

Risk in Outsourced IT Operations: A Systematic Literature Review of Technological Uncertainty, Knowledge Management and Opportunistic Behaviour

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Abstract

Technological adoption and digital transformation are increasingly enabling organisations to gain a competitive advantage, underpin business processes and create efficiencies. Utilisation of technologies brings several risks such as the risk of cyber-attacks and infrastructure dependency. To mitigate these, and to reap other benefits, organisations are increasingly turning to third-party IT suppliers to innovate and manage their IT estates. The field of IT operations and supply chain management has gained extensive research over the decades; however, none seem to bring these aspects together with technology risk mitigation in a systematic way. This paper systematically reviews 63 articles to ascertain historical research trends to indicate future research interest and consolidate research themes to discuss the gaps in the extant research. Alongside the fact that academic interest is projected to continue, closely coupled with world events, important findings show that technological uncertainty, information asymmetry and opportunistic behaviour are closely coupled in outsourced IT operations, and that knowledge management acts as a key mitigation mechanism which is illustrated by a new conceptual model. The review also reveals that existing research focuses heavily on ex-ante IT operations outsourcing decisions, with limited attention given to the ex-post operational phase, where most risks in IT operations materialise. Several gaps are identified for the field including how knowledge management can be utilised to mitigate technology risk within the IT operations function linking out to technology adoption. More generally, research into the public sector is found to be underreported giving researchers another lens to investigate current research themes with or adopt those previously listed. Overall, the review provides an integrated understanding of technological uncertainty in outsourced IT operations and highlights key opportunities for further research into ex-post phase, specifically long-term knowledge management in sector-specific outsourcing.

Keywords: IT Operations; IT Outsourcing; Knowledge Management; Technology Risk; Technology Adoption; Systematic Literature Review (SLR)

Wordcount: 286

1.0 Introduction

It is widely accepted that technology is advancing at pace, enabling businesses to undergo digital transformation and technological adoption to support, underpin and enhance business processes. With that, the need and reliance on third parties to supply technological services is also increasing (Pacheco and Paul, 2023). With cost being the main driver for utilising third-party suppliers to innovate, develop and run IT services, other drivers include access to expert resources and IT competence benefits (Qu and Pinsonneault, 2011). With the above benefits to IT outsourcing come limitations, these include loss of control, opportunism and in some cases, higher transaction costs (Hansen et al., 2019, Khan et al., 2019). This can have consequences for the roles and functions undertaken by the internal IT department, such as knowledge management, and therefore decision-making capacity.

Since Kodak pioneered outsourcing the IT business process to a third-party supplier in 1989, academic interest in the subject, in line with general supply chain management has grown. Adding to this, several world events over the past few decades such as the Y2K bug, the global financial crisis of 2008 and the COVID-19 pandemic have changed the landscape for IT, forcing organisations to adapt, digitise and change sourcing strategies, maintaining academic interest in the area. Despite the growing literature, this body of research tends to focus on only one dimension at a time, for example, outsourcing governance, Transaction Cost Economics, or technological risk as evidenced in prior SLR's examining only isolated aspects (Lacity and Willcocks, 2014, Lin and Vaia, 2015, Nduwimfura and Zheng, 2015). Only when integrating these aspects will researchers be able to explain how organisations can mitigate risk once IT

operations have been outsourced. Due to further limited clarity on what constitutes as “IT Operations” for the purposes of this review, this refers specifically to the ongoing run, maintenance and evolution of infrastructure, applications and services which is distinct from software development outsourcing or project management. This falls in line with more common IT outsourcing literature, which focuses more on ex-ante sourcing decisions rather than the ex-post operational phase where technological uncertainty, information asymmetry and opportunistic behaviour can most strongly affect organisational outcomes (Hanafizadeh and Zareravasan, 2020).

Only by contrasting this viewpoint, does the need for this SLR become necessary. By reviewing all literature covering these aspects since the first papers began to emerge in 1992, this study aims to consolidate the position so far, enabling the development of both academic inquiry and real-world decision making. Following the six-step process proposed by Sauer and Seuring (2023) and illustrated in Figure 1, this SLR provides a modern baseline for future research to build upon and identifies both generalised and specific research directions that scholars may wish to pursue. One key area of future interest is understanding the gap in public sector reporting within the field, not only technically how public sector organisation IT operations operate, but what barriers there are to research and publication in this field specifically.

