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Backsourcing of IT with focus on software development—A systematic literature review☆

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ABSTRACT

Context: Backsourcing is the process of insourcing previously outsourced activities. Backsourcing can be a viable alternative when companies experience environmental or strategic changes, or challenges with outsourcing. While outsourcing and related processes have been extensively studied, few studies report experiences with backsourcing.
Objectives: We summarize the results of the research literature on backsourcing of IT, with a focus on software development. By identifying practically relevant experience, we present findings that may help companies considering backsourcing. In addition, we identify gaps in the current research literature and point out areas for future work.
Method: Our systematic literature review (SLR) started with a search for empirical studies on the backsourcing of IT. From each study, we identified the context in which backsourcing occurred, the factors leading to the decision, the backsourcing process, and the outcomes of backsourcing. We employed inductive coding to extract textual data from the papers and qualitative cross-case analysis to synthesize the evidence.
Results: We identified 17 papers that reported 26 cases of backsourcing, six of which were related to software development. The cases came from a variety of contexts. The most common reasons for backsourcing were improving quality, reducing costs, and regaining control of outsourced activities. We model the backsourcing process as containing five sub-processes: change management, vendor relationship management, competence building, organizational build-up, and transfer of ownership. We identified 14 positive outcomes and nine negative outcomes of backsourcing. We also aggregated the evidence and detailed three relationships of potential use to companies considering backsourcing. Finally, we have highlighted the knowledge areas of software engineering associated with the backsourcing of software development.
Conclusion: The backsourcing of IT is a complex process; its implementation depends on the prior outsourcing relationship and other contextual factors. Our systematic literature review contributes to a better understanding of this process by identifying its components and their relationships based on the peer-reviewed literature. Our results can serve as a motivation and baseline for further research on backsourcing and provide guidelines and process fragments from which practitioners can benefit when they engage in backsourcing.

1. Introduction

Outsourcing, i.e., the contracting out of business activities typically performed in-house to third parties, has been reported since the 1970sand became mainstream in Information Technology (IT) in the 1990s (Davis et al., 2006; Dibbern et al., 2004). Outsourcing gained considerable media attention due to the benefits advertised by, in particular, a few large, successful initiatives. Cases such as Kodak's outsourcing of its technology systems in 1989 encouraged other companies to follow the same path (Dibbern et al., 2004; Benaroch et al., 2010). In the following decade, the explosive growth of the internet and major improvements in telecommunications provided an extra boost to this growing trend (Dibbern et al., 2004; McLaughlin and Peppard, 2006).

Initially, most outsourcing agreements were between companies in the same geographical area. At the beginning of the

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2000s, companies began to search for vendors outside their home country, particularly those which could provide additional benefits, such as lower operational costs, access to new markets, or knowledge (Davis et al., 2006; Dibbern et al., 2004; Solli-Sæther and Gottschalk, 2015). Companies increasingly started outsourcing also software development activities as part of the general IT outsourcing trend.

However, and perhaps not unsurprisingly, not all outsourcing relationships were successful. Many companies encountered problems with their outsourcing initiatives or experienced strategic or environmental shifts (Benaroch et al., 2010; Sparrow, 2003; Wong, 2006) that made the outsourced activity strategically critical to the organization. Expected cost savings were not always realized, often due to unexpected costs in offshore locations (Solli-Sæther and Gottschalk, 2015; Cullen et al., 2006; Whitten, 2010) or coordination and communication costs that proved to be higher than expected. Even when cost savings were achieved, other issues such as poor relationships with the vendor, unsatisfactory quality, and lack of control were reported (Sparrow, 2003; Brandes et al., 1997; Gottschalk and Solli-Sæther, 2005). As a result, some companies started reversing their outsourcing decisions, bringing previously outsourced activities back in house, or *backsourcing* (Solli-Sæther and Gottschalk, 2015; Wong, 2006).

Research on outsourcing resulted in a wide range of academic contributions, including investigations into the motivation for outsourcing, expectations about benefits, and the factors leading to a successful outsourcing relationship (Solli-Sæther and Gottschalk, 2015; Gottschalk and Solli-Sæther, 2005; Lacity and Willcocks, 1998). Secondary studies have aggregated these findings to understand the outsourcing process and to synthesize lessons learned from real-world experiences (Dibbern et al., 2004; Bergkvist and Fredriksson, 2008; Khan et al., 2011a,b). As the outsourcing phenomenon is multifaceted, new terminologies emerged to help describe the diversity of outsourcing relationships (Solli-Sæther and Gottschalk, 2015; Bergkvist and Fredriksson, 2008; Šmite et al., 2014).

In contrast to outsourcing, backsourcing has received little attention in the research literature (von Bary and Westner, 2018a; Hirschheim and Lacity, 2000; Whitten and Leidner, 2006), in which we could identify five literature reviews (von Bary and Westner, 2018a; Leyh et al., 2018; Wong and Jaya, 2008; Veltri, 2005; von Bary et al., 2018b). As discussed in Section 5.2, the existing reviews mainly provide insights about the reasons for ending an outsourcing relationship and deciding to bring outsourced IT back into the organization. They provide only a superficial view of the process of backsourcing and how organizations handle it in practice. Interestingly, we could not find any attempts to aggregate knowledge about backsourcing in the Software Engineering (SE) literature, despite the fact that software development may be either the sole scope or a significant part of the scope of IT backsourcing.

Motivated by the lack of in-depth reviews related to the backsourcing of IT, the complete lack of reviews related to backsourcing in SE, and the potential contribution both to research and practice, we designed and conducted a systematic literature review to aggregate what is empirically known about backsourcing. Our objective was not limited to investigating the motivation behind the backsourcing decision; rather, we wanted to investigate what is known about the process of backsourcing from decision to completion. In addition to the elements already described in previous reviews, our aim was thus to identify how companies had brought projects back in house, and what the reported outcomes were.

To this end, we searched for and extracted empirical evidence from backsourcing cases, interview studies, and surveys reported in the peer-reviewed academic literature. In this paper, we describe the evidence in a narrative format, highlighting the situational context in which the cases were reported. Moreover, we have tried to explicate relationships between elements such as actions and outcomes to the extent possible. To the best of our knowledge, this paper provides the only in-depth literature review of available empirical studies of backsourcing of SE to date.

Thus, the contribution of this paper to the field of SE is (a) the recognition of the importance of the topic for SE management, (b) the identification of a lack of in-depth studies of backsourcing of software development, and (c) a set of empirically-derived insights on backsourcing of value to practitioners who are considering backsourcing as an alternative to their current sourcing strategy, or who are involved in a backsourcing process. Furthermore, we hope to inspire further empirical research that will provide a deeper understanding of the backsourcing process.

The rest of the paper is organized as follows: Section 2 presents background information about backsourcing; Section 3 describes our research approach. In Section 4, we report the findings for our research questions. Finally, Section 5 compares our results with related work and discusses the limitations of our study and its implications for research and practice. Finally, Section 6 presents our concluding remarks.

2. Background and related work

2.1. Defining backsourcing

As discussed above, we define *backsourcing* as *the process of bringing previously outsourced activities back in house*. We thus view backsourcing as a process that starts with the decision to backsource and ends when the outsourced activity has been successfully (re-)integrated into the organization. Put another way; backsourcing is the process of moving from outsourcing to insourcing.

In the literature, the term "backsourcing" is used somewhat inconsistently. It has been used as a synonym for reshoring, backshoring, relocating, reverse outsourcing, re-insourcing, or insourcing (Bergkvist and Fredriksson, 2008; von Bary and Westner, 2018a; Nujen et al., 2015; von Bary, 2018). The distinction between these is often unclear, as the contexts in which the terminology is applied differ broadly. Reshoring, backshoring, and relocating are related to moving the outsourced services to a new location, often back to the "original country" (Nujen et al., 2015). In contrast, reverse outsourcing and re-insourcing relate to a change in the sourcing relationship (Nujen et al., 2015; Nujen et al., 2018), e.g., from outsourcing to insourcing. Insourcing has also been used as a synonym for backsourcing, as reported by a literature review on outsourcing terminology (Bergkvist and Fredriksson, 2008).

As is clear from our definition, to us, the critical factor for backsourcing is the occurrence of a previous outsourcing relationship in which activities such as software development or operations were conducted outside the company's borders. These activities might have been conducted in any geographical location and as a result of backsourcing, may remain in the same location or move to a new location; this is not a defining aspect of backsourcing but of the new insourcing model with which it ends. Our definition of backsourcing as a process is in line with those of other researchers, e.g., Dibbern et al. (2004), Solli-Sæther and Gottschalk (2015), Lacity and Willcocks (1998), Wong (2006), Hirschheim and Lacity (2000), Wong (2008) and Whitten and Leidner (2006).

2.2. The emergence of backsourcing

Backsourcing has been increasingly discussed in the research literature since the 2000s (Hirschheim and Lacity, 2000). In early work, researchers identified four archetypes of insourcing, one of

which was carried out as a result of failed outsourcing, i.e., backsourcing. The topic gained some academic interest as reports emerged of companies that had decided to cease outsourcing relationships and were looking for alternative sourcing solutions (Dibbern et al., 2004; Whitten, 2010). The most commonly reported post-outsourcing alternatives are re-outsourcing and backsourcing (Dibbern et al., 2004; Whitten, 2010; Whitten and Leidner, 2006). Other alternatives include continued outsourcing, switching outsourcing vendors (Whitten, 2010), and multisourcing relationships (Šmite et al., 2014).

According to the literature, the reasons for termination of an outsourcing relationship are often expectation mismatches, or "outsourcing expectation gaps" (von Bary and Westner, 2018a; Lacity et al., 2007; Leyh et al., 2018; Wong and Jaya, 2008; von Bary et al., 2018a). In particular, gaps occurred in situations where companies rushed into outsourcing agreements expecting major benefits such as reduced costs and improved quality of products and services but realized later that these expectations were unrealistic. In many cases where the outsourcing effort failed to meet expectations, companies opted to gain full control of the previously outsourced services through backsourcing rather than re-outsource (Benaroch et al., 2010; Nujen et al., 2015; Bhagwatwar et al., 2011).

The decision to backsource affects both the client and the vendor and introduces critical issues (Nujen et al., 2015; Wong, 2008). One such issue is the transfer of knowledge between the two organizations during the backsourcing process (Nujen et al., 2015; Bhagwatwar et al., 2011). Other tasks that turn backsourcing into a complex process are contract termination and possible negotiation of a new contract to cover the transition period, (re-)building an in-house organization to handle the previously outsourced processes, and ensuring continuity of the previously outsourced services (Bhagwatwar et al., 2011; Wong, 2008).

IT services have become a popular field for outsourcing and, consequently, for backsourcing (Kotlarsky and Bognar, 2012). The scope of IT backsourcing includes a wide range of services, such as the operation of computer systems (including hardware and software), software development, electronic data processing, and technological support (Solli-Sæther and Gottschalk, 2015). In this work, we aim to understand backsourcing of IT from a SE perspective. We are primarily interested in the context of software development and the impacts of backsourcing on SE management activities (Bourque and Fairley, 2004).

3. Research method

3.1. Research questions

Our goal was to investigate the IT backsourcing phenomenon according to evidence presented in empirical, peer-reviewed studies. In particular, we were interested in how backsourcing software development compared to other IT-related services. We addressed this goal through five research questions:

RQ1. *What is the context of the reported backsourcing instances?* To understand the circumstances of backsourcing, we extracted characteristics of the business, the previous outsourcing arrangement, and the new organization. We also distinguished backsourcing of software development and other IT-related services.

RQ2. *Why do companies backsource?* We aim to understand the rationale behind backsourcing, in particular, the reported reasons for and against backsourcing.

RQ3. *How do companies backsource?* We want to understand how backsourcing is carried out in practice. What are the elements of the backsourcing process, and how is it performed?

RQ4. *What are the reported outcomes of backsourcing?* We aim to understand the consequences of the backsourcing process. We identified positive and negative outcomes reported in the literature, related practices, and the context in which they occurred.

RQ5. *What are the relationships between the context, reasons, processes, and outcomes of backsourcing?* We intend to deepen our understanding of the backsourcing process beyond what can be achieved by analyzing the themes in isolation. We identified connections between elements we extracted from the literature and used them to describe potentially interesting relationships.

RQ6. *What software engineering concepts are addressed by the backsourcing of software development?* Finally, we emphasize the software engineering aspect related to which the phenomenon of backsourcing is observed. We classified the codes and themes we synthesized from software development cases according to the core concepts and principles of the Software Engineering Body of Knowledge (SWEBOK) (Bourque and Fairley, 2004).

3.2. Search and selection process

Our search and selection process is grounded in the guidelines for systematic literature reviews in software engineering (Kitchenham et al., 2015).

3.2.1. Preliminary search

To familiarize ourselves with the literature on the topic and to identify relevant databases, we conducted a preliminary search in Google Scholar using a general search string composed of terms related to the phenomenon of interest and research domain. We limited this preliminary search to the references in the 20-first page results. Our main goal was to assess whether studies about backsourcing are available and which databases we could find them. Based on our preliminary search results, our search strategy comprised of five databases and meta-engines: Scopus, ACM Digital Library, Springer Link, IEEE Library, and Web of Science.

We further benchmarked the results of our preliminary search with the papers included in a related review on the same topic (von Bary and Westner, 2018a). We identified eleven papers missing from the preliminary search that we deemed relevant for our review. The other papers were not found using our preliminary search string in the first 20 pages of the results. We further searched for each of the eleven papers individually and identified the sources by which they could be found. Eight of the missing papers were indexed by two databases (Science Direct and EBSCO Host) we added to our search strategy.

Finally, three papers were still missing. Despite being available in the databases we used, these papers did not include the search string terms in the abstract. We assessed whether they could be found in the reference list of the included papers at this stage. As this was the case, we adopted snowballing as a complementary search strategy to ensure we could find all the references also included in the benchmark study.

3.2.2. Search string

Following the preliminary search, we refined our search string using keywords from the most relevant papers. The resulting search string is:

(backsourcing OR backshoring OR "global resourcing" OR reshoring OR insourcing OR inshoring OR relocating OR "global relocation" OR re-outsourcing OR homeshoring OR "back in-house" OR "fail outsourcing") AND ("information technology" OR "information systems" OR "software development" OR "software project" OR "software engineering" OR "digitalization")

Table 1
Databases searched.

Database	Results
1. Scopus	278
2. ACM digital library	616
3. Springer link	3867
4. IEEE library	67
5. Web of science	69
6. Science direct	44
7. EBSCO host	461
Total	**5402**

We searched the seven databases listed in Table 1 using the title, abstract, and keyword fields whether possible. Due to limitations, we performed a search using all fields in three databases: ACM Digital Library, Springer Link and EBSCO Host. A full description of the individual search strings used in the different databases is reported in the study protocol.[1]

We collected and aggregated the references of the 5402 resulting papers in a single list. We then removed duplicates, incomplete references, and non-papers (see exclusion criteria E4–E6). This preliminary filtering reduced the number of candidate papers to 3207, as illustrated in Fig. 1.

3.2.3. Study selection

The candidate papers were reviewed by two of the authors and selected according to the following criteria:

Inclusion Criteria

I1. Empirical studies (e.g., case study, survey, interview) on backsourcing
I2. Peer-reviewed literature produced by practitioners (e.g., experience reports) on backsourcing cases

Exclusion Criteria

E1. Papers that are not related to the phenomenon of interest, i.e., backsourcing
E2. Papers not in the context of information technology
E3. Secondary studies and theoretical papers
E4. Non-papers, e.g., conference proceedings, lecture notes, and presentations
E5. Non-peer-reviewed papers, e.g., experience reports in the press or on a corporate website
E6. Duplicated papers
E7. Papers providing no empirical evidence about reasons, processes, and outcomes of backsourcing.[2]

Initially, we filtered papers based only on their title and abstract. We screened the full text in the case of papers for which we could not reach a clear decision. Two researchers conducted the selection independently, and a third researcher settled disagreements. This process resulted in the inclusion of 25 papers (Fig. 1).

3.2.4. Snowballing

Imprecise terminology resulted in many irrelevant papers that contained the right keywords but did not address the phenomenon we sought to investigate. This created a lot of manual filtering work. At the same time, our preliminary search highlighted a risk that our database searches might have missed relevant papers. To address this problem, we used backward and forward snowballing (Wohlin, 2014) to search for additional studies.

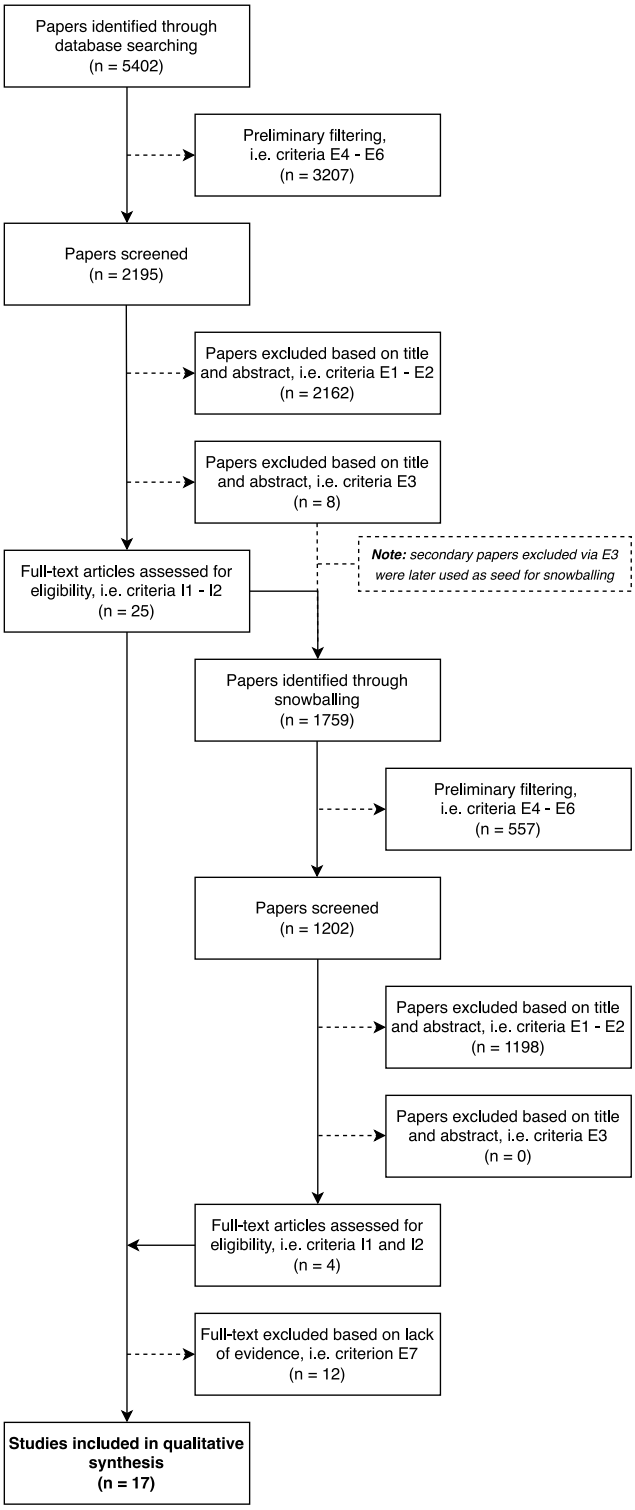

Fig. 1. Study selection and snowballing process flow.

