

## ► Methodological support for business process redesign in health care: a literature review protocol

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### Summary

Research efforts that aim to develop methodological support for the redesign of business processes in the health-care domain are fragmented and performed in different domains. Due to these characteristics, it can be expected to be difficult to establish the state-of-the art with respect to this body of knowledge. This paper presents a research protocol that was developed prior to a literature review in this field, which illustrates the structure and rigor that we deem necessary to overcome the noted obstacles.

### Introduction

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Increasingly, health-care organizations are facing pressure to improve the performance of their processes in terms of cost, time, quality and flexibility. The redesign of business processes can significantly contribute to this objective. However, redesign projects are characterized by high risk of failure since sufficient methodological support is missing.<sup>1</sup>

Hence, the authors of this protocol decided to initiate a research project that aims at establishing a method that supports health-care practitioners in this act, where it is still left as an open question whether an entirely new method should be developed or whether existing methods can be used as a basis. Due to the fact that research efforts that aim at developing methodological support for redesigning business processes are fragmented and performed in different domains, a structured literature review is conducted as a first step in this research project. This allows for the identification of the existing body of knowledge in the domains of management science, information systems and health care.

Generic guidelines for conducting such a structured literature review are widely available, e.g. Fink,<sup>2</sup> Rowley and Slack,<sup>3</sup> and Torraco.<sup>4</sup> However, to the best of our knowledge,

we are the first to report a *detailed* literature review protocol in this *cross-domain area*, prior to the actual execution of a literature review. Typically, existing literature reviews focus on presenting the results and discussing their findings, while the underlying protocol does not receive the required attention, consequently hindering the traceability of its results. This protocol illustrates how a literature review for business process redesign in health care can be conducted in a more structured way.

The protocol, developed prior to the literature review that is currently ongoing, is described in the remainder of this article. In the second section, we start with positioning the literature review in the context of the research project mentioned earlier. In the remaining sections, the different stages of the literature review, as derived from Kitchenham,<sup>5</sup> are described. In the third section, the purpose of the literature review, which includes the research objectives, scope and questions, is discussed. In the fourth section, the project organization of the literature review is briefly described. In the fifth section, the search strategy that we use to identify a relatively complete census of relevant literature is explained. In the sixth section, the so-called 'relevance screening' is outlined as applied to the identified studies, in order to select the relevant ones of these. In further sections, we briefly explain our first ideas with regard to respectively the quality screening, data extraction, data synthesis and reporting stage of the literature review. In the last section, we end this article with our concluding remarks.

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## Research context

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As discussed in the introduction, a research project that aims at introducing either a new or substantially improved method that supports health-care practitioners in developing process alternatives has been initiated. This research project consists of four phases: exploration, development, evaluation and refinement. The objective of the exploration phase is two-fold. Firstly, our aim is to gain insights into the business process redesign methods that currently exist in literature and practice that have the potential to support health-care practitioners in developing alternatives to their existing processes. Secondly, our aim is to identify actionable, critical success factors of business process redesign initiatives in the health-care domain. After validation, these critical success factors are used to elicit requirements for the new business process redesign method that is to be designed in the development phase of this research project.

To achieve the two-fold objective of the exploration phase, three different research strategies are applied, i.e. a literature review, cross-case survey and field survey. First of all, the literature review that focuses on the current body of knowledge in the scientific domain is performed. Subsequently, a cross-case survey and a field survey are conducted to (a) identify and evaluate the business process redesign methods that have been applied in the health-care domain, and (b) further validate the critical success factors in the health-care domain as identified by the literature review.

In the remainder of this article, we focus on the first research strategy of the exploration phase, i.e. the literature review.

## Purpose

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In this section, the research objectives, research scope and research questions of the literature review are discussed.

## Research objectives

The objective of this literature review is two-fold.

The first objective is to identify methods in the scientific domain with the potential to support health-care practitioners in developing new process alternatives that significantly outperform the performance of current processes. *Methods* may be interpreted in this literature review as tangible handbooks, which describe how to deliver one or more outputs based on precisely described inputs.