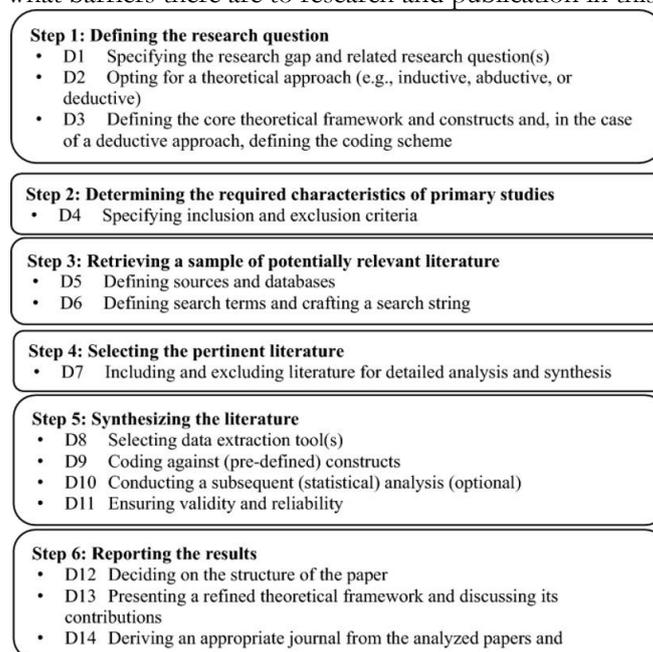


Figure 1 Six step process to undertaking a SLR Sauer and Seuring (2023)

This SLR advances knowledge in IT Operations and Supply Chain Management in the following ways:

- Identifies research gaps and future direction in the field of IT Operations Management specifically concerning how knowledge management can affect various uncertainties.
- Validates a modern approach to undertaking an SLR as outlined by Sauer and Seuring (2023).
- Analyses research trends and themes within the field to indicate future research interest.

The paper is set out as follows: section 2 outlines the methodology used defining the decision points for the SLR and why those decisions were taken. Section 3 contains the results and section 4 the discussion, outlining the findings of the SLR and directly addresses the research questions set out in the paper. Section 5 proposes the future research directions, and the paper concludes with section 6 where final summaries are made.

2.0 Methodology

This systematic literature review (SLR) aims to investigate the operational management of information technology (IT) supply chains by using knowledge management and the considerations this brings to risk management.

To achieve this, the framework to undertaking a SLR as outlined by Sauer and Seuring (2023) has been followed meaning the process is divided into a six-step process split further by fourteen decision points outlined in the following sections.

2.1. Defining the Research Question

This step sees the outline of the research questions at decision point one. The research questions are formulated through the proposed review topic outlined above, to holistically review the extant literature and establish where the literature could be updated in the future.

- RQ1: What are the trends in the extant research?
- RQ1.1: What are the publishing trends surrounding the management of IT in an outsourced model?
- RQ1.2: What types of methodologies are used to evaluate research surrounding the management of IT in an outsourced model?
- RQ1.3: In which countries are research surrounding the management of IT in an outsourced model undertaken?
- RQ1.4: What sectors have attracted the most research attention?
- RQ1.5: What are the key theoretical frameworks used to assess the research area?
- RQ2: What are the main themes surrounding the management of IT in an outsourced model?
- RQ3: What are the gaps in the extant research for future research direction?

The second decision point is the identification and adoption of a theoretical approach. For this SLR, an inductive theoretical approach was adopted. This is because it allows theory identification through the analysis of patterns and themes of the mainly qualitative data gathered on a more general topic of focus (Sabherwal and King, 1991) as opposed to a deductive approach, which begins with a hypothesis to either prove or falsify often through quantitative means such as experiments (Varpio et al., 2020). This is not to say that a deductive approach to proving the theoretical output of this inductive SLR cannot be used (Hyde, 2000).

The final decision point for step one is to identify a theoretical framework. The approach outlined by Sauer and Seuring (2023) does not explicitly require the adoption of a theoretical framework at step one, and in fact, they do not in their own SLR used to define the process. So, given the exploratory nature of this review, a theoretical lens is not imposed. This allows for a broader and more inclusive identification of relevant literature, avoiding a premature narrowing of scope.

2.2. Determining the characteristics of primary studies

Using guidelines outlined by Pilbeam et al. (2012) and Durach et al. (2017), the inclusion and exclusion criteria (outlined in Table 1) makes up the outcome of decision four.

Criteria	Include/Exclude	Rationale
Publication in peer-reviewed journals	Include	It is expected that peer-reviewed articles are of higher quality than other documents.
Contain a main theme of any of the research themes with respect to outsourcing; IT Operations, Knowledge Management, Technology Risk, Opportunistic Behaviour or Technology Adoption	Include	The focus of the SLR is around outsourcing IT and the supply chain that surrounds that. These are the key themes linked to RBV.
Paper may be published in any year	Include	The SLR is inclusive of all publications to provide a holistic view.
Studies utilising qualitative and quantitative methodologies presenting empirical, theoretical or literature reviews	Include	All approaches to research have contributed to extant literature.
Papers relating to topics which do not focus on outsourcing	Exclude	The main theme of the SLR is outsourcing.
Papers in any language other than English	Exclude	The author is only able to read English.
Papers to which there is no access to the full text	Exclude	The full text must be available to be reviewed.