We first identified a starting set of 25 highly relevant papers through the database search. We had also identified eight secondary studies excluded by criterion E3. The secondary studies are relevant to our research as they potentially identified primary studies we could have missed. The snowballing starting set comprised 33 papers from these combined sources.

[1] Available at https://tinyurl.com/pqrotocol-slr-backsourcing.

[2] We added this exclusion criteria in a later stage (see Section 3.4) as we discovered that some candidate papers did not provide any evidence related to our research questions.

Table 2
Summary of the included papers.

#	Year	Type	Publ. Venue	Field[d]	Cases
Case studies					
Wong (2006)	2006	conf.	ICIS	IS	C23
Hirschheim and Lacity (2006)	2006	chpt.		IS	C11–C12
Moe et al. (2014)	2014	jour.	ESEJ	SE	C15–C18
Moe et al. (2012)	2012	conf.	ECGSE	SE	C15, C17–C18
Barney et al. (2013)	2013	chpt.		IS	C1–C2
Butler et al. (2011)	2011	conf.	HICSS	IS/IT	C3
Hirschheim and Lacity (2000)	2000	jour.	Comm. ACM	IT	C11–C12
Wong (2008)	2008	conf.	PACIS	IS/IT	C23–C26
Ejodame and Oshri (2018)	2018	jour.	JIT	IT	C4–C10
Kotlarsky and Bognar (2012)	2012	jour.	JITTC	IT	C13–C14
Solli-Sæther (2016)	2016	mag.	MAGMA	F&M	C22
Interview studies					
von Bary et al. (2018a)	2018	jour.	IJISPM	IS	
Nujen et al. (2018)	2018	jour.	JMTM	TM	C19–C20
Aspir et al. (2019)	2019	jour.	Israel Affairs	MD	
Survey studies					
Whitten and Leidner (2006)	2006	jour.	Dec. Sciences	Bus.	
Raghuram (2016)	2016	conf.	ICEEOT	CNC	
Experience report					
Petalidis (2018)	2018	jour.	JITTC	IT	C21

[a,b,c] These cases are reported by more than one paper.
[d]IT: Information Systems; IS: Information Technology; SE: Software Engineering; F&M: Finance and Management; TM: Technology Management; MD: Multidisciplinary; Bus: Business; CNC: Computer Networks and Communications.

The resulting 1759 papers were added to our selection list. Once again, we removed duplicates and incomplete references, reducing the candidates from the snowballing process to 1202. We applied the selection strategy described in Section 3.2.3 to the new candidates, which resulted in the inclusion of four additional papers (Fig. 1).

3.3. Quality assessment

We opted for not conducting the quality assessment, as opposed to what is proposed by Kitchenham et al. (2015). The quality assessment intends to assess the primary studies and did not fit our units of analysis, i.e., the backsourcing cases. The lack of a shared structure describing the cases and the diversity of case reporting posed a significant challenge for such an assessment. Instead of assigning a quality score to the data we gathered, we listed the cases supporting such evidence.

3.4. Data extraction

In total, we identified 29 papers resulting from our selection strategy: 25 from the database search and four from snowballing. We conducted trial data extraction to confirm whether they contained the data required to answer our research questions. To address these cases, we introduced a new exclusion criterion (E7), which further excluded 12 papers. The resulting 17 papers are summarized in Table 2.

The backsourcing experiences were mostly described as cases, and most of the papers report on more than one case. In particular, all case studies explicitly describe their cases, as it does the interview study (Nujen et al., 2018). The experience report in Petalidis (2018) was also treated as a case, as it provides enough details about the context. Each case represents a unique situation and context in which backsourcing occurred. Even cases discussed in a single paper show differences that are worth investigating independently, and therefore we opted for extracting the data on a case rather than on a paper basis. For example, study (Kotlarsky and Bognar, 2012) reports on two cases, one of which is on software development and the other related to application and database hosting.

We identified 26 cases in the included papers. Most of the cases were reported by only one paper, but the cases marked [a,b,c] in Table 2 were reported by more than one paper. We collected evidence from all the cases and later merged the redundant information during the data synthesis step.

(a) Case C23 was detailed in paper Wong (2006), and was also analyzed alongside C24–C26 in the paper Wong (2008);
(b) Cases C11 and C12 were reported in the journal paper Hirschheim and Lacity (2000) and also in the book chapter Hirschheim and Lacity (2006); and
(c) Cases C15, C17–C18 were described by the conference paper Moe et al. (2012), and also by a more recent journal paper, i.e., Moe et al. (2014), complemented by a fourth case.

In addition, we had four papers that did not report cases: two interview studies (von Bary et al., 2018a; Aspir et al., 2019), and two surveys (Whitten and Leidner, 2006; Raghuram, 2016). For these, we extracted data from the entire paper as a unit of study. Those studies collected evidence from many participants with varied backsourcing experiences.

We used qualitative data analysis software (NVivo 12) to collect and code the papers and manage an evidence database. The evidence comprises relevant textual information we extracted, a reference to the place in the paper the information was found, and a comment that relates the text to the topics we investigated: contextual information, reasons for backsourcing, elements of the backsourcing process, and outcomes of backsourcing. We also aimed at identifying relationships, but at that point, we did not specify the kinds of relationships we were looking for. In the Section below, we detail the process of extracting qualitative data and refining them into themes.

3.5. Data synthesis

We used inductive coding and qualitative cross-case analysis (Cruzes et al., 2015; Miles et al., 2014; Saldaña, 2015) for data synthesis. The inductive coding process is grounded on progressively emerging codes rather than starting from a set of

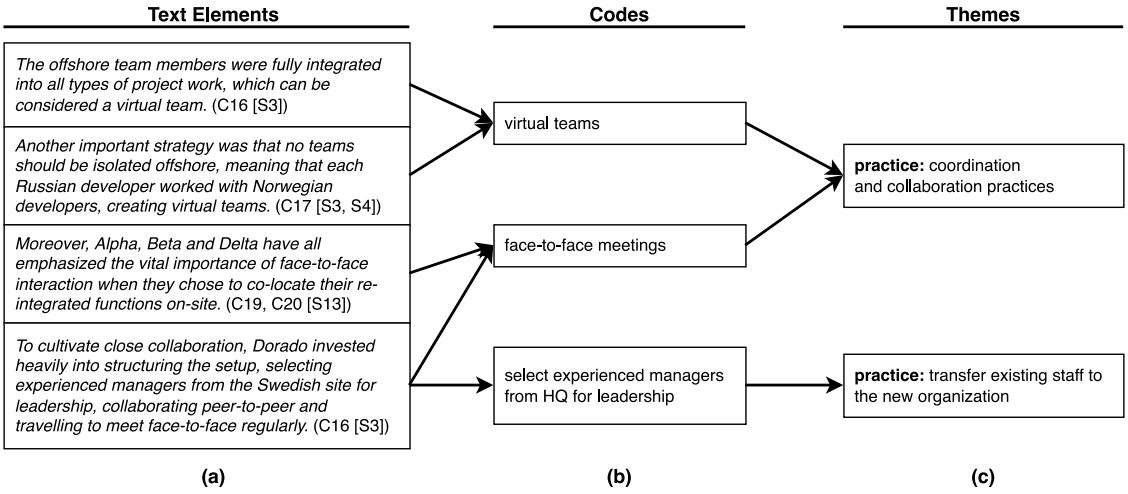

Fig. 2. Example of the coding process.

pre-defined codes (Bailey and Jackson, 2003). Our coding process followed the two-cycle approach (Miles et al., 2014), as exemplified in Fig. 2.

First, we identified textual elements in the papers related to the backsourcing phenomenon (Fig. 2(a)). We then assigned codes to each element that described its content (Fig. 2(b)). A textual element can be associated with multiple codes. Further, we checked codes across the whole data set to identify similarities. We merged codes with the same meaning and aggregated similar codes into higher-level codes called themes (Fig. 2(c)). We often needed to go back to the previous step and revise the codes, changing their description to fit better the "overall picture" provided by the themes.

We repeated this process several times, deriving higher-level themes with each iteration. We stopped aggregating codes when high-level themes associated with the research questions emerged, i.e., *contextual information, the reason for backsourcing, elements of the backsourcing process,* and *outcomes of backsourcing*. We conducted further revisions to prune and organize the themes into meaningful structures which we could use to interpret the findings.

Our unit of study is a case, which means multiple references to the same code in two papers still count as only one data point. That way, the coding process did not produce duplicated evidence about the cases C11–C12, C15, C17–C18, C24–C26, as illustrated in Fig. 2.

To present the findings, we employed matrix display and narrative description. The matrices tabulated and organized the data – codes and themes – for interpretation. The narrative descriptions portrayed the findings according to the contextual situations reported in the papers and allowed us to compare conditions across cases, highlighting similarities and differences (Cruzes et al., 2015; Miles et al., 2014). A matrix display was used to address RQ1 to RQ4, and narrative description was used to describe the themes related to RQ2 to RQ5.

Later, we established connections between the themes using short comments to explain the relationships (e.g., supports, mitigates, incurs). We used relationships to create networks that better described a backsourcing event in the light of a situation or context (Miles et al., 2014), which helped us to address research question RQ5. Our approach to investigating relationships was grounded in axial coding. First, we identified themes containing many relationships and chose them as central entities for the relationship networks. We then positioned themes linked to a central theme around it, drawing lines to represent the relationships. Successive iterations of this step expanded the network from its core to its edges.

Finally, we categorized the themes we derived from the cases of software development backsourcing according to the knowledge areas (KAs) of the SWEBOK (Bourque and Fairley, 2004), intended to characterize the phenomenon of backsourcing according to the key concepts of SE knowledge. SWEBOK also acknowledges related disciplines such as computer science and systems engineering. We opted not to categorize the evidence of other IT-related cases as they are out of our specific scope and could potentially affect the interpretation of our findings.

3.6. Threats to validity

This Section discusses the threats to the validity of our study and the actions we took to mitigate them, according to the categories of Ampatzoglou et al. (2019):

Study selection validity. Completeness is a critical issue for SLRs (Kitchenham et al., 2015). Our mixed search approach considered seven electronic databases and further snowballing interactions, aiming to identify all the relevant papers. We employed validation steps to reduce the risk of missing relevant papers, including a preliminary search and a comparison with related work. Another threat related to completeness regards the precision of the search string due to multiple meanings and homonym terms. Unreliable terms, e.g., "resourcing", broadly increased search results with too many irrelevant papers. Through multiple iterations, we refined our search string to find relevant studies. In each iteration, we pruned terms we considered relevant initially but did not provide relevant results. Still, we did not assess the impact of each term on the final search string. This extra validation step would increase the validity of our results and likely result in further improvements in precision.

Prior to the selection, we piloted a subset of the papers and revised the inclusion and exclusion criteria, aiming for a common understanding. Two reviewers carried out the selection process independently to reduce the likelihood of excluding relevant papers, and a third researcher mediated disagreement. We extended our selection process to cover papers in languages other than English, but only a Norwegian paper was included. We found candidate papers in other languages (e.g., German, French, and

Chinese), but they were later excluded as they did not provide evidence to address our research questions.

Data validity. Our resulting data set comprises 17 papers that investigate different aspects of the backsourcing phenomenon. The set of papers was smaller than we expected. Since we did not observe theoretical saturation when coding, the scarcity of data limits the conclusions, we can draw from the finding. In addition, the high heterogeneity of the included papers posed a challenge, as evidence gathered from a given primary paper was often not supported by other papers (Miles et al., 2014).

We acknowledge that our inductive coding influenced our ability to reflect upon the data and biases due to our experiences (Ampatzoglou et al., 2019; Bailey and Jackson, 2003). We tried to mitigate issues of neutrality and impartiality via a team-based data extraction/synthesis using NVivo server as the shared database. One researcher synthesized the data, and two others validated the process. All three researchers collectively reviewed the resulting codes and themes and interpreted the results. Recurrent discussions during the entire process provided opportunities to identify and correct researcher biases.

Our data synthesis ensures that a given case will produce only one data point, even if multiple papers report the case. Still, there is a bias towards papers that report multiple cases. A single paper with four cases can contribute up to four data points for a given code. See, e.g., the code 'virtual teams' in Fig. 2 is supported by the same paper (Moe et al., 2014) twice. We acknowledge that this issue will likely impact our results as we count the frequency of cases, not papers.

Research process validity. Repeatability is another essential aspect of SLR validity (Kitchenham et al., 2011). To achieve this, we followed the guidelines for systematic literature reviews in SE (Kitchenham et al., 2015) and provided a detailed SLR protocol[1]. Any decision points and deviations from the proposed process were reported. To strengthen the reliability of our qualitative data extraction and synthesis, we have also made our nVivo data set available upon request.

Another potential area of bias is related to whether the questions address the main goal of the research (Kitchenham et al., 2015). To ensure a correct mapping, we derived our research questions RQ1 to RQ5 from different aspects of the phenomenon we investigated. We formulated the research questions as concisely as possible to ensure clarity. Later, each question was associated with a specific set of themes in our data analysis. RQ6 emerged from the particular interest in comparing the evidence in the field of software engineering to other related domains.

4. Results

We identified 26 case studies of backsourcing in 13 of the included papers. Two interview studies and two surveys, all with practitioners experienced in outsourcing and backsourcing as subjects, provided additional information. All included papers reported studies of practical, real-world backsourcing experiences.

4.1. Overview of the reported backsourcing cases

Table 3 presents the organizational context of the 26 identified backsourcing cases. A diverse set of business sectors was observed; frequently, those reported included software products and services (cases C15–C18, and C22) and financial services (cases C2, and C4–C6). A range of different activities has been subject to outsourcing, such as application hosting (cases C1, C2, C4–C6, C10, and C14), software development (C13, C15–C18, and C21), data center management (C8, C9, and C14) and server management services (C7). Our data set also includes a few cases of backsourcing of undefined IS/IT services (cases C3, C11, and C22), and six cases that did not detail the backsourced services at all. The cases that explicitly concerned software development are marked in bold in the table.

All backsourcing cases were from different companies, except for C4–C6, which were from the same financial services company, each of whose cases described the backsourcing of the application hosting of a different service.

The table also shows the sizes of the company and the new organization created to handle the previously outsourced activities. Using the EU classification[3] for companies, 15 cases were from large companies with more than 250 employees, and one case was from a small company (C11, with 40 employees). The size of the new organization designed to handle the backsourced activities was reported by only five cases (C15–C18, and C20): this ranged from small (less than 50 employees) to large (250+ employees).

We classified the sourcing models according to their relationship and geographical location (Šmite et al., 2014; Ågerfalk and Fitzgerald, 2008). For the relationship, outsourcing means that an outside vendor provides the service, while insourcing means that the service is produced within the company. The purpose of backsourcing is to transition from outsourcing to insourcing. However, we identified two cases (C6 and C16) that ended up with a mixed-sourcing strategy. Our data set also contains two cases in which backsourcing was considered but rejected (C1 and C2). Although these cases do not describe a backsourcing process, we included them because they provide meaningful insights about the reasons for and against backsourcing.

With respect to the geographical location, we identified backsourcing cases where the location of the new organization was either onshore, i.e., in the same country as the parent organization, or offshore, i.e., in another country. In their outsourcing agreements, most of the companies had used offshore vendors; an exception was case C5, which used a local vendor. After the termination of outsourcing, the most common strategy was onshore insourcing, i.e., bringing the service geographically close to the outsourcing organization. Four cases (C8, C15, C17, and C18) transferred from offshore outsourcing to "offshore insourcing", using offshore subsidiaries to take over the outsourced activities. We also identified one case (C8) adopting a mixed strategy whereby some services were brought back in house while others were transferred to different offshore locations.

4.2. Reasons for and against backsourcing

Top management and IT leaders primarily made decisions for or against backsourcing, often taking into account the perceptions (and complaints) of operational staff. In particular, developers' opinions have been used to support decisions in cases of dissatisfaction with vendor quality.

All but one of the included papers Hirschheim and Lacity (2006) discuss the reasons for the backsourcing decisions. The papers did not share a standard classification of reasons. We, therefore, identified text elements related to reasons and grouped them into categories with similar meanings, as explained in Section 3.5. For example, the high-level reason *quality problems* comprises low-level codes such as the quality of services provided and the quality of software products delivered. By this method, we established seven reasons for backsourcing and three against, as shown in Table 4.

We identified reasons against backsourcing in papers that discuss a decision between backsourcing and other sourcing options, e.g., switching vendors or continuing with outsourcing. In this

[3] https://ec.europa.eu/regional_policy/sources/conferences/state-aid/sme/smedefinitionguide_en.pdf.

Table 3
Organizational context of the cases.