The second objective is to identify the critical success factors of a business process redesign initiative in the health-care domain. After validation by means of the cross-case survey and the field survey, these factors are used for eliciting requirements for the new business process redesign method that is to be designed in the development phase of the research project.

## Research scope

The scope of each research objective is outlined below.

### *Scope of research objective 1. Identification of methods*

With regard to the first objective, four decisions are made concerning the research scope:

- It is limited to methods that aim at redesigning an inter-departmental or inter-organizational order-fulfilment process;
- It is limited to holistic methods;
- It is limited to methods that support practitioners in developing new process alternatives;
- It is not limited to methods that are customized for the health-care domain. Also, application domain-independent methods that may need further customization are within the scope of this literature review.

The details of the four decisions that are made regarding the scope of the first research objective are discussed below.

*Methods that aim at redesigning an interdepartmental or inter-organizational order-fulfilment process:* The scope of this literature review is limited to methods that aim at redesigning interdepartmental or inter-organizational order-fulfilment processes. In the health-care domain, these processes consist of the steps from intake till aftercare that are performed for a patient care request. These steps include diagnostic tests and treatments as well as supporting steps that are performed for a patient care request, like analyzing a medical record and making an appointment for surgery. It is widely acknowledged that due to the existence of dependencies between sub-processes from different departments, business process redesign initiatives need an interdepartmental or even a cross-organizational focus to achieve significant process performance gains.<sup>6</sup> Hence, this literature review focuses on methods that aim at redesigning such a comprehensive order-fulfilment process.

*Holistic methods:* The scope of this literature review is restricted to so-called holistic (multidimensional) methods. In contrast to one-dimensional methods, multidimensional methods do not have a single predefined solution concept in mind, but aim at changing multiple elements of a process simultaneously and take into account the effects on different process performance dimensions. It is assumed that, due to these characteristics, holistic methods have the most potential to achieve significant improvements in practice. Reijers and Mansar<sup>7</sup> have presented a Business Process Redesign framework to describe the elements that can be candidates for redesign. These are: customers, products, business process (with an operation and behavioural view), organization (with a structure and population view), information, technology and the external environment. Besides changing multiple elements of the process simultaneously, holistic methods also take into account their effects on multiple process performance dimensions. According to Jansen-Vullers *et al.*,<sup>8</sup> cost, time, flexibility, internal and external quality dimensions can be

distinguished. In this literature review, a method is called a *holistic method* if it aims at changing at least three process elements and takes into account the effects of redesigns on at least two process performance dimensions.

*Methods that support practitioners in developing new process alternatives:* A business process redesign initiative broadly covers four phases: (1) framing the process of interest, (2) understanding the current AS-IS process, (3) designing the new TO-BE process, and (4) implementing the new process.<sup>9</sup> In this literature review, the scope is restricted to methods that aim at supporting practitioners in developing new process alternatives. These methods belong to the third phase of a business process redesign initiative. However, this literature review specifically takes the outputs into consideration that are gained from the framing and understanding of the process in the first two phases, since they are clearly relevant as input for the third phase. In addition, this literature review does not ignore the outputs of the third phase that are needed as input for the fourth phase. Nevertheless, a detailed analysis of methods that are used in the first, second and fourth phase of a business process redesign initiative is outside the scope of this literature review.

*Application domain-independent methods:* Although our ultimate aim is to develop a method that supports health-care practitioners, we do not limit our attention to the health-care domain in this literature review. Expecting a scarcity of methods that are customized for the health-care domain, application domain-independent methods that may need further customization are also within the scope of this literature review.

*Scope of research objective 2. Identification of critical success factors*

With regard to the second objective of this literature review, five decisions are made concerning the research scope:

- It is limited to success factors of initiatives that aim at redesigning an interdepartmental or inter-organizational order-fulfilment process;
- It is limited to success factors of initiatives that aim at holistic business process improvement;
- It is limited to success factors of initiatives that aim at developing new process alternatives;
- It is limited to success factors that are actionable;
- It is not limited to success factors that are specific for the health-care domain. Also, application domain-independent success factors of business process redesign initiatives are investigated.