Table 1 SLR inclusion/exclusion criteria

This decision point concludes the second step in the SLR process and allows a criterion for the sample to be assessed against to provide a baselined sample.

2.3. Retrieving a sample of potentially relevant literature

Upon defining the above criteria, it is then possible to retrieve a sample of literature from online databases. To do so, first the target databases must be identified, this is decision four. Although as outlined by Pearce (2018), there are many free databases sources for use in collecting samples, for this SLR, it was decided to collect data from both Scopus and Web of Science (WoS) databases as these are available via institutional access and are regarded the most globally influential citation indexes (Asubiaro et al., 2024). Another reason for this is because some sources are not available in both databases, so in doing this, it is possible to obtain a more complete dataset.

The next step in the SLR process is to retrieve the dataset by generating search strings, this makes up decision six. To do this, several keywords were identified relating to the general topic outlined in section 1. Some keyword examples were “opportunistic behaviour”, “information technology” and “TTO” to ensure abbreviations were used as well as the keywords themselves.

All search strings were run against both databases on the same day (30th August 2023) to ensure consistency and reliability providing a total of 142 results. Because the keyword list was intentionally broad, the search strategy carries an inherent risk of conceptual drift (e.g., pulling in technology-risk papers unrelated to outsourcing). To mitigate this, thematic relevance was assessed at both title/abstract and full-text stages, and the rationale for exclusion of borderline items was recorded as described in section 2.4. This reflection on search breadth and potential bias increases methodological transparency.

2.4. Selecting the pertinent literature

Step four of the SLR process as outlined by Sauer and Seuring (2023), is to select the sample data used in the review. The 142 output documents generated from the search strings being ran against the two databases underwent a selection process outlined by Moher et al. (2009) and illustrated as a Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) diagram in Figure 2. Step four of this process neatly overlays the screening, eligibility and inclusion phases outlined by Moher et al. (2009). To automate the removal of duplicate documents output by numerous search strings against the two databases, the Bibliometrix package for RStudio was used (Aria and Cuccurullo, 2017). This utilised code to amalgamate all documents, remove duplicates and generate a matrix to be used in the subsequent steps of the screening phase. This resulted in the removal of 27 documents. The output matrix included various bits of information including a language and DOI allowing for a fast exclusion of non-English documents and where the full text was not available via the home institution as per exclusion criteria set out in Table 1. The resulting list of 97 full texts were then tested against the remaining inclusion/exclusion criteria providing a final sample of 63 documents for review.

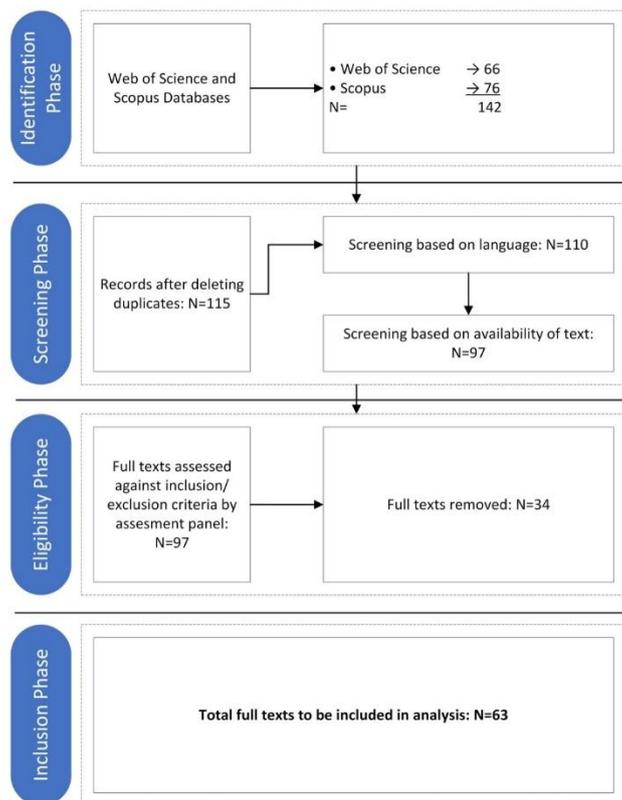


Figure 2 Visualisation of Step Four (Selecting the Pertinent Literature)

To enhance reliability, a secondary reviewer independently screened the papers and reviewed all borderline cases with the author at review meetings. Disagreements were resolved through discussion, and where uncertainties persisted, the more inclusive option was chosen. Where relevance was unclear, cases were retained for full-text review. Borderline cases such as papers addressing technology risk without an explicit outsourcing component were discussed jointly with the secondary reviewer to ensure consistent interpretation of thematic relevance. This helped minimise the risk of unintentionally excluding papers where outsourcing was embedded but thematic relevance not highlighted. Although a formal inter-rater statistic (Cohen's kappa) was not utilised, this collaborative approach helped ensure consistent application of inclusion criteria.