Case	Business sector	Backsourced services	Company size/New organization size	Pre-backsourcing sourcing model	Post backsourcing sourcing model
C1 (Barney et al., 2013)	Food manufacturing	Application and infrastructure hosting and management	–	Outsourcing	Outsourcing
C2 (Barney et al., 2013)	Banking and finance	Application hosting	Large (39k)	Outsourcing	Outsourcing
C3 (Butler et al., 2011)	–	IS/IT services (not detailed)	Large (150k)	Outsourcing	Onshore insourcing
C4 (Ejodame and Oshri, 2018)	Banking and finance	Application hosting	Large (140k)	Offshore outsourcing	Onshore insourcing
C5 (Ejodame and Oshri, 2018)	«same company as C4»	Application hosting and management	«same as C4»	onshore Outsourcing	Onshore insourcing
C6 (Ejodame and Oshri, 2018)	«same company as C4»	Application hosting	«same as C4»	Outsourcing	Out- and insourcing
C7 (Ejodame and Oshri, 2018)	Pharmaceutical, biological and consumer healthcare	Server management and monitoring	Large (99k)	Outsourcing	Onshore insourcing
C8 (Ejodame and Oshri, 2018)	Insurance	Datacenter and operations	Large (20k)	Offshore outsourcing	Onshore and Offshore insourcing
C9 (Ejodame and Oshri, 2018)	Automotive	Datacenter and data management	Large (25k)	Offshore outsourcing	Onshore insourcing
C10 (Ejodame and Oshri, 2018)	Chemical manufacturing, transport, and logistics	Application hosting and management	Large (8k)	Outsourcing	Onshore insourcing
C11 (Hirschheim and Lacity, 2006, 2000)	Chemical manufacturing	IT services (not detailed)	Small (40)	Outsourcing	Onshore insourcing
C12 (Hirschheim and Lacity, 2006, 2000)	Chemical manufacturing	IT services (not detailed)	Large (1k)	Outsourcing	Onshore insourcing
C13 (Kotlarsky and Bognar, 2012)	**IT services provider**	**Software development**	**Large (1.5k)**	**Offshore outsourcing**	**Onshore insourcing**
C14 (Kotlarsky and Bognar, 2012)	CD & DVD manufacturing	SAP application and database hosting	Large (8k)	Outsourcing	Onshore insourcing
C15 (Moe et al., 2014, 2012)	**Software-intense services**	**Software development**	**-/Small (40)**	**Offshore outsourcing**	**Offshore insourcing**
C16 (Moe et al., 2014)	**Software product**	**Software development**	**-/Medium (100)**	**Offshore outsourcing**	**Out- and insourcing**
C17 (Moe et al., 2014, 2012)	**Software product**	**Software development**	**Large (260∼270)/Small (60)**	**Offshore outsourcing**	**Offshore insourcing**
C18 (Moe et al., 2014, 2012)	**Software product**	**Software development and maintenance**	**-/Medium (100)**	**Offshore outsourcing**	**Offshore insourcing**
C19 (Nujen et al., 2018)	Telecom	–	–	Outsourcing	Onshore insourcing
C20 (Nujen et al., 2018)	Telecom	–	Large (21k)/Large (300)	Outsourcing	Onshore insourcing
C21 (Petalidis, 2018)	**Government**	**Software development and maintenance**	–	**Outsourcing**	**Onshore insourcing**
C22 (Solli-Sæther, 2016)	Software provider	–	–	Offshore outsourcing	Onshore insourcing
C23 (Wong, 2006, 2008)	Service	IT services (not detailed)	Large (10k)	Outsourcing	Onshore insourcing
C24 (Wong, 2008)	Higher education (private)	–	–	Outsourcing	Onshore insourcing
C25 (Wong, 2008)	Government	–	–	Outsourcing	Onshore insourcing
C26 (Wong, 2008)	Consumer goods	–	–	Outsourcing	Onshore insourcing

context, the reasons against backsourcing are points in favor of another sourcing option. In most cases, companies adopted backsourcing in spite of the reasons against it. In only two cases (C1 and C2) did they opt to switch vendors instead.

The first six rows represent the cases in which the backsourcing of software development activities was explicitly discussed, and the next 14 rows represent cases of backsourcing of other IT-related services or cases in which the backsourcing service was not reported (C19, C20, C24–C26, see Table 3). The next four rows do not represent cases, but evidence from studies (von Bary et al., 2018a; Aspir et al., 2019; Whitten and Leidner, 2006; Raghuram, 2016) in which a backsourcing event was not detailed.

4.2.1. Reasons for backsourcing

As can be seen in Table 4, we identified the following reasons for backsourcing:

Quality problems. Eight cases and four other studies mentioned quality problems or the need to improve quality as a reason for backsourcing, making this the most cited reason in our data. Quality issues mentioned included poor quality of the delivered product (C16–C19, and C22), poor quality of service provided (C11, C16, C23, Aspir et al., 2019; Raghuram, 2016), and dissatisfaction with the vendor (C22, von Bary et al., 2018a; Aspir et al., 2019). In many cases, an attempt to solve quality issues in the outsourcing agreement put a strain on the relationship,

Table 4
Reasons for and against backsourcing.

	Reasons for backsourcing								Reasons against backsourcing		
Case	**Quality problems**	**High costs**	**Lack of control**	**Poor client–vendor relationship**	**Vendor competence issues**	**Changes in strategy or management**	**Outdated technology**	**New regulations**	**Lack of internal capabilities**	**High switching costs**	**Dependency on the vendor**
SD cases											
C13			•							•	
C15				•					•		
C16	•			•							
C17	•			•	•					•	
C18	•			•	•				•		
C21			•								
Other IT-related cases											
C1		•								•	•
C2		•								•	
C3		•	•			•					
C11	•	•			•						
C12		•			•						
C14		•	•								
C19	•			•	•				•		•
C20					•				•		•
C22	•		•	•							
C23	•	•	•			•	•				
C24	•		•			•					
C25					•	•	•				
C26						•					
(von Bary et al., 2018a)	•	•		•				•	•		•
(Aspir et al., 2019)	•	•	•								
(Whitten and Leidner, 2006)	•	•		•							
(Raghuram, 2016)	•	•			•	•					
Total	**12**	**11**	**8**	**8**	**8**	**6**	**2**	**1**	**5**	**4**	**4**

perhaps exacerbating existing relationship problems, as a team leader from C18 (Moe et al., 2014) commented: *"Our people felt like they were spending basically all their time writing work orders and writing code for these guys through [email]"*. A survey-based study (Whitten and Leidner, 2006) investigated whether the companies chose to switch vendors or to backsource. The participants represented various companies from sectors such as manufacturing, education, healthcare, and public administration. Out of 160 respondents, 70 kept their outsourcing agreement, 54 opted for backsourcing, and 36 switched vendors. The decisive argument for choosing backsourcing rather than switching vendors was poor quality of products and services.

High costs. The second most cited reason, reported in seven cases and four other studies, was high costs with the outsourcing vendor. Cases C1, C3, C11–C12, C14 and studies (von Bary et al., 2018a) and (Aspir et al., 2019) reported that outsourcing could be more expensive than expected due, e.g., to poorly-negotiated contracts and unexpected costs. Backsourcing was perceived to be cheaper than continued outsourcing (von Bary et al., 2018a; Whitten and Leidner, 2006) and then to switching vendors (Whitten and Leidner, 2006). The company in C1 expected the costs of switching vendors to be higher than keeping the current agreement, but that was not the case. In C2, C14, and Whitten and Leidner (2006), expectations of lower in-house maintenance and operational costs motivated the backsourcing decision. In C3, rising outsourcing costs also exposed issues with vendor competence, and the company felt they were not receiving "value for money". Cost savings were the official reason for backsourcing, but the researchers raised the question of whether the real reason was the CEO's perception of a bad outsourcing agreement. If this was the case, high costs were being used as an excuse to terminate the outsourcing agreement.

Lack of control. Seven cases plus an interview study reported that companies experienced a lack of control over their projects or services due to outsourcing. A wish for more flexibility in the management of the sourced project (C13, C14, C23, and C24), a lack of control of companies' own services (C14, C21), and a lack of control over the vendor (Aspir et al., 2019) were reported as reasons to backsource. In cases C3 and C24, the outsourced service gained vital importance for the company due to business changes, justifying the backsourcing decision.

Poor client–vendor relationship. Degradation of outsourcing relationships leading to a backsourcing decision was reported in eight studies, four of which concerned software development activities. In four cases (C16–C18, and C22), poor communication and collaboration issues were reported as causes of relationship degradation. Other factors included internal staff dissatisfaction (C16 and C17), lack of trust in the vendor (C22 and Whitten and Leidner, 2006), conflicts over product ownership (C17), and misalignment between the client and vendor organizations' ways of working (von Bary et al., 2018a). In cases C15, C16, C18–C19, the deterioration of the outsourcing relationship was driven by a perception of poor service quality. One manager in C16 (Moe et al., 2014) commented, *"What we found out with [vendor's name] was that you know, the maintenance team, took only the easy bugs, and they were measured on the number of solved bugs. They took the easy ones, not the critical ones"*.

Vendor competence issues. Lack of vendor competence was reported in seven cases and a survey study. Building vendor competence required a great deal of effort and resources from the client in C11 and C12, and the resulting knowledge gained by the vendor was subsequently not used in the client's best interests. A manager in C11 (Hirschheim and Lacity, 2006, 2000) recalled, *"I think you find with outsourcing that any innovation in technology comes from your own people, (…) But basically, the [outsourcing vendors] just crank it. (…) You pay for them to learn your business; then they move those people to court other companies in your industry. They transfer skills to get new business; now the learning curve is yours to pay for again"*. In C11, the vendor refused to introduce new technologies and siphoned talents to other

customers, while as in C12, the client provided the vendor with its own technical staff. In C20, the vendor's expertise ceased to be a market differentiator, prompting the company to start discussing backsourcing.

Changes in strategy or management. Changes in core competency (Raghuram, 2016), changes of strategic direction (C23–C24), and changes in management (C23, C25–C26) were reported as impetuses to review a company's sourcing strategy. In C24, a new business partnership allowed review of existing outsourcing agreements. In cases C3 and C23, the personal beliefs and attitudes of the decision-makers were critical to the backsourcing decisions.

Outdated technology. In C23 and C25, the vendor employed an outdated technology, causing asymmetries with the client's organization that motivated the decision to backsource. In C25 (Wong, 2008), an interviewee commented *"The equipment [the vendor used] was relatively outdated, older. A lot of the systems were truly dispersed systems (…) with little capability of acting and interacting with other processes"*.

New regulations. Five out of 12 participants of an interview study (von Bary et al., 2018a) mentioned how compliance with new regulations (e.g., data privacy laws and bank regulations and standards) forced the client to bring services back in-house. The authors of von Bary et al. (2018a) noted that this reason appeared only in the most recent interviews due to the recent introduction of stricter standards by regulatory bodies in Europe.

4.2.2. Reasons against backsourcing

As shown in Table 4, we identified the following three reasons against backsourcing:

Lack of internal capabilities. Four cases (C15, C18–C20) and one interview study (von Bary et al., 2018a) reported a lack of internal capabilities as a hindrance to backsourcing. C19 and C20 pointed out how longer outsourcing relationships exhausted the company's capabilities to transfer services back. von Bary et al. (2018a) described factors such as missing staff, lack of technical knowledge, and lack of support from the vendor that prevented companies from backsourcing. Such reasons led the company in C1 to reject the backsourcing decision.

High switching costs. Changing the sourcing strategy, either by backsourcing or switching vendors, was reported as a high-cost process by C1, C2, and C17. Case C13 reported discussions about higher costs of operational activities after bringing services back in-house. In C1 (Barney et al., 2013), *high switching costs* were reported as one of the reasons for opting for a switch of vendors over backsourcing.

Dependency of the vendor. In C21, operational dependencies on the vendor locked the client into an undesired outsourcing agreement. Similar dependencies were reported in C19 and von Bary et al. (2018a), related to accessing expert knowledge, and to the lack of support for the transfer back, respectively. The issue was aggravated in C19 (Nujen et al., 2018), as the client shared the knowledge with the vendor in the first place, as one participant recalled: *"First we had to share our knowledge on how to produce telecom products […] now they have this expertise and are competing with us. They hold a trump card, knowing that they are now the only ones who have this expertise […] To resolve this, we now have to pay them a huge amount in order to be able to take back this part of the product in-house […]"*

4.3. Backsourcing as a process

One of our main goals was to establish what is known about the process of backsourcing. However, based on the current literature, this turned out to be rather challenging. Two papers (Wong, 2006 and Butler et al., 2011) described the backsourcing process as consisting of sequential stages. The processes they describe have few similarities in terms of terminology or the logic behind the formation of the process stages. Most papers simply described what companies had done as a connected sequence of events, sometimes including some rationale. Therefore, instead of trying to force the reported findings into a preconceived model, we employed selective coding and successive refinement iterations, identifying elements of the descriptions and their relationships. We identified the following set of elements of the backsourcing process:

Sub-processes: Fragments of the overall backsourcing process that describe essential things taking place (see Sections 4.3.1 to 4.3.5). Although the sub-processes we identified are similar to phases or stages of the conceptual models, they are different in the sense that they were not necessarily carried out sequentially. They might have been partially ordered and conducted simultaneously and iteratively.

Categories: Segments of a sub-process intended to group other backsourcing elements (activities, artifacts, attributes, and practices) that share a similar goal.

Activity: A piece of work undertaken as part of the backsourcing process or its sub-processes. In our coding process, activities are fine-level entities that describe actions that aim at producing a desired outcome. Activities differ from sub-processes and their categories, as those merely group multiple activities (and other elements) that have a shared goal. Activities are listed in relation to sub-processes in Sections 4.3.1 to 4.3.5.

Artifacts: An object or piece of information observed during the backsourcing process, which could affect or be affected by activities or sub-processes. In our study, artifacts mostly provide information support about the process or its elements. As an example of an artifact, a *transition plan* helps to detail the *knowledge transfer* activity.

Attributes: Qualities or features that characterize a sub-process, activity, or artifact. We did not try to gather an extensive list of attributes but instead tried to identify essential characteristics that, according to the evidence, could affect the backsourcing process. As an example, *implicit* and *explicit knowledge* are discussed according to different activities required for building knowledge in the new in-house organization.

Practices: Practices offer a certain way of performing an activity, or they support activities through the application of a method or approach. The evidence we collected often described different ways of enacting the same activity. As an example, *early termination* and *delay termination* practices are different ways of handling the termination of an existing outsourcing agreement. We designated practices with an identifier (e.g., P1) so that we could associate them with the outcomes to which they contribute (see Section 4.4).

The elements of backsourcing we identified helped us outline the backsourcing process as observed in the cases of interest. These elements do not provide a complete representation of the process, as they are limited by the context and the quality of the information reported in the articles. Fleshing out the elements identified here into a fully-fledged description of a potentially ideal backsourcing process has been left for future work.

As a result of our coding process, we identified five sub-processes of backsourcing: *change management, vendor relationship management, competence building, organizational build-up,* and *transfer of ownership.* Each sub-process describes a main theme of the backsourcing process. We describe each one according to its context in the papers, and list the related elements (i.e., activities, artifacts, attributes, and practices) in Tables 5 to 9. Each table represents one sub-process and is further divided into activities. In this section we present the sub-processes identified, and in Section 4.5 we discuss the relationships between them that we could identify.

Table 5
Change management.

Category	Element	Type	Observations
Planning	Plan backsourcing efforts	Activity	In C11, C21, and C23, a backsourcing plan outlined the tasks and efforts required for competence build-up and organizational build-up (see planning artifacts in Tables 6 and 7). In C23, the plan helped to communicate updates in the backsourcing process to top business management and other organizations inside the company.
	Backsourcing plan	Artifact	The plan in C21 included a timeline, activities, and related practices, and the rationale for the adoption of such practices. No case reported the people or roles involved in the process, nor evaluation steps or criteria for assessing the outcome of backsourcing.
	Backsourcing scope	Artifact	Defines the scope of the backsourcing, including, but not limited to, the outsourced service or product. von Bary et al. (2018a) describes careful consideration about the scope of outsourced resources and services to transfer back. In cases C13–C15, and C20, the client opted to transfer back all knowledge previously outsourced, whilst C4–C6 reported a partial backsourcing scope.
	New sourcing location	Attribute	Describes the sourcing location for the new organization. Companies need to consider relocation options (von Bary et al., 2018a and C23). As well as onshore, nearshore (von Bary et al., 2018a) or offshore subsidiary (C15–C18) were also considered. Offshore alternatives offered advantages: lower recruiting costs (von Bary et al., 2018a and C18), access to highly skilled personnel (C16 and C18), and proximP2ity to the customer market (C16 and C17). Offshore challenges included administrative overheads (C15 and C16), alignment of ways of working (C15), and ensuring a shared culture (C17).
	Select what to backsource	Practice	Selective transfer approaches were employed to select what to backsource in cases C3 and C23. The organization in C23 evaluated components by a cost–benefit analysis comparing bringing back in-house versus re-outsourcing. Also in von Bary et al. (2018a), interviewees stated that they first backsourced all previously outsourced services, then selectively outsourced some of them afterward.
	Form a planning team	Practice	In C21, a planning team laid out the steps for backsourcing. The team carried out a pilot backsourcing process, identifying and documenting issues; they also elaborated a transition plan (see Table 7) to guide the knowledge transfer.
	Establish a contingency plan	Practice	C3 and C21 reported a need to establish potential risks and mitigations. The difficulty of managing unanticipated obstacles was also highlighted in C23. In C3, the contingency plan mitigated the effects of a complete relationship breakdown by speeding up knowledge transfer (see Section 4.3.3).
Internal communication	Communicate the backsourcing decision	Activity	Internal communication was the starting point for the backsourcing processes in von Bary et al. (2018a), C11, C12, and C23. Reasons leading to the backsourcing decision were made explicit and communicated to the in-house organization (von Bary et al., 2018a, C11, and C12), motivating the backsourcing process.
	Sell the backsourcing case internally	Practice	In C11 and C23, this practice was used to inform top management and other organizations inside the company about the backsourcing plan. In C23, further communication provided updates on the backsourcing process and detailed changes affecting other internal organizations.
Post-backsourcing	Monitor outcomes of backsourcing	Activity	Case C23 reported how the organization specified performance measures to gauge the success of backsourcing. Unfortunately, the study does not describe the measurement approach used; rather, the perceptions of stakeholders (mostly managers) are reported. Similar performance assessments were also reported in C3 and C11–C14.
	Post-backsourcing expansion	Activity	A follow-up activity reported by a few cases (C15–C18) of Offshore insourcing. Companies expanded their in-house services even further after backsourcing by expanding their offshore organizations (C16 and C18), or via new business partnerships (C15–C18, von Bary et al. (2018a)).