The first three decisions are already explained in the preceding subsection. In the remainder of this subsection, the last two decisions are explained.

*Actionable success factors:* The term action-ability refers to the degree to which the success factor allows a concrete action to be taken or concrete decision to be made.<sup>10</sup> In this literature review, it refers to the degree to which the success factor allows a concrete requirement to be elicited

for the new method in the development phase of the research project. In feedback theory, three information levels are distinguished: the meta-task level, the task level and the task learning level.<sup>11</sup> At the meta-task level, the highest level, information is not considered to be actionable. For example, the success factor ‘ensure top management support’ does not allow a concrete action to be taken. The next level, the task level, is related to actual task performance and is actionable. For instance, ‘clearly articulate the purpose of the project and its strategic contribution’ is an actionable statement at the task level. The task-learning level, the lowest level, focuses on the details of task execution and is also actionable. For example, ‘Give a five-sheet PowerPoint presentation at 08:00 to discuss the purpose of the project and its strategic contribution’ is a statement at the task learning level. Although this statement is actionable, our focus is on identifying success factors at the task level.

*Application domain-independent success factors:* Expecting that the health-care domain can benefit from generic process change management insights, we do not limit our attention to critical success factors that are health-care specific. In addition, application domain-independent success factors of business process redesign initiatives are considered. However, studies that focus on success factors of initiatives in a specific domain other than the health-care domain are outside the scope of this study.

**Research questions**

Based on the research objectives and the defined scope, the following research questions are formulated:

- (1) Which holistic business process redesign methods are available in the scientific domain with the potential to support health-care practitioners in developing process alternatives that significantly outperform the process performance of current interdepartmental or inter-organizational order-fulfilment processes?
- (2) What are the actionable critical success factors of holistic initiatives that aim at developing process alternatives that significantly outperform the process performance of current interdepartmental or inter-organizational order-fulfilment processes in the health-care domain?

**Organization**

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The project organization of this literature review consists of a project coordinator, a review team and an advisory committee. The *project coordinator* is responsible for the coordination of all activities concerning the literature review. Together with another project member, the project coordinator forms the *review team*. This team is responsible for developing the review protocol, searching and selecting

the studies to be included in the literature review, extracting data from the selected studies, and synthesizing and reporting the outcomes of the literature review. The *advisory committee* is responsible for reviewing the protocol, the list of studies finally selected for data extraction, and the draft research paper. This committee consists of scientific experts in the field of business process redesign. Because research in this field is conducted by scientists who work in different research domains, two experts for each of the most relevant domains are invited to participate in the advisory committee. More specifically, the six members of the advisory committee cover the domains of management science, information systems and health care.

## Searching for literature

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The aim of the search stage is to identify studies in such a way that a relatively complete census of relevant literature is accumulated.<sup>12</sup> As recommended by many studies,<sup>2,5,13-15</sup> multiple search strategies are used in order to establish that important studies do not remain unidentified. An electronic database search is performed first, in order to enable a comprehensive search.<sup>2,3,14,15</sup> Subsequently, a secondary search is conducted to identify additional studies by means of backward and forward tracing of references. To further establish that important studies do not remain unidentified, the members of the advisory committee are contacted to assess the completeness of the search at the end of this secondary search. Below, the primary search and secondary search are explained, and their corresponding practical concerns are discussed.

### Primary search

The primary search is an electronic database search that is aimed at identifying an initial set of studies.

#### *Selection of electronic databases*

As proposed by a number of studies,<sup>13,16</sup> multiple electronic databases are used to cover the different research domains that are active in the field of business process redesign. More specifically, the electronic databases ABI/Inform, INSPEC and Medline are selected to provide coverage of, respectively, the management science, information systems and health-care domain. In addition, the EPOC Cochrane database and the International Journal of Care Pathways are scanned manually. These sources are outside the scope of the selected search engines but are considered to be highly relevant.

