th>
<th>Actors and Roles</th>
<th>Adoption and use</th>
<th>Planned approach</th>
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Decision to do BPM

Objectives:
- Research / Business
- Choice of tool
- Actors & roles
- Corporate policy vagueness
- Transferring diagrams to different tool

Choice of BPMN as modelling language

Choice of BPMN version

Adoption & use

Evaluation of achievement of objectives

Barriers

Enablers

Additional language

Method for managing large projects

Senior executives’ familiarity

Only BPMN core set for managerial users

Limited experience of analysts

Stable business processes

Hybridisation

Organisation Type

Use of colour

Training workshops

Emergent

Planned

BPMN: lacks method

BPMN: lacks some modelling constructs

Employees reporting different processes

Corporation policy vagueness

Transferring diagrams to different tool

Oates, Edwards & Wainwright, ICIS 2012
8. Write up and disseminate.


http://aisel.aisnet.org/icis2012/proceedings/ResearchMethods/5/
Conclusions from BPMN study

• Final evolved model: identifies factors which could influence the effective organisational use of BPMN
  – Model’s origins and evolution documented & amplified by our textual commentary

• Limited high quality empirical evidence re BPMN
  – In general
    – To support our model

• Implications for Researchers:
  – Areas for further research

• Implications for Practitioners:
  – Limited evidence about BPMN to inform decision-making about its adoption
So how’s this different from any other literature review?

• Model as starting point
  – shapes search, analysis, synthesis,
  – evolves to a final model

• Whole process is documented, traceable

• Ad hoc, partial or incomplete reviews are obvious

• Development of the evolved model is transparent
  – a process of emerging interpretation of the texts
RECAP:
So how’s this different from other SLRs?

Conventional SLRs for EBP
• Primary studies as series of experiments
• Summative verdict – via statistical meta-analysis
• Prescriptive
• Linear process
• Suited to cause-effect research
• Suited to quantitative, positivist research

Model-driven SLR for EBP
• Primary studies as set of case studies
• Richer understanding of socio-technical situation
• Informative
• Iterative process
• Suited to more complex situations
• Suited to qualitative, interpretive research
Conclusion

• Case for SLRs, but for IS SLRs being “different”.
• Method aimed at analysis and synthesis of qualitative research studies, to:
  – Stimulate further research
  – Support development of a cumulative knowledgebase in IS
  – Inform practitioner decision-making
  – Enable Evidence-Based Practice in IS
• Discussion of the use of a MD-SLR via an example (Business Process Modelling Notation)
References