4.3.1. Change management

The change management sub-process comprises *planning* the backsourcing process and *internal communication* of the backsourcing decision to ensure in-house engagement. Elements of this sub-process were described in 15 out of 26 cases, besides the interview study (von Bary et al., 2018a), as shown in Table 5. Some cases also detailed *post-backsourcing* activities related to this sub-process, such as assessing the outcomes of the backsourcing (C3, C11–C14, and C23) and further offshore expansions (C15–C18).

4.3.2. Vendor relationship management

Vendor relationship management consists of the activities related to outsourcing *contract termination*, having a *backsourcing agreement* for handling the backsourcing efforts, and the possible creation of a *post-backsourcing agreement* to support the parent organization after the backsourcing process has been completed. The backsourcing process requires a high level of interaction with the vendor and is thus impacted by and affects the client–vendor relationship. The elements related to this sub-process were described in cases C3, C13, C14, C18 and C23 (Table 6).

Table 6
Vendor relationship management.

Category	Element	Type	Observations
Contract termination	Terminate outsourcing agreement	Activity	In all cases, termination of the outsourcing relationship was initiated by the client. Also, according to von Bary et al. (2018a), the termination of the outsourcing agreement triggered a backsourcing decision in many companies. Cases C3 and C18 detailed two distinct options for terminating outsourcing agreements: early and delayed contact termination.
	Terminate contract early	Practice	In C3, the contract was terminated early to avoid the adverse effects of a relationship breakdown. It required the client to take more responsibility for knowledge transfer.
	Delay contract termination	Practice	In C18, a dependency of the vendor on a software release led to the postponement of the outsourcing termination until a new in-house organization was ready. Postponing termination helped the companies in C18 and C23 ensure the continuity of operations and allowed them to plan the backsourcing process.
	Extend outsourcing contract	Artifact	Describes the clauses and conditions that governed the outsourcing agreement. In the case reported in C23, the outsourced contract did not include definite termination clauses. In order to execute the backsourcing decision, the company first renegotiated a contract extension including such clauses.
Backsourcing agreement	Draw up a backsourcing agreement with the vendor	Activity	Establishes the vendor's responsibilities for knowledge transfer, as described in cases C3, C13, and C14. In C3, relationship breakdown and a lack of exit conditions in the outsourcing agreement led to two months spent negotiating a backsourcing agreement.
	Backsourcing contract	Artifact	A new contract that formalizes the backsourcing agreement and describes roles and responsibilities in the various parts of the backsourcing process. In C13, such a contract outlined the handover date and scope of backsourcing. In the case reported in C23, the original outsourcing contract did not allow the client to bring services back, so the company negotiated an extension including such clauses.
	Contract early	Practice	Draw up a new contract with the vendor as soon as possible to ensure commitment to the backsourcing process (C13, C14).
	Use external experts	Practice	In C3, the organization engaged a specialist contract consultant to ensure the renewal of third-party contracts.
Post-backsourcing	Maintain a business relationship with vendor	Practice	In C14, the company maintained a relationship with the previous vendor as an IT service provider after contract termination. That was possible due to a positive attitude towards the vendor.

4.3.3. Competence building

This sub-process focuses on acquiring the competence necessary to assume responsibility for the previously outsourced activities successfully. It includes transferring outsourced knowledge to the receiving organization and building any new competencies needed. *Knowledge transfer* needs to deal with both *explicit knowledge*, which is structured and embedded into artifacts, such as source code, data repositories, and documents describing a task or service, and *implicit knowledge*, which is typically embodied in the experience of individuals.

The sub-process is primarily discussed in cases C3–C10, C13–C14, C21–C23, and in the included papers Whitten and Leidner (2006). Collaboration with the vendor was a critical factor in ensuring successful *knowledge transfer* in cases C3, C21, and C23. Cases C13 and C14 reported challenges when the vendor did not assist with knowledge transfer and building.

4.3.4. Organizational build-up

Building up the organization that will take over the responsibility for the backsourced activities is vital to the success of backsourcing. During backsourcing, this new organization will absorb the knowledge transferred back in-house and ensure the continuity of services once the transfer is complete. Twelve cases of interest (C3, C11–C18, C21, C20, C23), a survey (Raghuram, 2016), and an interview study (Nujen et al., 2018) provided evidence for this sub-process and its related activities.

A vital activity concerning *setting up an in-house infrastructure* for development and operations is mentioned in four cases, i.e., C3, C13, C14, and C21. Other activities include maintaining a pool of skilled professionals; this is reported to be accomplished by means of *recruitment* (C3, C11, C23, and Nujen et al., 2018) *personnel retention* (C3, C15, and C18) and *personnel relocation* (C3, C16–C18, C20 and Whitten and Leidner, 2006). Finally, combined efforts in recruitment and training ensure in-house capabilities for development and operations (C3, C4–C11, C20, and C23).

4.3.5. Transfer of ownership

Case C11 reported how the outsourced product or service returned to the new organization after components were transferred in-house. The company now became responsible for managing the newly re-integrated knowledge and ensuring *the continuity of services* in-house, integrated with other services already in place (C4–C10). Seven cases of interest (C3, C13, C15–C18, and C23) and two other empirical studies (von Bary et al., 2018a and Nujen et al., 2018) provided support for this sub-process.

4.4. Backsourcing outcomes

Eight out of 17 papers reported the outcomes of the backsourcing process. We classified them into positive and negative, depending on their contribution to the process. Tables 10 and 11 list the outcomes we identified alongside the reported causes or

Table 7
Competence building.

Category	Element	Type	Observations
Knowledge transfer planning	Plan knowledge transfer	Artifact	In C21, a plan was drawn up to guide the efforts required for knowledge transfer. The plan was grounded in the components of the software process. In C23, the plan detailed strategies for incremental transfer and selective backsourcing.
	Responsibilities for knowledge transfer	Attribute	Describes the client's and vendor's responsibilities for competence building. In C3, this was a collaboration between both parties. In C13 and C14, the client took responsibility for the migration due to the risk of relationship breakdown.
	Backsourced knowledge	Artifact	Knowledge transferred back from the vendor (C4–C10, C21, C23).
	Knowledge symmetry	Attribute	Describes the knowledge equivalence between client and vendor. In C4–C10, the lack of knowledge symmetry imposed additional complications for knowledge transfer.
	Type of knowledge	Attribute	According to C15–C20, suitable knowledge transfer practices depend on whether knowledge is codified into documents (explicit) or the capability of individuals (implicit).
	Task inter-dependency	Attribute	Cases C4–C10 used task inter-dependency to analyze how different knowledge-building practices could be used. Decoupled tasks required lower levels of coordination and information exchange than highly coupled ones. C21 and von Bary et al. (2018a) reported difficulties in software development activities due to the high degree of coupling.
	Task expertise	Attribute	Used in C4–C10 to select knowledge building practices. Different expertise levels were required to perform knowledge-building tasks, e.g., specific knowledge depends more on a person's experience and skill, while generic knowledge is easier to grasp.
Knowledge transfer	Knowledge transfer	Activity	The core activity of this sub-process comprises transferring the necessary knowledge from the outsourced environment to the new in-house organization. In C21, the process systematically followed the software process, recording issues for each activity (e.g., requirements, architecture, implementation, and testing).
	Layered knowledge transfer	Practice	C23 employed a layering approach (a.k.a. "peeling the onion") to transfer knowledge, starting with the components that were easier to tackle, gradually moving up the difficulty ladder towards those that were more difficult and/or central to the functioning of operations.
	In-house knowledge building practices	Practice	A set of practices supporting the re-acquisition of previously outsourced knowledge. The companies in C4–C10 used the type of knowledge, the expertise required, and task interdependencies to select among practices such as formal processes and tools for work coordination, identify and access task-specific expertise, learning by doing, and learning by coworking and cooperation with peers.
	Socialization for knowledge-sharing	Practice	Knowledge-sharing via social interactions brought together experienced employees and novices. In C3, the company conducted technical interviews with experienced personnel to avoid the loss of technical knowledge. In C18, training programs fostered knowledge-building between co-located units. In C20, the company promoted workshops, forums, and arenas to foster knowledge sharing.
Training	Train skills and competencies	Activity	According to C19 and C20, training promoted knowledge-building by providing key skills and capabilities. The training was often reported to focus on the acquisition of technical knowledge, but in C17, continuous training also ensured that the common culture was maintained between on- and offshore sites. According to C4–C10, to make up for missing in-house capabilities, training was integrated into operations.
	Train a backup person	Practice	A backup person for each position minimized the risk of losing existing knowledge and continuity of services due to staff turnover (C23).
	Cross-site collaboration	Practice	In cases C15–C18, coordination strategies were employed to bring co-located people together and facilitate personnel training in an offshore location. In C19 and C20, face-to-face interaction helped transfer services to the in-house location.
Management	Use external experts	Practice	C14 and C23 reported use of external consultants for technical advice during knowledge transfer.

Table 8
Organizational build-up.

Category	Element	Type	Observations
Organizational planning	Re-organization plan	Artifact	In C11, the company made a plan for rebuilding the internal IS department, including actions such as acquiring resources needed for in-house operations and recruiting developers from the vendor.
	Set-up in-house environment	Activity	Acquisition, configuration, and management of resources for the new in-house environment (C3, C13, C14, C21). Different approaches depend on the resource requirements and environment. In C3 and C14, existing in-house infrastructure helped the knowledge transfer and reduced reorganization costs.
	In-house environment	Artifact	The technical resources including hardware and software used for the backsourced activities (C13 and C14), and to store the backsourced knowledge (C3 and C13).
Recruitment	Recruit to cover key skills and competencies	Activity	C3, C11, C23, and Nujen et al. (2018) reported using recruitment to secure skills and competencies for the new organization. Long outsourcing relationships (Nujen et al., 2018) and high employment turnover (C23) depleted in-house capabilities. To ensure that key capabilities were transferred to new recruits, this activity was combined with training in Nujen et al. (2018) and C23.
	Recruit from vendor	Practice	In C3, the new organization managed to retain the vendor's employees temporarily to build up its capabilities for in-house development and operations. In C11 and C23, the client negotiated the transition of its co-located employees back in-house.
	Recruit from the job market	Practice	Recruitment campaigns were used in C3 and C15 to hire professionals from the job market. In C15, the responsibility for recruitment was assigned to an experienced leader of the offshore organization.
	Short-term recruitment	Practice	Recruit short-term to fill up missing capabilities in the new organization (C14), to support the continuity of operations (C3), or to cover for loss of senior management (C3). In C13, external specialists were recruited as freelancers.
	Use external recruitment experts	Practice	C23 engaged a transitional vendor to support recruiting and training of personnel for specific areas.
	Recruitment requirements	Attribute	This characterized the prerequisites of the recruitment activity, such as formal education (C18), work experience (C16 and C18), and key skills and competencies (C3). C3 and C11 also reported a requirement in terms of the number of people needed.
	Recruitment timespan	Attribute	According to C3, backsourcing is a timely process, and recruitment strategy can be heavily impacted by time pressure.
	Recruitment source	Artifact	This indicates a pool of professionals to draw upon for recruitment purposes. Depending on availability, companies recruited professionals from different sources: new employees hired from the job market (C16, C18–C20), existing personnel transferred to the new organization (C13, C19–C21), and the vendor's employees (C3, C11–C13).
Personnel retention	Retention of key personnel	Activity	This refers to the ability to retain key staff, often related to the needs of implicit knowledge (C3, C15, and C18).
	Improve staff conditions	Practice	Offer better conditions for existing staff as a means of retaining them. In C3, C15, C18, the organization offered incentives for staff to transfer back.
	Watch employees	Practice	Monitor and control staff involved in backsourcing. To address risks of turnover, C15 and C18 employed control mechanisms, C14 closely monitored all employees involved in the backsourcing process, and C3 established a forum to watch those to be transferred back.
Personnel relocation	Bring people home	Practice	Bring outsourced staff back in-house to cover for missing capabilities and prevent loss of existing knowledge (C3, C20, and Whitten and Leidner (2006)).
	Reassign experienced staff	Practice	Transfer existing staff to the new organization. The companies in C16 and C18 transferred experienced developers to facilitate the acquisition of skills in their new offshore subsidiary; C16 also transferred experienced managers to provide leadership.
	Stepwise transition of personnel	Practice	In C17, the company had a large pool of developers available, so they employed a stepwise approach, moving one or two of them at a time to the project with proper support and training. This strategy allowed C17 to control the process on an individual level, building technical and domain knowledge.

Table 9
Transfer of ownership.

Category	Element	Type	Observations
Responsibilities	Take or transfer responsibility	Activity	This consisted of assigning responsibility for the backsourced services (entirely or partially) to an organization. In the case of C15, the new organization itself took responsibility for the service. In another case (C23), the company divided responsibility among various offshore organizations.
	Incremental responsibilities	Practice	The companies in C16 and C18 scaled responsibilities and resources with more commitment from the new organizations. They started on a small scale by allowing one team to collaborate on one product and establish lifecycle management before scaling up. In C16, this strategy was employed with an offshore subsidiary.
Internal business strategy	Role of the new organization	Attribute	This describes the role of the new organization at the end of the backsourcing process. In C16, the new organization became an integrated part of the company soon after taking responsibility for the transferred services. In C23, the new organization took the role of an independent service provider. In C3, extra time was required to integrate the newly built organization with the remainder of the company.
	Focus on operational continuity	Practice	Reach an agreement with other organizations for continuity of services. In C3, operations were re-established, but new development activities were suspended while building internal capabilities.
	Internal vendor–client model	Practice	In C23, the new organization adopted a vendor–client service model with other organizations in the same company. The model defined goals and metrics through which it monitored the performance of the services. The organization periodically conducted user satisfaction surveys. At the time of the study, the new organization was also planning to establish SLAs to establish formal coordination with other business units.
Continuity of services	Development and operations in-house	Activity	This ensures continuity of in-house services once knowledge has been transferred into the new organization (C13 and C14). In C3, operations continued immediately after knowledge transfer, but new development was postponed due to a lack of internal capabilities. In C14, a great deal of effort and highly motivated staff were required to provide in-house service. Efforts were reduced in C13 due to an existing in-house team already familiar with the backsourced service.
	Set up coordination and collaboration over sites	Practice	In cases C15–C18, coordination strategies supported service re-integration when the new organization was an offshore subsidiary. Such practices include: standardized ways of working, virtual teams, face-to-face interaction, and exchange visits.

conditions and the contextual factors that reportedly contributed to achieving the outcomes. Along with the contextual factors, we report related practices (see Section 4.3) that were claimed to have contributed to achieving positive outcomes or mitigating negative outcomes. In the last column, we detail the cases and studies in which we found evidence of the outcome.

4.4.1. Positive outcomes

According to Kotlarsky and Bognar (2012), there is limited evidence in the literature on how to conduct backsourcing successfully. The study aimed to identify success criteria by investigating two backsourcing cases (C13 and C14). The reported factors were: securing the backsourcing process contractually, setting up in-house development environments for close supervision, and hiring knowledgeable and motivated staff. A manager in C14 (Kotlarsky and Bognar, 2012) commented: *"Firstly, a technical in-house team has to be skilled and ready to take on the challenge; secondly, you should secure such transitions with contracts as soon as possible to ensure commitment; and thirdly, systems have to be set in good and clean conditions before migration. Taking over chaos is never a pleasure!"*. C3 reported success criteria collected through interviewee responses: maximizing the number of staff transferred back, ensuring no impact to service continuity, and meeting the transfer handout date. Furthermore, C3 implies that the knowledge transfer activity is crucial for backsourcing success as it 'sets the tone' for the continuity of services in-house.

In the above-mentioned cases, the perceptions of managers or other stakeholders were used as criteria to assess whether the backsourcing process was successful and to assess the importance of activities and practices for achieving success. Thus, the criteria we listed above are subjective, based on the experience and perceptions of stakeholders. Other outcomes used to assess the benefits of backsourcing include cost savings by having development or operations in-house rather than the previous outsourcing agreement (C11–C12); or successful completion of a particular activity or sub-process, such as knowledge transfer and building (C19, C20) or continuity of services (C3 and C13–C14).

4.4.2. Negative outcomes

Negative outcomes were described as adverse effects that resulted if risks were not mitigated. In the papers, they were discussed alongside the activities and practices employed to mitigate them (e.g., C3, C13, and C14). Other negative outcomes represent drawbacks such as extra costs (e.g., C17 and C18), time (C3), or effort (C15, C16, and C22) spent on the process. Only one case (C21) reported a failed backsourcing process, caused by failure to re-integrate knowledge in due time.

4.5. Relationships between backsourcing elements

In addition to extracting process elements and outcomes, we aggregated the evidence from the different studies by identifying reported relationships between the items across studies. The type of evidence varied due to different contextual factors and different research approaches. As an example, both cases C3 and C13 provide evidence about the activity *terminate the outsourcing contract*. In C3, the context is an *early termination* due to a poor client–vendor relationship, and in C13, a *delayed termination* allowed the company time to build its own internal capabilities.

When mapping the relationships, we first identified the relationships between elements by analyzing our coding (see

Table 10
Positive outcomes of backsourcing.