#### *Selection of data sources*

In line with the recommendations of Rowley and Slack,<sup>3</sup> and Webster and Watson,<sup>12</sup> the primary search is targeted at peer-reviewed journal articles and conference papers

in order to identify high-quality studies in an efficient way. The primary search is further constrained by limiting our attention to studies that are written in the English language, contain an abstract and are published in or after the year 1990. The year 1990 is generally considered to be the year of the start of the process wave<sup>17,18</sup> with publications of Hammer's<sup>19</sup> and Davenport and Short's<sup>20</sup> work.

#### *Search terms electronic databases*

As recommended by Fink<sup>2</sup> and Grimshaw *et al.*,<sup>21</sup> a broad search using free text and database-specific headings is used to identify an initial set of studies in an effective way. Although all three selected electronic databases have a detailed thesaurus, we conclude that for business process redesign initiatives electronic databases are poorly indexed. This is because, on the one hand, many different headings can and, in fact, are used to code business process redesign initiatives. On the other hand, many heterogeneous studies are labelled to the same heading. Our stated findings are in line with Grimshaw *et al.*<sup>21</sup> Hence, it is decided to complement high-level headings with a free text search in the title of the study to identify primary studies in an effective way. The free text search term is based on the research question and derived from the thesaurus terms of all three electronic databases. More details about the construction of the free text search term are described below.

The elements 'method', 'redesign' and 'process' are derived from the first research question. The elements 'factor', 'redesign' and 'process' are derived from the second research question. A structured scan of the thesaurus trees of all electronic databases was performed to discover related thesaurus terms for all these elements. After obtaining these terms, cross checks were performed between the different electronic databases. (For each thesaurus term identified within one of the electronic databases, we checked whether this term was also identified within the other electronic databases or not. If it was not identified by a certain database, the term was entered in the thesaurus of the electronic database. In case the term was found in the thesaurus of that database, additional terms were identified by scanning relevant broader, narrower and related terms in the thesaurus of that database). In this way, possible undiscovered thesaurus terms during the initial scan were localized and identified. After obtaining the thesaurus terms, additional synonyms, acronyms and abbreviations were identified by means of a general thesaurus and acronym library. Finally, advanced search options like Boolean operators and truncation symbols were used to construct the free text search term. The generated Boolean expression corresponding to the first question consists of four parts:

(([process] AND [redesign]) OR [process redesign]) AND [method]

Regarding the second research question, the following Boolean expression was created:

(([process] AND [redesign]) OR [process redesign]) AND [factor]

Each part in the above Boolean expression surrounded by ([ ]) is itself a Boolean expression consisting of synonyms, acronyms and abbreviations. For each part, the complete Boolean expression is shown in Table 1. The Boolean expressions in Table 1 are likely to be adapted during execution of the search. Specifically, all reviewed studies are manually scanned for additional terms.

As explained earlier, the free text search in the title of the studies is complemented with the use of database-specific headings. Specifically, we complement the free text search with the use of high-level subject headings and classification codes in INSPEC and Mesh headings and sub-headings in Medline. Headings are not used in ABI/Inform due to the absence of a clear hierarchical tree structure of headings. Regarding the other electronic databases, the selection of headings was on the safe side of inclusiveness. The detailed search filters of the three electronic databases, including the selected headings, are shown in an Appendix which is available at <http://ijcp.rsmjournals.com/content/15/4/119/suppl/DC1>.

**Secondary search**

After identification of an initial set of potentially relevant studies by means of performing the primary search, the relevance and quality of each identified study is screened. The relevance and quality screening procedure are discussed in the sections, ‘relevance screening’ and ‘quality screening’. After these screening procedures, a secondary search is performed, based on the articles that pass the relevance and quality screen. More specifically, the backward and forward tracing techniques are used to identify additional relevant studies.

**Table 1** Overview Boolean expressions

Part	Complete Boolean expression
Process	business model: OR (care ADJ3 continuit:) OR (care ADJ3 continuum:) OR case management OR chain: OR delivery system: OR network: OR operation: OR order fulfil: OR order processing OR organi#ational model: OR pathway: OR patientflow: OR patient flow OR process OR processes OR product: line: OR service: OR workflow: OR work flow:
Redesign	chang: OR CI OR CQI OR CQM OR design: OR develop: OR engineer: OR improv: OR innovat: OR invent OR inventi: OR optim: OR Quality Management OR redesign: OR reengineer: OR re-engineer: OR reform: OR reorgani: OR restructur: OR streamlin: OR total quality OR TQM
Process redesign	BPR OR (clinical ADJ2 path:) OR (critical ADJ2 path:) OR disease management OR integrated delivery OR (integrated ADJ2 path:) OR kaizen OR lean OR (patient ADJ2 centered ADJ2 care) OR (patient ADJ2 focused ADJ2 care) OR six sigma
Method	approach: OR blueprint: OR guide: OR guidebook: OR handbook: OR instruction: OR manual: OR method: OR procedure: OR protocol: OR road map: OR technique: OR tool:
Factor	antecedent: OR barrier: OR cause: OR challenge: OR determinant: OR enabler: OR factor: OR guideline: OR hurdle: OR issue: OR lesson: OR obstacle: OR recommendation: OR requirement: OR risk: OR rule:

The Boolean expressions that are shown in Table 1 are used in the INSPEC and Medline database. In the ABI/Inform database slightly different truncation symbols are used.

*Data sources*

The secondary search is targeted at peer-reviewed journal articles, conference papers, and grey literature (i.e. technical reports and work in progress). Analogously to the primary search, this search is further constrained by limiting our attention to studies that are written in the English language.

*Closure of data collection*

As recommended by Webster and Watson,<sup>12</sup> the secondary search stops when new relevant concepts are no longer discovered. Subsequently, the members of the advisory committee are contacted to assess the completeness of the search.

**Practical concerns**

A large number of references are generated during this stage. In order to manage these references, a bibliographic package is used. The generated unfiltered search results are saved and retained for further analysis.

**Relevance screening**

In the relevance screening stage, the studies that are considered relevant and the ones that are considered irrelevant are determined. As suggested by a number of studies,<sup>2,5,14,15,22</sup> inclusion and exclusion criteria are defined, and a screening procedure is developed to select studies in an unbiased way. In the remainder of this section, the inclusion and exclusion criteria, screening procedure and corresponding practical concerns are discussed.

**Inclusion and exclusion criteria**

As recommended by Kitchenham,<sup>5</sup> the inclusion and exclusion criteria are inspired by the research objectives, research scope and research questions. Regarding the first research question, the inclusion and exclusion criteria are shown in Table 2. All criteria are formulated as questions where the answers to these questions determine whether the study should be included or not. A study can only pass the relevance screen if all criteria in Table 2 are fulfilled. More precisely, for each study, all the questions corresponding to the inclusion criteria have to be answered with either ‘Yes’ or ‘?’ and all the questions corresponding to the exclusion criteria have to be answered with ‘No’ or ‘?’.

The inclusion and exclusion criteria related to the second research question are shown in Table 3. Analogously to the relevance screen related to the first research question, a study can only pass this relevance screen if all criteria in Table 3 are fulfilled.

**Screening procedure**

As proposed by a number of studies,<sup>5,16</sup> a two-stage screening procedure is used to select relevant studies in an efficient way:

**Table 2** Overview relevance criteria related to the first research question

Inclusion (I) and exclusion (E) criteria
(1) Does the study aim at developing a business process redesign method? (I)
(a) Does the method aim at redesigning interdepartmental or inter-organizational order-fulfilment processes? (I)
(b) Is the method a holistic method? (I)
(i) Does the method aim at changing at least three different process elements? (I)
(ii) Does the method take into account the effects of redesigns on at least two different process performance dimensions? (I)
(c) Does the method support practitioners in developing new process alternatives? (I)
(i) Does the method only aim at framing the process of interest? (E)
(ii) Does the method only aim at modelling or analyzing the AS-IS situation? (E)
(iii) Does the method only aim at evaluating different process alternatives? (E)
(iv) Does the method only aim at implementing a new process design? (E)
(d) Is the method customized for another domain than the healthcare domain? (E)