Positive outcome	Claimed causes or conditions	Contributing factors	Support
Continuity of services	Not rushing to terminate outsourcing	The client and vendor renegotiated a contract extension that allowed the client to plan the backsourcing and build up the organization. A related practice is: *Delay contract termination*	Observation in C23
Successful transfer of ownership and responsibilities	New offshore developers integrated with the local team	The company established a new offshore unit and transferred all the products to the new location. Related practices are: *In-house knowledge-building practices, Socialization for knowledge-sharing, Cross-site collaboration*	Observation in C15, C16, and C17
Successful re-integration of existing knowledge	Knowledge-building efforts	The companies identified a lack of internal capabilities for operations and dependencies for specific knowledge. A related practice is: *In-house knowledge-building practices*.	Observation in C19–C20, theoretical model in Nujen et al. (2018)
Existing knowledge kept	Retain employees and trained backup persons	The company hired employees from the vendor with the skills and capabilities needed to continue operations in-house. Training a backup person with the required skills helped alleviate the challenges of high turnover. Related practices are *Cross-site collaboration,* and *Recruit from vendors*.	Observation in C23
Return of investment in training	Longer retention of employees	The company established a new offshore subsidiary and transferred projects to the new location. Training strategies were in place to further increase the competencies of developers. A related practice is: *Cross-site collaboration*.	Observation in C17
Acquisition of skilled professionals	Hire of employees with relevant skills from the vendor	During backsourcing, the client was granted access to the vendor's pool of skilled professionals. Related practice: *Recruit from the vendor*.	Observation in C14 and C23
	Bringing back outsourced staff	It was necessary to bring experienced people back from the vendor to cover for low in-house technical capabilities. A related practice is: *Bring people home*.	Observation in C3
	Addressing turnover issues	Companies that build-up the new organization as an offshore subsidiary could experience turnover challenges. To ensure the retention of personnel, the companies employed practices such as *Cross-site collaboration, Bring people home,* and *Watch employees*.	Observation in C15, C17, and C18
Better service quality	Better coordination with the new subsidiary	The company in C17 acquired an offshore competitor and merged the two organizations. Related practices are: *Socialization for knowledge sharing, Cross-site collaboration,* and *Stepwise transition of personnel*.	Observation in C17
	Successful recruitment of highly skilled developers	The companies established new offshore subsidiaries, allowing them to recruit from a pool of well-educated and highly-skilled professionals. Improvements in quality were perceived by managers.	Observation in C16 and C17
Better control over project priorities	Regained control over operations	Small and medium enterprises (SMEs) contracting large outsourcing vendors had difficulties in receiving priority, due to the size of their contracts.	Observation in C15, C16, and C18
Lower maintenance costs	Setting up an in-house environment	Under the outsourcing agreement, the vendor could charge for every maintenance task.	Observation in C13 and C22
Lower recruiting costs	Recruiting and training new personnel via a transitional vendor	A transitional vendor was hired to support the company during the backsourcing process. Through them, the company was able to recruit from a pool of skilled personnel. A related practice is: *Use external recruitment experts*.	Observation in C23
Lower operational costs	Internal provision of IS service	Under the outsourcing agreement, the client IS department was transferred to the vendor. Later, the vendor charged increased service fees. This resulted in reduced trust and relationship deterioration.	Observation in C11 and C12
Market advantages	Cultural proximity to target customers	The company established a new offshore subsidiary and transferred projects to the new location.	Observation in C17
New business competencies	Hosting/operating the application in-house	The in-house team acquired new technical skills to continue operating. These competencies helped differentiate the company from its competitors.	Observation in C14
Expanded offshore business	More responsibilities transferred to an offshore subsidiary	The company established a new offshore organization and transferred projects and employees to the new location. Further expansions added new resources and responsibilities. A related practice is: *Incremental responsibilities*.	Observation in C16 and C18

Table 11
Negative outcomes of backsourcing.

Negative outcome	Claimed causes or conditions	Contributing factors	Support
Long time to negotiate a backsourcing agreement	Lack of an exit strategy	The original outsourcing contract lacked clear termination conditions.	Observation in C3
Unsuccessful knowledge transfer	Lack of trust and relationship breakdown Dependency on the vendor Lack of professionalism	The client–vendor relationship is degraded due to, e.g., low quality of service. A related practice is P6. The outsourcing contract does not oblige the vendor to be involved in knowledge transfer. Uncertainty of vendor's staff about keeping their jobs afterward.	Observation in C3, C13, and C14 | | | |
Extra refactoring costs	Restructuring of existing knowledge	Poor service under the backsourcing agreement delivered low-quality software code.	Observation in C15 and C22
Extra reorganization costs	Merging offshore developers into the new organization	The company established a new offshore subsidiary and transferred projects to the new location.	Observation in C16
Extra management costs	Management overhead	The company established a new offshore subsidiary and transferred projects to the new location.	Observation in C17
Extra recruitment costs	Hiring and training of new personnel	The company has reduced internal staff since the backsourcing agreement. A related practice is: *Recruit from the job market*.	Interviewee responses in C3
Loss of key staff	Resilient vendor willing to keep staff	The company wants to take advantage of the vendor's technical knowledge and transfer staff back to in-house. A related practice is *Recruit from vendor*	Observation in C3
Interruption of services	Lack of capabilities in-house	Early termination of the contract did not give the company enough time to build up the new organization. A related practice is *Focus on operational continuity*.	Observation in C3
New unit not fully integrated into the organization	Differences in organizational culture	At the time of publication of Butler et al. (2011) (one year after knowledge transfer was complete), this was still an ongoing issue.	Observation in C3

Section 4.5). We then selected core elements based on the number of individual relationships. We drew diagrams by arranging elements around a core element and connecting them via the relationships described, thus creating networks. Through successive iterations of the same procedure, we expanded the relationship networks. We chose the networks with the highest number of internal connections and added further detail to them in the form of narrative descriptions, telling a story about the relationship according to the information in the cases. The diagrams represent relationships as the cases report them, and they are not intended to describe a complete view of the backsourcing process or its components. We thus make no other claims with respect to these diagrams than that, to the best of our ability, they try to depict the empirical evidence as we interpreted it in the papers included in this study. We discuss how this work could be expanded by future work in Section 5.4.

The following subsections describe three relationship networks that we identified by means of this process and found interesting. We illustrate each of them with a diagram and explain how they can be read through narratives that attempt to describe typical process flows. Each diagram includes boxes with different colors representing such elements as reasons for backsourcing, activities, artifacts, attributes, practices, and outcomes. The individual relationships we identified are represented by arrows connecting the elements. The core elements are two activities highlighted in bold in the center of the diagram. A sequence of arrows flowing from top to bottom cross the core elements and highlight a possible reading sequence or flow.

4.5.1. Contractual agreements in backsourcing

The first relationship is centered on two agreements; the *outsourcing contract* to be terminated; and a *backsourcing agreement* that outlines the responsibilities of the client and vendor during the backsourcing process. We identified evidence of this relationship in cases C3–C4, C11–C15, C18, and C23. In all of them, the decision for backsourcing came from the client. A diagram illustrating this relationship is presented in Fig. 3.

The basic flow starts with the client deciding and/or *communicating the backsourcing decision*, leading to the *termination of the outsourcing contract* (C11 and C12). Cases C3, C18, and C23 discuss timing issues related to contract termination. Two strategies were identified: (1) *early termination* to end a *poor client–vendor relationship* as soon as possible, and (2) *delayed termination* to guarantee *continuity of services*. In the diagram, we show the two options, with their connected elements and relationships, as large gray boxes with dashed borders. After the contract termination, the parties negotiate new conditions to ensure knowledge transfer and continuity of outsourced services back in-house (C3, C13, and C14). Elements and relationships belonging to the new backsourcing agreement are included in the third gray box.

Early termination to end a poor client–vendor relationship. Due to issues with its vendor, the company in case C3 decided to *terminate the outsourcing contract early*. The client set up an arbitrary exit date and kept to the deadline despite requests from the vendor to extend it. The early termination helped avoid adverse effects from *lack of trust and relationship breakdown* due to the *poor client–vendor relationship*. Other cases we identified (C12, C15, and C18) also revealed symptoms of such relationship breakdown due to relationship issues during the outsourcing agreement.

Delay termination to allow continuity of services. Early termination was not a viable option in C18 and C23 due to *dependency on the vendor*. Instead, the companies in those cases decided to postpone the outsourcing termination to allow the client time to bring the services back and to ensure their *continuity of services* in-house. A managing director in C23 (Wong, 2008) stated, *"We extended the contract for twelve months, just to give us time to get ourselves organized... We tried to resource the whole organization, it was very complex"*. The contract extension also included exit clauses that ensured the outsourcing relationship was eventually terminated after the extension period.

Backsourcing agreement. Following the termination of the outsourcing agreement, the companies in C13 and C14 ensured their backsourcing plan through a *new contract*, mitigating the

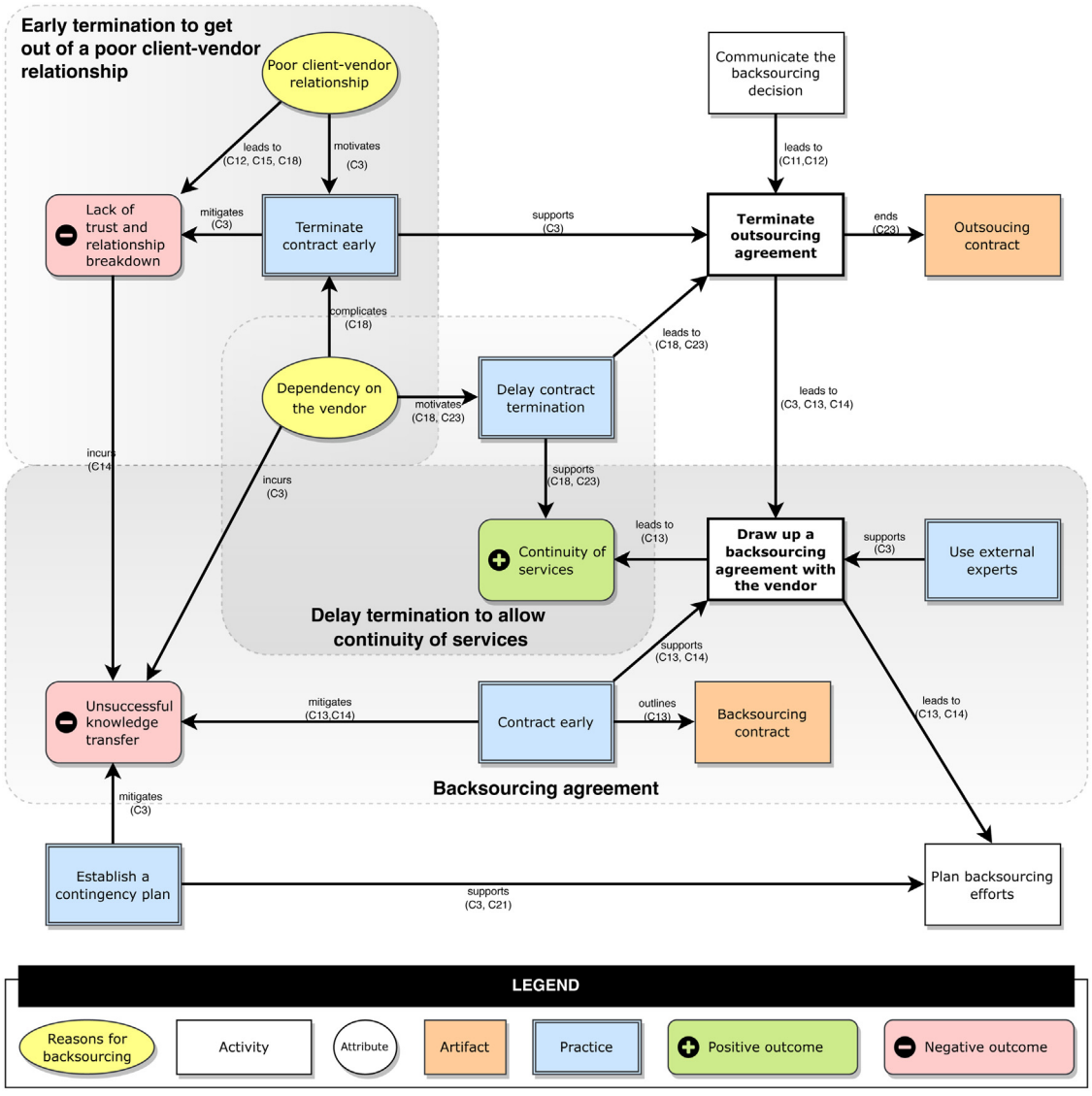

Fig. 3. Relationships related to terminating the outsourcing contract and creating a backsourcing agreement.

risks of *unsuccessful knowledge transfer* due to a potential *relationship breakdown*. Due to the circumstances, the company in C3 did not have any exit strategy and ended up spending a long time *drawing up an agreement with the vendor*. As a mitigation practice, the company *established a contingency plan* to speed up knowledge transfer in the event of a complete relationship breakdown. The company in C3 also *used external experts* to support the renegotiation of third-party contracts from the vendor to the client.

4.5.2. From outsourced knowledge to in-house development and operations

Competence building is a core sub-process of backsourcing, as it describes the transition of knowledge from the vendor to the client and the build-up of necessary in-house knowledge. In this relationship, knowledge comprises both *explicit knowledge*, such as project documentation, guidelines, and scripts; and *implicit knowledge*, e.g., skills, competencies, and experience. This sub-process has the goal of enabling successful *development and operations in-house* (C14 and C16). The elements in this diagram were reported by cases C3–C11, C13–C21, C23, and also supported by the interview study (von Bary et al., 2018a) and the survey study (Whitten and Leidner, 2006).

Fig. 4 illustrates four sub-processes: (i) *competence building*, (ii) *in-house knowledge building*, (iii) *organizational build-up*, and (iv) *transfer of ownership*. The main flow starts with a relationship between the *backsourced scope* (i.e., outsourced knowledge) and the *knowledge transfer* activity. A set of *in-house knowledge-building practices* supports this activity. A further relationship links *knowledge transfer* and *backsourced knowledge*. Finally, another relationship describes how *backsourced knowledge* provides support to *development and operations in-house*.

Competence building. Cases C15, C19, and C20 describe how knowledge is moved and maintained with the vendor under the outsourcing agreement. This led, in cases C15 and C20, to a loss of knowledge on the part of the client. The knowledge difference between the vendor and the client is called *knowledge asymmetry* (Ejodame and Oshri, 2018). This asymmetry posed a challenge for *knowledge transfer* and motivated researchers to investigate the practices for in-house knowledge building reported in cases C4–C10.

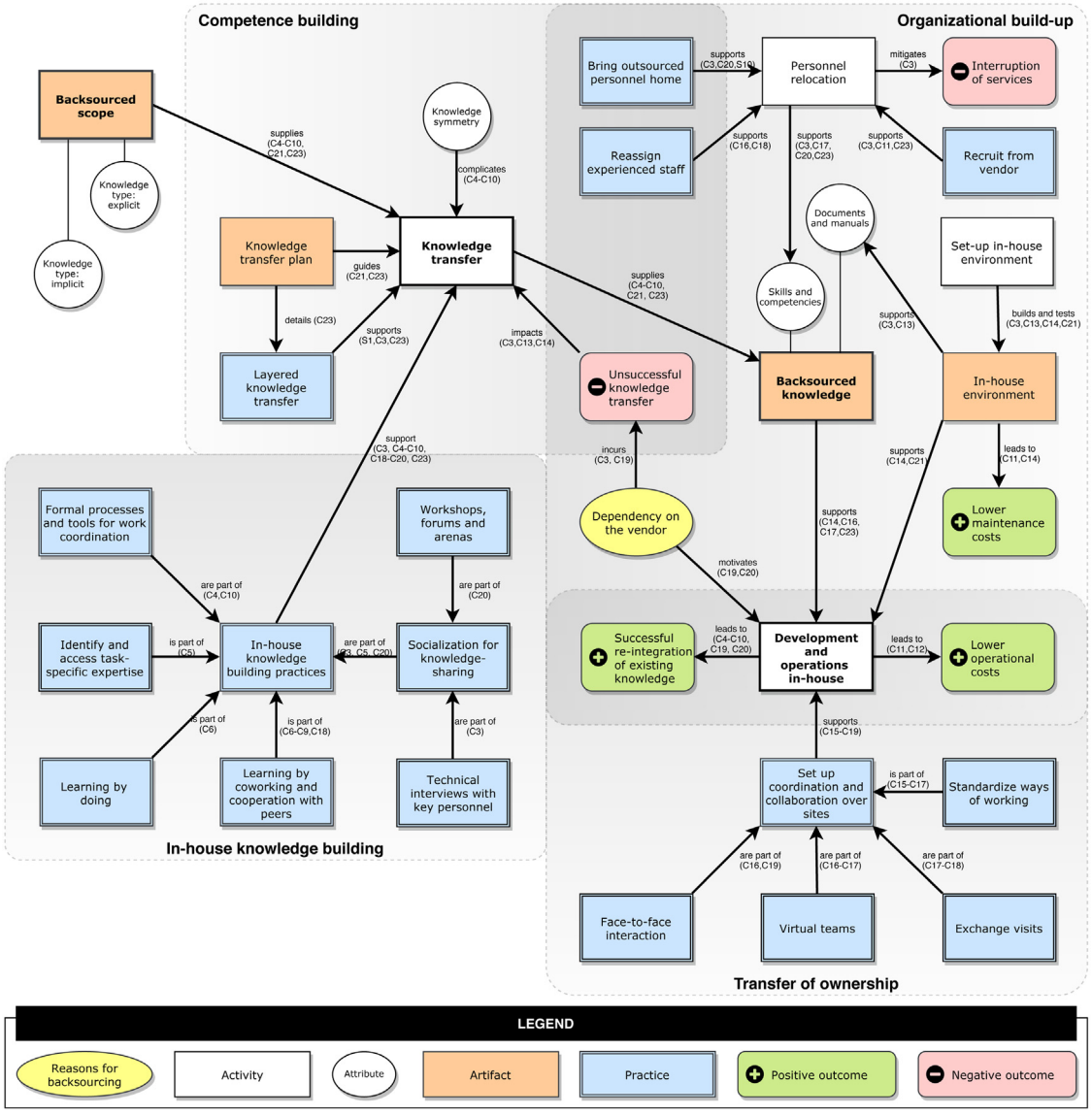

Fig. 4. Relationship between knowledge transfer and reestablishing in-house development and operations.