- The title and abstract of studies identified by the primary and secondary search are screened by a single reviewer and irrelevant studies are excluded from further examination. This screen is on the safe side of inclusiveness and based on the inclusion and exclusion criteria as discussed earlier. For each study, the criteria are judged from top to bottom. If one of the relevance screen criteria is not met, no further analysis of other criteria is needed. A subset of titles and abstracts is screened by a second reviewer in order to test inter-rater-reliability. Analogously to Mistiaen *et al.*,<sup>23</sup> inter-rater-reliability is assessed on a 10% random sample of studies. Fink<sup>2</sup> has recommended the use of

**Table 3** Overview relevance criteria related to the second research question

Inclusion (I) and exclusion (E) criteria
(1) Does the study aim at identifying success factors of business process redesign initiatives? (I)
(a) Does the study focus on initiatives that aim at redesigning inter-departmental or inter-organizational processes? (I)
(b) Does the study focus on initiatives that aim at holistic business process improvement? (I)
(i) Do the initiatives aim at changing at least three different process elements? (I)
(ii) Do the initiatives take into account the effects of redesigns on at least two different process performance dimensions? (I)
(c) Does the study focus on initiatives that aim at supporting practitioners in developing process alternatives? (I)
(i) Do the initiatives only aim at framing the process of interest? (E)
(ii) Do the initiatives only aim at modelling or analyzing the AS-IS situation? (E)
(iii) Do the initiatives only aim at evaluating different process alternatives? (E)
(iv) Do the initiatives only aim at implementing a new process design? (E)
(d) Are the success factors actionable and formulated at the task level? (I)
(e) Does the study aim at identifying success factors that are specific for another domain than the health-care domain? (E)

the Kappa statistic to evaluate inter-rater-reliability. If the Kappa statistic is lower than the generally accepted threshold, i.e. 0.6, then the complete set of studies is reviewed by two reviewers. Any inclusion/exclusion disagreements between the reviewers are resolved by means of the consensus approach;

- Full copies are obtained for all studies that pass the title and abstract screen. All full copies are independently reviewed against the inclusion and exclusion criteria by two reviewers. For each study, the criteria are judged from top to bottom. If one of the relevance screen criteria is not met, no further analysis of other criteria is needed. Inter-rater-reliability is again evaluated by means of the Kappa statistic and any disagreements between the reviewers are resolved by means of the consensus approach.

Before starting the screening procedure, all criteria and screening stages are piloted, and discussed and documented in detail by the members of the review team. During the execution of the relevance screening procedure, screening issues and improvement possibilities are discussed in review meetings.

### Practical concerns

A spreadsheet is used to document all inclusion and exclusion decisions in detail. All search results that are stored in the bibliographic package are exported to this spreadsheet. As suggested by Walsh and Downe,<sup>22</sup> a flowchart is created to summarize the relevance screening results.

### Quality screening

After screening for relevant studies, it is necessary to assess the quality of primary studies.<sup>2,5,13,14,21,22</sup> Similar to the previous stage, inclusion and exclusion criteria are defined, and a screening procedure is developed for an unbiased selection of studies. The final inclusion and exclusion criteria are determined after the relevance screening. In the remainder of this section, the concept-version of the inclusion and exclusion criteria, screening procedure and corresponding practical concerns are discussed.

### Inclusion and exclusion criteria

Inclusion and exclusion criteria are defined on the safe side of inclusiveness, because further validation takes place by means of the cross-case survey and the field survey. A set of possible inclusion and exclusion criteria related to the first research question is shown in Table 4. With regard to the second research question, a set of possible inclusion and exclusion criteria is shown in Table 5. Analogously to the relevance screen, all criteria in Table 4 or Table 5 should be fulfilled to pass the quality screen.