The companies in cases C21 and C23 employed *knowledge transfer plans* to help lay out the steps and strategies for *knowledge transfer*. In C3, C13, C14, and C19, a *dependency on the vendor* to hand over outsourced knowledge incurred a risk of *unsuccessful knowledge transfer*. A similar dependency motivated C19 and C20 to re-integrate backsourced knowledge and continue operations in-house. As a technology officer in C19 (Nujen et al., 2018) said: *"Instead of becoming dependent on suppliers or, even worse, competitors, we need to protect and share this knowledge within our organization before it gets lost"*.

Layered knowledge transfer aims to organize and prioritize the knowledge to be transferred. In the case of C23, the approach started with the knowledge that was easier to handle and proceeded to the most difficult kind. A managing director in C23 (Wong, 2008) describes this incremental approach as follows: *"We call it peeling the onion. We took the top layer of the onion, which was the worst problem, and we took care of it, and we peeled the next layer and the next layer and the next layer and the next until we reach the core"*.

In-house knowledge building. This sub-process comprises a set of practices that provide means of transferring knowledge from the vendor to the client. Note that this is described in Section 4.3.3 as a set of practices associated with the category *knowledge transfer*. We found reports on the use of *in-house knowledge-building practices* in cases C3–C10, C18–C20, and C23. Cases C4–C10 detail a set of characteristics that could affect the adoption of certain knowledge-building practices. The characteristics are the *type of knowledge* (i.e., implicit or explicit), the *task expertise* required, and dependencies, e.g., from other sources of knowledge, or from related tasks. In Fig. 4, we depict the following knowledge-building practices:

- Evidence from two cases (C4 and C10) described how *formal processes and tools* were employed for building *explicit knowledge*. Such methods and tools are the project management or software development methodologies that serve as a template or guide for the service to be backsourced. The context of the two cases was backsourcing of a data processing task; the explicit knowledge, stored as project documentation, guidelines and scripts, described how to conduct such a task.

- Case C5 described a stepwise practice that consisted of (1) identifying task-related knowledge needs, (2) locating knowledge holders, and (3) bringing them together for knowledge exchange. The situation described in C5 is a financial business process that depends on a series of coupled systems and requires coordination between different organizations inside and outside the company. As described by an interviewee in C5: "There will be some level of interaction; if the person had a credit card, for example, then they'll have to contact [The Company] about it, or if they had a particular product they would have to contact the product service about it".
- *Learning by doing* and by coworking (described in C6–C9) helped organizations build implicit knowledge through the accumulation of experiences. In C6, the employees designated to operate a fraud audit task learned by redoing the previously outsourced service. In cases C7–C9, coworking and cooperation with peers were used to facilitate learning in the context of backsourcing data center management. The similarities between these four cases lay in the specific expertise required for the task.
- Social interactions were a means of fostering a culture of knowledge sharing in C3, C5, and C20. They supported building *implicit knowledge* via interaction with peers. This is better explained by a technology officer from C20 (Nujen et al., 2018): *"[…] technical experts tend to keep unique knowledge they do not want to share […] so a main challenge is to change this culture. We had to explain to the guys that the industry is changing […]so they need to understand that they also need to expand their knowledge and combine it with other resources".* Two social interaction practices were reported in the papers: *technical interviews* in C3, and *workshops* in C20. Although we found supporting evidence for other social interaction formats, such as mentoring programs, we believe they are also applicable in knowledge building.

Organizational build-up. Evidence gathered from four cases (C3, C13, C14, and C21) describes how the company built up a new organization to handle the backsourced services and to absorb the knowledge to be transferred back. This *backsourced knowledge* supported development and operation in-house. Once this organization was built, in cases C11 and C14, *maintenance costs were lowered*. *Personnel relocation* helped mitigate risks of *interruption of services* due to the loss of key capabilities in C3 and C23. To compensate for a deficit in internal capabilities, companies adopted the following practices: (1) *bring outsourced personnel home*, (2) *reassign experienced staff*, and (3) *recruit people with key skills from the vendor*. A director of operations in C3 (Butler et al., 2011) stated: *"The biggest hurdle was to make sure that the continuity of service was there. (…) We managed that by hiring a lot of VENDOR's staff who's already in the position".*

Transfer of ownership. Cases C4, C10, C14, C16, C17, and C23 described the continuity of in-house development and operations once knowledge had been transferred. In the context of C14 and C23, knowledge was defined as the skills and competencies needed for operations, and in C16 and C17, it meant domain knowledge required for software development. In cases C4–C10, the *successful re-integration of existing knowledge* was the main benefit expected from the backsourcing process. C11 and C12 reported another positive outcome: *lower operational costs* by continuing operations in-house once the new organization was built.

In cases where the new organization was an offshore subsidiary (C15–C18), development and operations in-house were supported by *coordination and collaboration over sites*. That comprised a set of practices such as *face-to-face meetings, virtual teams, exchange visits*, and *standardized ways of working*. In the context of cases C15–C18, developers in a new offshore in-house organization employed these practices to share domain knowledge and corporate culture. A manager from the company in C16 (Moe et al., 2014) explained, *"We had four guys coming here sitting with us for three months... and as they were traveling back to Ukraine, they were kind of setting up new teams, being the foundation of the new teams"*. In C19, the face-to-face interaction aimed to locate within the company the existing knowledge needed for the new organization.

4.5.3. Keeping implicit knowledge in-house

The diagram in Fig. 5 describes relationships aimed at ensuring sufficient knowledge to develop and operate software in-house, identified from cases C3–C11, C13–C20, and C23. These relationships are focused on *implicit knowledge* that relies on a person's experience, skills, and competencies. The elements we identified aim to manage personnel to avoid losing existing knowledge and to build new knowledge based on existing human resources.

One sub-process and two categories are the core elements of this relationship: *competence building* (C19, C20, and Aspir et al., 2019), *personnel retention* (C3, C15, and C18), and *recruitment* (C3 and C11). The first two contribute directly to the outcome, but recruitment should be aligned with training to contribute to a shared outcome (C17 and C20). Another category, *personnel relocation*, provides practices that support *competence building* (C3 and C18). The structure of the diagram in Fig. 5 shows the three core elements draped around the shared outcome *existing knowledge kept*. The reading flow here is not a straight path, but rather an interconnected path that leads to the core outcome.

Personnel retention. A significant risk for backsourcing reported in C3 is the *loss of key staff*, as they possess knowledge that is vital for the new organization. Cases C3, C15, and C18 reported that through *the retention of key personnel*, companies mitigated such loss and ensured that *existing knowledge was kept* in-house. C3 reported an attempt by the vendor to cherry-pick people, which meant that the vendor removed people with key competencies from the project. C15 and C18 reported turnover issues among the vendor's staff that could *impact competence building*. Also, risks of *unsuccessful knowledge transfer* were aggravated by uncertainty about job retention among the vendor's staff (C13 and C23). To cope with such issues, companies in cases C3 and C18 closely *watched employees* involved in knowledge transfer; and companies in C3, C15, and C18 offered *improved working conditions* and incentives to address turnover issues. Finally, C18 concluded that retaining employees longer is synergistic with *competence building* (see below), resulting in a *return of investment in training*.

Recruitment. Besides the knowledge obtained by experience, all the skills and competencies needed might not always be found internally (Aspir et al., 2019 and C23). To make up for this, C3 and C15 reported recruitment campaigns aimed at *hiring professionals from the job market*. The company in C23 had many difficulties in finding the right professionals; thus, they employed *external experts* to help with recruitment and training. As stated by their manager (Wong, 2008): *"We found the market for those people (i.e., network engineering) very difficult to find. So we went with a vendor that is a transitional vendor. Their modus operandi in life is to help you go from an outsourced to an insourced situation. They hired the people, they trained the people, and at the end of the six-month period, they transferred them to your organization (…)".*

Instead of tapping the job market for the expertise they needed, C11 and C17 *recruited from the vendor's* employees, as they already had expertise and skills in the outsourced service. Another supporting practice was to *recruit short-term* to fill missing capabilities. The company in C3 hired short-term managers to

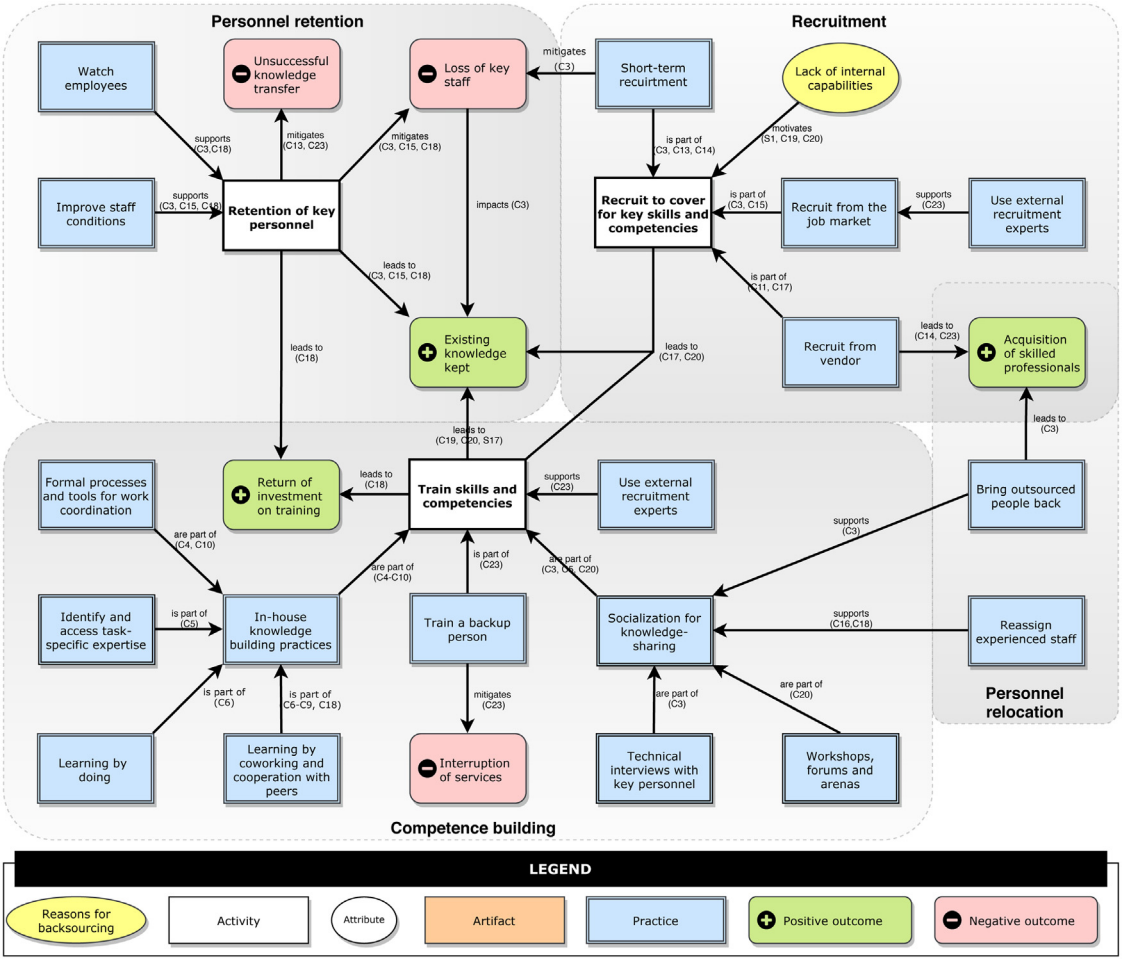

Fig. 5. Relationship between sub-processes personnel retention, recruitment, and knowledge building.

replace key management staff. C13 and C14 reported short-term contracts to cover for lack of technical expertise. As described in C3 and C11, recruitment helped in building capabilities for development and operations.

Competence building. This sub-process helped *keep existing knowledge in-house* (C19, C20, and Aspir et al., 2019). Most practices related to this activity were presented in Section 4.5.2 above, so we will not describe them again here. In addition to the practices discussed previously, we identified two that relied on existing personnel: *train a backup person* (C23), and *socialization for knowledge sharing* (C3, C16, C18 and C20). In C23, a backup person was trained for each position; the practice minimized the risk of *interruption of services* due to personnel turnover. Case C3 reported that technical staff from the vendor were brought to the organization for knowledge sharing. Similarly, cases C16 and C18 reported *reassigning experienced staff* to a new offshore organization in an attempt to facilitate *knowledge sharing via social interactions*. C20 employed *workshops* with experienced personnel and novices, resulting in the rebuilding of key competencies. The existing knowledge was re-integrated with the new in-house organization, leading to the desired outcome of *keeping existing knowledge in-house*.

4.6. SE concepts related to backsourcing

Finally, we categorized the themes obtained from software development cases according to the knowledge areas and key concepts of the SWEBOK (Bourque and Fairley, 2004). Most evidence we gathered is related to the KAs *SE management, SE economics, and SE professional practice*. Table 12 summarizes the SE topics covered by each of our previous contributions and the cases supporting the evidence.

Context of backsourcing. The overview in Table 3 shows the different contexts in which the backsourcing cases occurred. Regarding backsourced service, we identified only six cases (C13, C15–C18, C21) of software development (the KA *SE process* in SWEBOK). Two cases (C18 and C21) also mentioned backsourcing of *software maintenance*.

Reasons for backsourcing. The software engineering subject most extensively discussed in the software development cases, not surprisingly, is *offshoring and outsourcing*. This subject is primarily over by the knowledge area *SE economics*, which addresses topics connecting SE and business, such as the decision-making about sourcing and supplier. Other relevant concepts covered by SWEBOK are *cost and costing*, but none of the software development cases reported high costs as a reason for backsourcing.

Some of the reasons for backsourcing pointed out by software development cases are also related to the KA *SE management* and the key concept of *quality management*, such as quality problems (C16–C18), lack of control (C13, C21), and lack of internal capabilities (C15, C18; see Table 4). SWEBOK does not detail project management concepts aiming at the client–vendor relationship. Still, the concept *software acquisition and supplier contract management* is potentially relevant.

Backsourcing process. In Section 4.3 we outline backsourcing as a process comprised of five subprocesses:

Table 12
SWEBOK KAs covered by the software development cases.

Knowledge area - Related concepts	**Support**
Software requirements	Change management (C21)
Software design	Change management (C21)
Software construction	Change management (C21)
Software maintenance	Context (C13,C21)
Software configuration management	Change management (C21)
SE management	Reasons (C13,C15–C18,C21), change management (C21), competence building (C16–C18), Organization build-up (C13,C15,C7–C18,C21)
- Quality management	Reasons (C16–C18), outcomes (C16–C17)
- Resource allocation	Competence building (C16–C18), Organization build-up (C16–C18) and relationship 2 (C15–C18)
- Review and evaluation	Outcomes (C13, C15–C17)
SE process	Context (C13,C15–C18,C21)
- Software life cycles	Change management (C21)
SE professional practice	
- Dealing with problem complexity	Organization build-up (C13,C15–C18)
- Dealing with multicultural environments	Organization build-up (C15–C18)
- Dynamics of working in teams/groups	Organization build-up and transfer of ownership and relationship 2 (C15–C18)
- Employment contracts	Organization build-up (C13,C15–C18)
- Nature and Roles of SE Standards	Organization build-up (C15–C18)
- Team and group communication	Organization build-up and relationships 2 and 3 (C15–C18)
SE economics	
- Cost and costing	Outcomes (C13, C16–C17, C21)
- Decision-making process	Reasons (C13,C15–C18,C21), vendor relationship management (C13)
- Offshoring and outsourcing	Context, reasons (C13,C15–C18,C21), change management (C15–C18)
- Terminate decisions	Vendor relationship management and relationship 1 (C18)

- **Change management:** In C21, a backsourcing plan is drawn following a *software development life cycle* (SDLC) structure. A series of interrelated activities relate to SWEBOK KAs: (1) *software requirements*, (2) *software design*, (3) *software construction*, (4) *configuration management*, and (5) *SE management*. Other elements in this subprocess relate to the concept *offshoring and outsourcing* in *SE economics*: new sourcing location and adopting a post-outsourcing expansion (C15–C18).
- **Vendor relationship management:** Activities and practices in this subprocess are related to the KA *SE economics*. The *decision making process* is explicitly mentioned in C13 and *terminate decisions* in C18. In the latter case, the decision made was delaying the termination to allow the continuity of services (see also the relationship 4.5.1.
- **Competence building:** We found little support for the concepts of knowledge transfer and knowledge transfer plan in the SWEBOK. However, the KA *maintenance* discusses the transition of a software product from the developer to the maintainer. In addition, *SE management* addresses personnel management activities such as training and mentoring (C15–C18) at the project and organizational levels. software development cases also discuss *resource allocation*, and personnel relocation is the most frequently mentioned category (C16–C18).
- **Organization build-up:** From a SE perspective, backsourcing requires a series of managerial activities, particularly infrastructure and organizational management. Vital topics covered by the KA *SE management* are recruitment (C13, C15, C17–C18, and C21) and resource relocation (C16–C18). C15–C18 also highlighted good practices related to the KA *SE professional practice*, and its key concepts *team and group communication, dynamics of working in teams/groups, dealing with multicultural environments*, and *nature and role of SE standards*. In C13, a highly motivated and skilled team completed a complex unfinished task left by the vendor (*dealing with problem complexity*). C13 also details using short-term *employment contracts* to cover their resource pool.
- **Transfer of ownership:** This subprocess primarily involves the KA *SE professional practice* and the related concept of *dynamics of working in teams/groups*. The practices that illustrate them are: taking over responsibilities (C15–C16) and setting up coordination and collaboration (C15–C18). Also important to mention that the continuity of services in-house could be related to the KA *software maintenance*.

Outcomes of backsourcing. Tables 10 and 11 list outcomes of the backsourcing process and their related practices. *review and evaluation* of intended objectives is addressed by the KA *SE management*. C13 reported remediating issues with performance post-backsourcing, and C16 and C17 demonstrated improved quality post-backsourcing. Another topic discussed concerning the outcomes is *cost and costing*: either the cost of realizing backsourcing (C16, C17) and lower maintenance costs post-backsourcing due to building up an in-house environment (C13). C21 also mentioned the cost of attempting backsourcing without success.

Interesting relationships. This work has detailed three relationships between the process elements we identified. The first relationship (Section 4.5.1) has a small contribution of C18 about the *terminate decisions*, regarding KA *SE economics*. The second relationship (Section 4.5.2) covers aspects of software practice regarding *SE management: resource allocation*, *SE professional practice: dynamics of working in teams/groups* and *teams and group communication*. Finally, the third relationship report on SE-related practices across all elements: competence building, recruitment, personnel retention, and relocation. These practices are related to the KA *SE management* and the concept of *resource allocation*.

5. Discussion

This section discusses the meaning and relevance of our findings, grouped into four topics. First, we discuss the findings for each research question. Second, we compare our results with the related secondary studies. Third, we discuss the gaps in and limitations of our results. Finally, we make recommendations for research and practice.

5.1. Interpretation of the findings

RQ1. What is the context of the reported backsourcing instances?

We identified 26 backsourcing cases representing a variety of company sizes, business sectors, and backsourced activities (Table 3). Most organizations built a new organization for handling the backsourced activities onshore, i.e., in the same geographical location as the parent organization.

We did not identify many contextual similarities across cases, except for those reported in the same paper. For example, the only four cases of offshore backsourcing we identified were reported by the same authors (Moe et al., 2014, 2012). Unfortunately, cases often omitted crucial contextual information, such as details of the outsourced activities or projects (C19–C20, C22, C24–C26), the organization in charge of the service, and the outsourcing contract. The lack of complete contextual information limited our analysis of the backsourcing cases.

Looking at the software development papers, the first one (Kotlarsky and Bognar, 2012) comparatively explored two cases, one of them related to software development. Papers Moe et al. (2014) and Moe et al. (2012) reported four cases of failed outsourcing and further backsourcing in Scandinavian companies. The fourth paper Petalidis (2018) detailed a failed attempt to backsource a software project of a governmental agency. Besides these four papers, another two (Nujen et al., 2018; Solli-Sæther, 2016) could have described backsourcing of software development, but the cases did not explicitly report the backsourced services. Therefore, our analysis considered the cases in these papers among the other IT-related services.

RQ2. Why do companies backsource?

The backsourcing decisions reported were more often reactive than proactive in nature. We found strong links between the reasons *poor-client relationship* and *dependency on the vendor*, with the activity *termination of the outsourcing agreement* supporting this insight.

The backsourcing decisions were seldom motivated by a single reason. In particular, *poor client–vendor relationship* was often reported alongside other reasons for backsourcing, e.g., *quality problems* and *vendor competence issues*. Interestingly, the main reported reasons for backsourcing were strikingly similar to the rationale for outsourcing in the first place (Hirschheim and Lacity, 2000), implying a relationship between failure to meet outsourcing expectations and backsourcing.

Interestingly, *high costs* were not reported by a single software development case. Furthermore, no software development case reported *dependency on the vendor* as a factor that would have detracted from the decision to backsource. C18 mentioned this dependency solely as a deferment of the contract termination with the outsourcing vendor.

Many of the reasons for backsourcing software development were the same as those for backsourcing other IT-related activities. However, none of the software development cases reported *cost savings* as a motivation for backsourcing; non-software development studies extensively reported this reason. It is worth noting that findings from C3 suggest that *cost savings* might not always be reported as an official reason for backsourcing. Thus, it is possible that the software development cases reported only the official reasons and did not investigate the true motivation for the backsourcing decision more deeply. Furthermore, we did not find any evidence of *changes in strategy or management* in software development cases. This was most probably related to the small number of reported cases, as we could also not identify any explanation for the lack of such changes.

Despite strong arguments in favor of backsourcing, some companies found it difficult to end their poor relationship with the vendor due to *a lack of internal capabilities* and *dependency on the vendor*. These reasons against backsourcing often occurred together. In such cases, the decision-making process had to consider the trade-offs between terminating a poor relationship and the need to ensure the continuity of the outsourced activities. Companies opting for the former faced the consequences of a relationship breakdown and risks related to knowledge transfer.

Surprisingly, we did not find evidence supporting *dependency on the vendor* in the cases of software development backsourcing. Besides influencing the backsourcing decision, a dependency on the vendor could affect knowledge transfer and in-house development and operations (see, e.g., Sections 4.5.1 and 4.5.2). Still, this evidence was gathered solely from cases and studies not related to software development. It is reasonable to assume that the lack of evidence about *cost savings*, *changes in strategy or management*, and *dependencies of the vendor* is due to the limitations and scarcity of the backsourcing cases reported in the literature. Thus, it is worth investigating more practical cases of software development backsourcing with regard to such reasons and their effects on the backsourcing process.

RQ3. How do companies backsource?

While the descriptions of the backsourcing process varied widely in the included papers in respect of both terminology and depth, we were able to identify 13 activities, nine attributes, nine artifacts, and 28 practices related to the process, which we grouped into five sub-processes: *change management*, *vendor relationship management*, *competence building*, *organizational build-up*, and *transfer of ownership*.

Table 13 shows the contribution provided by each case (plus studies Wong, 2008; Raghuram, 2016) for the sub-processes and categories we identified. The categories comprise diverse elements (i.e., activities, practices, artifacts and attributes) with a common theme. The first six cases are specific to software development, while the remaining columns list the contributions of other IT-related cases and studies.

Due to the scarcity of evidence and the quality of reporting, we did not achieve theoretical saturation when coding. Thus, we find it unlikely that the process elements would add to a complete and consistent backsourcing process description. No single case reported all categories, but some (C3, C14, C18, C23) contributed to all five sub-processes, as shown in Table 13. The diverse evidence reflects both the differences in reporting and the fact that the context of the cases varied, implying that backsourcing can be carried out differently in different contexts. Further research is needed to flesh out the process and to understand the contextual variation better.

All sub-processes were supported both by software development and other cases, but not all elements. For example, the practice *forming a planning team* to lay out the steps of backsourcing is only described by case C21 in the context of software development. This practice was aggregated with other planning strategies in the sub-process *change management* that, in turn, is supported by a broader set of backsourcing cases, both software development and other IT-related. Although it is reported in the specific context of a software project, we see no clear reason why such a practice would not be applicable to general IT-related backsourcing.

Table 13
Contribution of evidence sources to backsourcing process elements.

Subprocess	**SD**						**Other IT-related activities**									
Category	C13	C15	C16	C17	C18	C21	C3	C4–10	C11	C12	C14	C19	C20	C23	von Bary et al. (2018a)	Raghuram (2016)
Change management	•	•	•	•	•	•	•		•	•	•		•	•	•	
Planning	•	•	•	•	•	•			•		•		•	•	•	
Internal communication							•		•	•	•			•	•	
Post-backsourcing	•	•	•	•	•		•		•	•	•			•	•	
Vendor relationship management	•				•		•				•			•	•	
Contract termination					•		•							•	•	
Backsourcing agreement	•						•				•			•		
Post-backsourcing											•					
Competence building	•	•	•	•	•	•	•	•			•	•	•	•	•	•
Knowledge transfer planning	•	•	•	•	•	•	•	•			•	•	•	•	•	•
Knowledge transfer					•	•	•	•					•	•		
Training		•	•	•	•			•				•	•	•		
Management											•			•		
Organizational build-up	•	•	•	•	•	•	•		•	•	•	•	•	•		•
Organizational planning	•					•	•		•		•					
Recruitment	•	•		•	•	•	•		•	•	•	•	•	•		•
Personnel retention		•			•		•				•					
Personnel relocation			•	•	•		•						•			•
Transfer of ownership	•	•	•	•	•		•				•			•		
Responsibilities		•	•		•									•		
Internal business strategy			•				•							•		
Continuity of services	•	•	•	•	•		•				•					

Another example of practices described within a specific study perspective is to *maintain a business relationship with the vendor* after backsourcing, which was reported only in C14. Although reported by an IT case, the context in which this practice occurred is not dependent on the backsourced activity. It depends instead on a positive attitude towards the vendor. Note that C14 did not report dissatisfaction with the vendor as a reason for the backsourcing.

The same logic seems to apply to other elements as well. For example, the activity *internal communication of the backsourcing decision* was supported by C11, C12, and C23, von Bary et al. (2018a), and it is part of the *change management* sub-process that has been extensively reported in both software development and IT contexts. Here too, the lack of evidence does not imply evidence of absence, and we think this activity may also be helpful in backsourcing software development.

Another interesting pattern concerns two practices: *recruit from the vendor*, and *bring outsourced people home*. Both are unreported in software development contexts. Does that mean that software development companies avoid bringing outsourced people back in-house, either by recruiting or relocation? The evidence does not suggest this (C13, C16, C18 and C21), although there is a lack of detail about how to bring people back in software development cases. Therefore, we draw on the non-software development cases to detail practices *Recruit from vendor* and *Bring people home*.

We found a few activities and practices supported only by software development cases. A noteworthy practice is to *delay the contract termination* to ensure the continuity of operations (C18 and C23). Unlike other IT-related services, software development is a process that cannot easily be paused and resumed. Iterative processes broadly adopted in outsourced contexts require continuity and depend on the coordination between distributed teams. This implies additional risks for *competence transfer* and *organizational build-up* that could be mitigated by a late termination. Companies opted to finish building an in-house environment and transfer knowledge before terminating their contracts with the vendor.

We also found that elements associated with a sub-process often interacted with elements from other sub-processes, e.g., by association or dependency, suggesting a degree of overlap instead of a purely sequential process. For example, the activity *development and operations in-house* (Table 9) depends on setting up an in-house environment and transferring outsourced knowledge back. Another example is the association between *recruitment* and *training* (see Tables 7 and 8) to cover key competencies. The findings of such connections revealed interesting relationships between the process elements we investigated further in RQ5.

If the process is not purely sequential, we can assume that there are multiple paths a company can take to carry out backsourcing successfully. Examples of such alternative paths are C3 and C18; the latter ensured complete *knowledge transfer* before *terminating the outsourcing contract*, while the former carried out these two activities in reverse. Furthermore, not all activities and practices are mandatory. For example, a company could complete backsourcing without *recruiting new staff* or *training existing personnel*. However, it is important to note that such activities (and practices) are often related to an outcome, in this case, *acquiring skilled professionals*.

Ideally, a complete backsourcing process should relate outcomes to each step or action. However, most activities and practices we identified were not explicitly associated with an outcome, so how the actions taken during the process contributed to its end result is unclear. Even when activities were associated with outcomes, we did not find a common contextual factor across studies to explain the finding. Instead of aiming for a theoretically ideal backsourcing process, we opted to aggregate the available evidence about how backsourcing was conducted. We expanded the elements' description with a narrative of the situations in which they occurred, aiming for a richer depiction of the process.

RQ4. What are the reported outcomes of backsourcing?

Outcomes of the backsourcing process are positive or negative results achieved by conducting certain activities and practices rather than by completing backsourcing.

Most of the outcomes we identified, i.e., 18 out of 23, were reported by only one study. Many were reported by several cases in the same study, resulting from shared data collection and

analysis procedures (see e.g. cases C11–C12, C15–C18, and C19–C20). Most observations describing outcomes were reported in C3, C11, C21, and C23. In particular, C3 contributed two-thirds of all negative outcomes. The scarce evidence about outcomes suggests that impacts from specific backsourcing actions have not been well investigated or that they are not easily assessed.

Most observations were drawn from interviews with the participants in the backsourcing cases, and not much is reported about the triangulation of these findings with documents or other data sources. In addition, all the cases we identified were post-mortem, i.e., they occurred prior to the investigation. Thus, the evidence supporting the outcomes is grounded in personal opinion and recollection. This calls for further research to assess the real benefits and drawbacks of backsourcing and its related activities.

Seven of the fourteen positive outcomes we identified were reported by software development cases. The most substantial contributors to this were cases C15–C18; all were from the same study. The only positive outcome that reported similar causes for both software development and IT-related cases is *lower maintenance costs*. To achieve this, companies in C13 (software development) and C22 (IT) set up an in-house environment that provided a similar service to their outsourcing vendor without incurring their excessive costs. High costs were reported as a reason for the backsourcing in C22, but not in C13.

Four of the negative outcomes were associated with backsourcing of software development, two of them in aggregation with other IT-related cases: *refactoring costs* and *unsuccessful knowledge transfer*. The former is a consequence of restructuring the low-quality knowledge delivered by the outsourced vendor. The latter was also caused by issues with the vendor, e.g., *lack of trust* and *dependency on the vendor*. The commonalities there are issues with the previous outsourcing that incurred additional challenges during backsourcing.

It was also noteworthy that the outcomes *continuity of services* and *successfully re-integrated existing knowledge* were not reported in software development cases. Although the evidence across studies is not strong, these outcomes are described as an intended goal in IT-related backsourcing cases. However, they are likely also to be relevant for software development since *continuity of services* means carrying out the software process in-house after knowledge is backsourced, and *re-integration of knowledge* ensures that domain and technical knowledge is built and maintained by the in-house team. The lack of evidence about such outcomes in the software development context is worth investigating.

RQ5. What are the relationships between the context, reasons, processes, and outcomes of backsourcing?

We identified and described three relationships that present an interesting amalgam of software development and IT backsourcing cases. The connections found are supported by evidence from multiple cases in both contexts. Nonetheless, a few diagram clusters were derived from only one context.

The first relationship (Fig. 3) describes a vital decision point in any backsourcing process: when to *terminate the outsourcing agreement*. There are clear benefits from postponing this activity and ensuring the vendor's responsibility for knowledge transfer. Nonetheless, companies with problems with *poor vendor relationships* were willing to terminate the outsourcing agreement as soon as possible. The decision has implications for later steps in the process. Companies opting for *early termination* should acknowledge risks for *unsuccessful knowledge transfer* and *continuity of services*. A candidate for mitigation of this risk was reported by case C13 (software development), in which the company negotiated the vendor's commitment to supporting the backsourcing process early on.

The second relationship (Fig. 4) describes a long chain of events centered on *knowledge transfer*. This is a crucial activity in backsourcing, and it affects other sub-processes, such as *organizational build-up* and *transfer of ownership*. The issues with knowledge are due to the knowledge type, symmetry, degree of coupling, and expertise required. The organization should establish the knowledge needed for *setting up the new in-house environment*. Sloppy execution of this step can lead to problems when *re-integrating knowledge*.

Many connections in the diagram were gathered from an aggregation of software development and IT-related cases. software development cases contributed mostly with evidence related to *competence building* and *organizational build-up*. In particular, C21 detailed moving a software project back home using the software process as a guiding structure. Other interesting findings supported exclusively by software development cases are about *setting up coordination and collaboration over sites*; these practices describe how companies in C15–C17 set up a distributed development environment after backsourcing.

The third relationship (Fig. 5) is centered on the outcome *keeping existing knowledge in-house*. This knowledge is needed for *continuity of services* after backsourcing, and it is found in people's skills and competencies. This implies that people are vital for successful backsourcing due to the *implicit knowledge* they retain. The relationship describes many practices a company can employ to keep implicit knowledge by means of acquiring or retaining key personnel. Some of these practices are complementary, which means they are employed together for greater benefit. A good example is how *relocating experienced personnel from the vendor* and using them to *share knowledge via social interactions* led not only to *keeping existing knowledge*, but spreading it within the new organization (C20).

The *loss of key personnel* (e.g., developers with domain knowledge or technical experts) is a major risk described in this relationship. Cases C15 and C18 reported how to mitigate this risk by *monitoring employees involved in the backsourcing* and *offering better work conditions* as a means of retaining them. These practices were described in the context of software development cases, but we are confident that they are broadly applicable to other contexts. Similarly, cases C16 and C18 provided evidence of strategic *practices for knowledge sharing* that ensure that knowledge is not retained by only a few key people. We venture to say that dependency on key personnel for continuity of services is in many ways as risky as dependence on a vendor.

RQ6. What are SE concepts addressed by the backsourcing of software development?

Due to the low number of papers and scarce evidence on the backsourcing of software development, we opted to include studies on the backsourcing of other IT-related services, such as the hosting of data and applications and server management. These cases have many similarities with backsourcing of software development. Still, we were particularly interested in the particular aspects of the SE domain investigated. We highlighted the evidence from six cases (C13, C15–C18, and C21) that reported software development and/or maintenance as the subject of backsourcing and categorized them according to the KAs of the SWEBOK (Bourque and Fairley, 2004).

SE process is the discipline that describes the set of activities to develop, maintain and operate the software. Contrary to our expectations, the software development cases we identified have not deeply investigated this aspect. Only C21 focuses on the aspects of the software process, detailing the backsourcing plan according to the software life cycle. The project plan was comprehensive, but numerous issues with deliverable artifacts (software architecture, source code, and documentation) made it impossible to backsource.

The KA of *SE management* addresses the three central elements of the backsourcing process we identified (Sections 4.3.2–4.3.4). The concept of *quality management* describes the need to identify and assure software quality. This description resonates well with our results for reasons and outcomes of backsourcing identified (Sections 4.2 and 4.4). We also note that other concepts in this KA (e.g., *risk management, monitor and control process*) are discussed in cases of IT-related backsourcing. The lack of evidence about these activities in software development cases is surprising, as they are related to ensuring the success of the backsourcing process.

SE professional practice comprises a set of subareas, i.e., *professionalism, group dynamics, and communication skills*. The concepts discussed herein are mostly related to the activities and practices for competence building and organization build-up (Sections 4.3.3 and 4.3.4). Human resources and the implicit knowledge they hold are vital elements of the backsourcing of software development. Disregarding their importance could lead to negative outcomes, e.g., loss of key staff, extra costs with recruiting, and more pressing unsuccessful knowledge transfer.

In the software development backsourcing cases we identified, *SE economics* mainly concerns *offshore and outsourcing*, which is unsurprising. Other relevant topics in this KA are the *decision-making process and terminate decisions*. These concepts are strongly related to the vendor relationship agreement (Section 4.3.1). We assume that the concepts in this KA are focused on the early stages of backsourcing, but this is correct concerning *cost and costing*. Although many cases we identified pointed out high costs as a key factor for decision-making, none are among the software development cases. Still, our evidence about software development cases is minimal, and we believe that the costs of software development backsourcing should be further investigated.