**Table 4** Overview quality criteria related to the first research question

**Inclusion (I) and exclusion (E) criteria**

- (1) Does the study provide at least a 0.5 A4 page description of the method that aims at developing new process alternatives? (I)
- (2) Does the study include a description of the inputs for the business process redesign method, i.e. the information needed or steps to be taken before creating process alternatives? (I)
- (3) Does the study include a description of the outputs of the method that aims at developing new process alternatives? (I)

**Table 5** Overview quality criteria related to the second research question

**Inclusion (I) and exclusion (E) criteria**

- (1) Does the study include at least a two sentence definition of all success factors? (I)
- (2) Are the success factors solely based on expert opinion? (E)

**Screening procedure**

The quality screening is independently performed by two reviewers for all studies that pass the relevance screen. Full copies of these studies are investigated to review the studies against the inclusion and exclusion criteria of the quality screen. For each study, the criteria are judged from top to bottom. If one of the quality screen criteria is not met, no further analysis of other criteria is needed. In line with the relevance screening, inter-rater-reliability is assessed by means of the Kappa statistic and any disagreements between the two reviewers are resolved by means of the consensus approach.

Analogously to the relevance screening, all criteria and the screening procedure are piloted, and discussed and documented in detail by the members of the review team, before executing the screen. During the execution of the quality screening procedure, review meetings are again scheduled to discuss screening issues and improvement possibilities.

**Practical concerns**

The spreadsheet that is used to document the results of the relevance screen is also used to document all inclusion and exclusion decisions of the quality screen. A flowchart is again created to summarize the quality screening results.

**Data extraction**

After identification of the studies that have to be included in the literature review, useful data from each included study is extracted. For an unbiased data extraction, a number of studies<sup>5,14-16</sup> have recommended to develop a

data extraction form and a data extraction procedure. In the remainder of this section the data extraction form, procedure and corresponding practical concerns are discussed.

**Data extraction form**

Detailed descriptions of methods and success factors are extracted from the included studies. As proposed by Okoli and Schabram,<sup>14</sup> the detailed data extraction form is developed after the quality screening procedure has been applied, in order to make use of the insights gained during the preceding stages.

**Data extraction procedure**

As suggested by Brereton *et al.*,<sup>16</sup> an extractor-checker construction is used to extract data from the selected studies in order to make efficient use of review resources. The consensus approach is again used to resolve data extracting discrepancies.

Analogously to the relevance and quality screening, the data extraction form and the detailed extraction procedure are piloted, and discussed and documented in detail by members of the review team, before extracting data from the included studies. During the execution of the data extraction procedure, review meetings are again scheduled to discuss data extraction issues and improvement possibilities.

**Practical concerns**

A spreadsheet is used to document the extracted data from the studies.

**Data synthesis**

In this stage, the extracted data are summarized and compared critically. For which, a qualitative synthesis procedure is used that aims at:

- Putting the knowledge from the review into a model or conceptual framework that offers a new perspective on the topic (e.g. Torraco<sup>4</sup>);
- Identifying homogeneity but also discordance and dissonance between findings (e.g. Walsh and Downe<sup>22</sup>);
- Including a critical evaluation of how well the literature presents the issue: strengths, key contributions as well as deficiencies, omissions and inaccuracies are identified (e.g. Torraco<sup>4</sup>).

As recommended by Randolph,<sup>15</sup> and Webster and Watson,<sup>12</sup> the experts in the advisory committee contribute to the critical evaluation and review the draft research paper.

## Reporting

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In the end, the produced results need to be reported effectively. Our aim is to publish the literature review in a peer-reviewed periodical in health care, information systems or management science.

## Conclusion

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There is a high need for developing methodological support for the redesign of business processes in the health-care domain. Research efforts that aim to develop this methodological support are fragmented and performed in different domains. In order to gain insights into the state-of-the art with respects to this body of knowledge, a structured literature review is needed.

Generic guidelines for conducting such a structure literature review are widely available. However, to the best of our knowledge, we are the first to report on a *detailed* literature review protocol in this *cross-domain area*, which precedes and facilitates the actual execution of a literature review. Typically, existing literature reviews focus on presenting the results and discussing their findings, while the underlying protocol does not receive the required attention, consequently hindering a proper traceability of its findings.

This literature review protocol illustrates how a literature review can be conducted with the structure and rigor that we deem necessary to overcome the noted obstacles in the field of business process redesign in health care. We contend that by employing such an approach, (a) traceable results are produced; (b) the finally selected set of studies is unbiased from personal preferences and representative of the existing body of knowledge regarding business process redesign in health care.

### DECLARATIONS

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