Other KAs pointed out by the evidence are the stages of the software life cycle (requirements, design, construction, and maintenance). Surprisingly, no cases discussed software testing, even though product and service quality are among the most cited reasons for backsourcing. C21 mentioned the discipline as part of *software life cycle*, but it does not provide any information about testing activities.

Also noteworthy is that the *software maintenance* area in SWEBOK includes a discussion about transferring software from a developer to a maintainer. Assume the outsourcing vendor is a developer organization and the in-house organization is a maintainer; this description fits the backsourcing phenomenon perfectly. Interestingly, the *key issues in software maintenance* cover aspects of this scenario well, including challenges with outsourcing. We do not advocate that this scenario is unique. However, it is an example of potential aspects of SE worth investigating.

Similarly, the key concept of *software acquisition and supplier contract management* in the KA *SE management* has similarities to the outsourcing (also backsourcing) agreement. The description of this concept highlights the need for agreements for software being developed both *internally or externally* to the organization. This topic is of interest for further investigations of the relationship described in Section 4.5.1.

5.2. Comparison with existing literature reviews of backsourcing

We were able to identify five literature studies related to backsourcing in IT (von Bary and Westner, 2018a; Leyh et al., 2018; Wong and Jaya, 2008; Veltri, 2005; von Bary et al., 2018b). These papers were excluded during our selection process as they did not contribute first-hand empirical evidence about backsourcing of software development. However, they serve as valuable sources for comparing and complementing our findings with alternative interpretations.

Table 14 lists the existing reviews and the research questions they address. The topic which received the most attention in the reviews was the reason for canceling outsourcing agreements and deciding to backsource (comparable to our research question RQ2). All five reviews included a research question related to this topic and two of them (Wong and Jaya, 2008; Veltri, 2005) focused on this question in particular.

Two papers (Wong and Jaya, 2008; von Bary et al., 2018b) differ from ours by investigating practitioners' literature (trade journals and press reports) instead of empirical studies. Notably, there is no review in the field of SE, despite the fact that many IT backsourcing projects have a strong software development component and that issues related to the reintegration of SE in an organization can be among the main challenges in a backsourcing effort. The five studies are as follows:

Antecedents of information systems backsourcing (Veltri, 2005). This report's second chapter, a doctoral thesis, presents a non-systematic literature review on critical factors of the backsourcing decision. This review was subsequently expanded upon and published as a chapter in a book (Veltri and Saunders, 2006). The related study differs from ours in several aspects, one being its aim: the literature review provided a theoretical foundation for the thesis, but it is not intended to achieve completeness on the topic. In fact, neither our academic literature review nor the other two reviews in this section (Leyh et al., 2018; von Bary and Westner, 2018a) share any primary sources with this related work. Still, the study reports three main motivations for backsourcing similar to the reasons we identified: *changes in strategy and management*, *cost savings*, and a *poor client–vendor relationship*. The authors analyzed the findings from the perspective of underlying theories, whereas we employed inductive coding based on the narrative from included papers. Thereafter, their work bears no further comparison with ours. The remaining chapters build upon the literature review to develop a theoretical framework focused on the backsourcing decision's economic, strategic, and related considerations. The framework was later applied as a methodological tool to categorize backsourcing cases.

Drivers of IT backsourcing decision (Wong and Jaya, 2008). The paper presents a literature review of 13 backsourcing cases reported by the press and identifies the main reasons for the backsourcing decisions. Reasons for backsourcing, in order of frequency, are power and politics (6), cost (5), service quality (5), changes in IT role (5), loss of control (4), changes in organizational structure (4), IT resource accessibility (3), changes in strategic directions (1), and changes in vendor organization strategy (1). Interestingly, the most frequent driver, 'power and politics at top-level management', does not have a similar reason in our study. Only two cases we identified (C3 and C23) discussed the influence of top management in the backsourcing decision. We suspect this divergence could be due to differences in reporting in the primary sources; ours used empirical studies while their study used press reports. Despite this difference, we noted a few similarities: three reasons for backsourcing (*quality problems*, *cost savings*, and *regain control*) are the topmost cited in both studies. These reasons are part of the 'outsourcing expectation gaps' group in Wong and Jaya's work (Wong and Jaya, 2008).

Information system backsourcing, a systematic literature analysis (Leyh et al., 2018). This SLR aimed at answering two research questions similar to ours: what are the drivers of backsourcing (our RQ2), and how do companies backsource their services (our RQ3). The review includes 20 papers; our search strategy also found all of them; however, we excluded 14 of them as they do not present empirical evidence to answer our research questions. The remaining six papers (Wong, 2006; Moe et al., 2014; Butler et al., 2011; Wong, 2008; Kotlarsky and Bognar, 2012; Whitten and Leidner, 2006) are included in our

Table 14
Related literature reviews.

Year	Authors	Type[a]	Data source	Field	Main topics
2005/6	Veltri (2005), and Veltri and Saunders (2006)	NSLR	Acad. lit. (15 papers)	–	Reasons
2008	Wong and Jaya (2008)	NSLR	Press reports (13 cases)	Business	Reasons
2018	Leyh et al. (2018)	SLR	Acad. lit. (20 papers)	–	Reasons and overview of the backsourcing process.
2018	von Bary and Westner (2018a)	SLR/MS	Acad. lit. (31 papers)	Business	Reasons and implementation success factors. Mapping of topics and research approaches.
2018	von Bary et al. (2018b)	SLR/MS	Grey lit. (173 publications)	Business	Reasons. Comparison of topics to academic literature.

[a]SLR = Systematic Literature Review; NSLR = Non-systematic Literature Review; MS = Mapping Study.

study as well. It is worth noting that the related work only covered papers until 2016 and, as a result, missed five relevant papers that we identified during our search process. Concerning the reasons for backsourcing, the SLR identified only three: expectation gaps, internal or external changes, and environmental changes. Expectation gaps are reported most often. Concerning RQ3, the related work described four components of the backsourcing process: (1) transfer and management of knowledge, (2) project management challenges, (3) relationship management, and (4) hiring or re-hiring strategies. Overall, our SLR also confirmed those sub-processes, but we extended the process by reporting one additional sub-process: *transfer of ownership*.

Information systems backsourcing (von Bary and Westner, 2018a). A literature review that synthesized 31 papers on the topic of backsourcing in IS. The related work differs from ours, mainly by including non-empirical studies (21 out of 31 included papers). Out of the ten remaining studies, seven are in common with our SLR (Wong, 2006; Moe et al., 2014; Butler et al., 2011; Hirschheim and Lacity, 2000; Ejodame and Oshri, 2018; Kotlarsky and Bognar, 2012; Whitten and Leidner, 2006). Their motivators and decision factors are comparable to our reasons for backsourcing, and once more, 'expectation gaps' are ranked highest. The related study distinguishes motivators from decision factors, as the former are triggers, and the latter are enablers and barriers to the backsourcing process. Their findings of 'implementation success factors' are somehow similar to our outcomes, but we could not map them. The related work also derived instructions based on the included papers; we did a similar job by eliciting activities and practices. In our research, we did not find elements (e.g., activities and practices) that are consistently reported, so we instead described them alongside the context or situation in which they were identified.

Gaps between research and practice in the field of information systems backsourcing (von Bary et al., 2018b). A review of practitioner literature on information systems (IS) backsourcing. The paper provides an overview of a large set of papers (173) from trade journals and categorizes them according to publication topic and reasons for backsourcing. It also provides a comparison between the practitioner and the academic literature provided by the related work mentioned above (von Bary and Westner, 2018a). The findings suggest that practitioner literature is mostly descriptive and has limited coverage of topics. For example, the included papers report only the following reasons for backsourcing: cost savings, quality improvements, and control and flexibility. Once more, the findings support the evidence from academic literature that 'expectation gaps' are the reasons most often reported for backsourcing decisions. From a methodological perspective, this related work differs from ours, as we included only empirical evidence, largely limiting practitioner literature. Therefore, we see this work as complementary to ours, and further research ought to verify whether our findings can also be confirmed in cases of practitioners' literature.

Our work expands on the literature mentioned above by adding a more in-depth description of the elements of the backsourcing process. Only one piece of related work (Leyh et al., 2018) provided a similar description. However, our work differs from theirs in that we classified the elements according to their contribution to the process (i.e., activities, artifacts, attributes, and practices). We also provided an original contribution by identifying connections between elements that allowed us to describe three relationships.

5.3. Research gaps

Even though our findings cover a wide range of topics, recurrent themes across the 17 included papers were seldom confirmatory. Two papers could describe different circumstances for the occurrence of the same theme. An example of this issue is the activity *termination of the outsourcing relationship*, which can be either delayed (C23) or hastened (C3). In addition to that, the few cases we identified in the literature are probably a small sample of a large population of backsourcing events. Thus, any interpretation of our findings attempts to understand why and how the phenomenon occurs under the reported circumstances rather than in general. We were able to identify several interesting gaps in the literature:

Type and strength of evidence. Most of the evidence we collected is based on observations from a case and from the perspective of an interviewee interpreted by the researcher. However, we gathered 92 direct quotes in ten papers (Wong, 2006; Hirschheim and Lacity, 2006; Moe et al., 2014; Barney et al., 2013; Hirschheim and Lacity, 2000; Wong, 2008; Butler et al., 2011; Ejodame and Oshri, 2018; Kotlarsky and Bognar, 2012; Nujen et al., 2018) which provide an unfiltered insight into the data. A subset of those quotes is presented in this work. Besides that, papers often reported how backsourcing cases occurred, and large parts of the articles were dedicated to recounting or narrating the backsourcing story. We noted a lack of in-depth studies that investigate the causes and rationale of the process or studies that describe the process in detail. Due to this, our study mostly reports patterns we identified and aggregated from the papers instead of the causal evidence. This gap reveals a need for more experimental and observational studies that could explain the patterns we identified.

SE Topics not investigated. Our findings concerning the KAs of SE highlighted some opportunistic gaps. Firstly, ideas largely

explored in other IT-related cases were lacking in any software development case. Such are topics of risk management, monitoring process, and high costs as a reason for backsourcing. In addition, SWEBOK's KAs offer some exciting concepts that have not yet been investigated: software testing, key issues of software maintenance, and supplier contract management.

In addition, we compared our findings to other literature studies 5.2 to understand the contribution we brought in relation to the existing knowledge. Our study does not analyze these other SLRs looking for recurring patterns or exploring dissimilarities. As the field matures, it would be interesting to conduct tertiary research that aggregates the multiple SLRs/SMS finding into a shared understanding.

Lack of supplier's perspective. None of the papers identified in our study included the perspective of the vendor company. Some cases (C3, C11–C13) report that the vendor's staff were transferred back in-house, but those people were not interviewed. The client–vendor relationship is often discussed in terms of deterioration and breakdown, especially when detailing the reasons for the backsourcing decision in software development cases (e.g., C16–C18, and C22). Just one case we identified (C14) reported a business relationship with the vendor after backsourcing. The lack of a supplier's perspective points out a gap in the literature that further studies can address.

Lack of attention to the job market. Some papers mentioned the potential impact of backsourcing on the local job market, but the information was often conflicting. On the one hand, the survey study in Raghuram (2016) reported no impact on the job market or local economy due to backsourcing; on the other hand, the same paper reports a negative impact on wage rates due to backsourcing. Case C14 reported that due to a global financial crisis, a sizable pool of experienced professionals became available in the job market. The case does not describe the impact on wage rates, but we can assume, based on the supply and demand law, a negative impact due to the influx of new available people. Other papers (Moe et al., 2014, 2012; Nujen et al., 2018) only mentioned that recruitment campaigns drew from the job market, but did not investigate the conditions in which this occurred.

Failed backsourcing. An interesting finding is the only case of failed backsourcing (C21) identified. The paper described an attempt at backsourcing motivated by the need to regain control over an e-government information system. It detailed the actions and technical issues encountered when bringing back software the source code, architecture artifacts, and software documentation. The backsourcing process here required much effort, especially in understanding and taking ownership of the software artifacts. The attempt failed due to the inability to complete the backsourcing in the required time. It is important to note that in this pilot, the client worked in isolation without collaboration from the vendor. Despite its negative outcome, C21 provided meaningful evidence regarding a backsourcing process following the software life cycle.

5.4. Implications for research and practice

We have a few recommendations for further research and practice based on our results.

One opportunity for further research concerns the relationships illustrated in Section 4.5. The three relationship diagrams aggregated evidence from multiple papers, but further primary studies are needed to confirm the relationships. Confirming whether our representation appropriately depicts backsourcing events reported from practice would be valuable. A further study could draw cases from practitioner literature (similar to von Bary et al., 2018b), and use the relationship diagrams to guide qualitative data analysis. Such a study could confirm or provide complementary or conflicting evidence regarding the relationships we identified. In either case, the evidence would strengthen our findings with a deeper understanding of the phenomenon in practice. A limitation of this idea, as already pointed by von Bary et al. (2018b) is the limited coverage of topics in practitioners' reports.

Other ideas for further research derive from the limitations we discussed in Section 5.3. First, observational and experimental studies could use the insights we provide in this paper to make testable predictions. Such studies already exist within the topic of outsourcing, e.g., Dutta and Roy (2005), Rao and Sarda (2003) and Xue et al. (2005), denoting a higher degree of maturity of the field. Furthermore, we encourage researchers willing to conduct case studies of the backsourcing phenomenon to take into account different perspectives such as the vendor, the job market, and failed backsourcing events. Diversity in research views is valuable for further synthesizing of studies. Also of paramount importance is exploring the topic from a SE point of view. We suggest that researchers consider the SWEBOK KAs discussed in Section 4.6. Finally, SLRs and SMSs like ours aggregate the evidence from such primary studies. As the field matures, tertiary research would be necessary to aggregate, compare and analyze the findings of multiple secondary sources.

From a SE practitioner's point of view, our paper could serve as reflexive or instructive reading. Practitioners who have already participated in a backsourcing process could compare the context, motivations, elements, and outcomes we describe here with their own experiences. We also encourage practitioners to share their views in professional forums, magazines, and blogs, thus contributing to the further evolution of the field.

For practitioners who have still to take part in a backsourcing process, or who are currently involved in one, the themes we identify here could be employed as instructional and reference material. Two sections of our results are especially relevant for those planning or currently implementing a backsourcing process.

First, Section 4.3 lists key practices that could provide meaningful insights for practical use. Note that the practices were identified in different contextual situations, and one should reflect on how they might fit a given real situation. It is also important to consider which practices to adopt based on the expected outcomes. When combined with Section 4.4, the practices can become a checklist of actions and expected outcomes. We encourage practitioners to evaluate whether the practices led to the desired outcomes.

Second, the relationship diagrams in Section 4.5 may be of interest in providing instructional support when implementing the process. The diagram flow makes explicit the relationships and dependencies between practices and other elements, and the description provides details of the circumstances in which such a relationship occurred in the literature. Most of the circumstances described in this paper are based on insights and lessons learned. Additional information about them is found in the included papers; we provided a full list of references in Table 2.

6. Conclusions

This research aimed to understand the phenomenon of backsourcing in information technology, with a focus on SD. We conducted a systematic literature review, extracting qualitative data from empirical studies reporting mostly real-world experiences. We analyzed the evidence via inductive coding and narrative synthesis. Central findings of our review include the following:

- The context of backsourcing cases is assorted. In our study, the backsourcing events were not limited to a particular business sector, company size, or software activity. Moreover, we did not find patterns in the data related to these contextual factors. Regarding the backsourcing setting, most cases we identified were oriented to the onshore setting, i.e., bringing the service to the same geographical location. However, we noted a few cases of offshore backsourcing.
- Reasons for backsourcing are often related to a previous outsourcing agreement. The most common reasons for backsourcing were *quality problems*, *high costs*, and *lack of control* of the outsourced services. Often, reasons in favor of backsourcing are aligned to unrealized expectations for the outsourcing agreement. Many companies adopted backsourcing despite considering the reasons against it (e.g., a *dependency on the vendor*) during the decision-making process.
- There is no commonly-used or streamlined backsourcing process. Each case we identified carried out a specific backsourcing process. The processes comprised several elements, some of which we identified across multiple cases. The evidence revealed five major sub-processes; we also listed activities, attributes, and artifacts that contributed to the sub-processes. We also collected a set of 28 key practices supporting the backsourcing process. We found a few similarities in activities and practices across the cases, but the circumstances in which they occurred were seldom the same.
- Our results suggest that outcomes are often related to a particular way of conducting a activity or the adoption of a strategic practice. We cannot claim that merely adopting such practices would actually achieve the desired outcomes. However, we believe that adopting practices based on evidence is relevant to the IT industry, and that it can foster validation and improvement of such key practices in the field.
- Based on the evidence we collected about the backsourcing process, we have detailed three relationships of interest. The first relationship describes the roles of contractual agreements in backsourcing, especially the dependencies arising from previous outsourcing contracts. The second describes the flow of knowledge from outsourced setting to the new in-house organization, and the continuity of development and operations. The third establishes a relationship between human resources and keeping knowledge in-house. The relationships are intended to be used as illustrations of a given sub-process flow and to help understand how different parts of the backsourcing process can be implemented.
- We identified six cases of backsourcing focused on software process and software maintenance; those are the cases of particular interest for the SE domain. Backsourcing reported in these cases is mainly associated with the KAs of *SE management, SE professional practice, and SE economics*. These three supporting areas aim to manage SE at the organizational level effectively. We also pointed out that backsourcing potentially affects other KAs worth exploring, such as *software maintenance, software testing, and supplier contract management*.

Finally, we conclude that backsourcing is a complex process; it comprises a plethora of elements, and it depends heavily on circumstantial factors. Therefore, we recommend that companies willing to take this path should first understand the process and its implications. We contribute to this goal by organizing and summarizing evidence from credible cases of backsourcing and other empirical studies reported in the literature.

CRediT authorship contribution statement

Jefferson Seide Molléri: Conceptualization, Methodology, Investigation, Formal analysis, Writing – original draft, Visualization. **Casper Lassenius:** Conceptualization, Methodology, Investigation, Data curation, Writing – original draft. **Magne Jørgensen:** Conceptualization, Methodology, Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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