Additionally, during this stage a short reflective log was maintained documenting reasons for exclusion of borderline papers and used for prompt during review meetings. This provided an audit trail supporting the transparency and reproducibility expected of SLRs at Q1 standard. A methodological note must also be made to acknowledge the limits of access-based limitations which could introduce publication bias.

2.5. Synthesising the literature

The first decision of step 5, decision eight, is to decide on the data extraction tool to be used to code and synthesise the data. QDAS programmes are heavily recommended for this by Sauer and Seuring (2023) due to their impressive functionality to store documents, auto and manual code, while offering tabulated comparison and comprehensive qualitative analysis and querying. More specifically, O'Neill et al. (2018) outline on how NVivo can be used to code text, link them and generate visualisations and relationships to support a SLR. This approach offers more functionally than other spreadsheet-based options given by Sauer and Seuring (2023), and although Microsoft Excel is the most commonly used tool for synthesising SLR literature, it is not specifically designed for this functionality (Al-Zubidy and Carver, 2019). For these reasons, NVivo was the tool chosen to undertake the synthesis of the sample due to its ability to systematically store coded excerpts and run cross-case queries. As a coding protocol was established prior to analysis, this reduced researcher subjectivity and aligns with recommended SLR practice.

To fairly code the sample, it is important to pre-determine the coding criteria. This ensures that as the SLR progresses coding structure is well documented, reliable and understood (Sauer and Seuring, 2023). On this premise, the main themes were set out as parent codes (Outsourced IT Operations, Knowledge Management, Technology Risk, Opportunistic Behaviour or Technology Adoption) as outlined in section 1. These parent codes then contained multiple sub-codes, for example, ‘Barriers to Technology Adoption’ as a sub-code of ‘Technology Adoption’. Other codes were used to help analyse literature trends such as research methodology, journal, year to enable analysis on where the literature has been and to identify gaps or areas for future work.

Table 2 outlines the sources forming the final dataset for the SLR. The table shows where there was relevance to one or more of the main themes and were coded during the synthesis part of the SLR process.

Categories	Authors
Technology Risk	(Lowis and Accorsi, 2011), (Worrell et al., 2013), (Tang et al., 2018), (Samtani et al., 2020), (Jacobs et al., 2020), (Mantha and García de Soto, 2021), (Leverett et al., 2022), (Baho and Abawajy, 2023), (Lin et al., 2023)
Outsourced IT Operations, Opportunistic Behaviour	(Lin and Hekkala, 2016), (Qin et al., 2018), (Awe et al., 2018), (Hansen et al., 2019), (Nepomuceno et al., 2022)
Knowledge Management, Opportunistic Behaviour	(Aron et al., 2005), (Fauchart, 2006), (Kloyer and Scholderer, 2012), (Yang et al., 2020)
Outsourced IT Operations, Knowledge Management, Technology Risk, Opportunistic Behaviour	(Frigant, 2011), (Qu and Pinsonneault, 2011), (Mathew and Chen, 2013), (Khan et al., 2019)
Outsourced IT Operations, Technology Risk, Opportunistic Behaviour	(Kauffman and Tsai, 2009), (Handley and Benton, 2012), (Hansen et al., 2017), (Haq et al., 2019)
Outsourced IT Operations, Knowledge Management, Opportunistic Behaviour	(Rustagi et al., 2008), (Cruz and Liu, 2011), (Cheng and Chen, 2016), (Hoseini et al., 2020)
Knowledge Management, Technology Risk, Opportunistic Behaviour	(Szczepański and Światowiec-Szczepańska, 2012), (Adams and Graham, 2017), (Yang et al., 2021)
Knowledge Management, Technology Risk	(Lean and Tucker, 2005), (Palomino et al., 2013), (Syed, 2020)
Knowledge Management	(Al-Karaghoul et al., 2005), (Meenan et al., 2010), (Mishra et al., 2024)
Outsourced IT Operations, Knowledge Management, Technology Risk, Opportunistic Behaviour, Technology Adoption	(Schneider and Sunyaev, 2016), (Öbrand et al., 2019)
Outsourced IT Operations, Technology Risk, Opportunistic Behaviour, Technology Adoption	(Yigitbasioğlu et al., 2013), (Chang et al., 2017)
Knowledge Management, Technology Risk, Opportunistic Behaviour, Technology Adoption	(Ravichandran, 2005), (Hong et al., 2010)
Outsourced IT Operations, Knowledge Management, Opportunistic Behaviour, Technology Adoption	(Bui et al., 2019), (Acharya et al., 2022)
Outsourced IT Operations, Technology Risk, Technology Adoption	(Marinč, 2013), (Eachempati, 2017)
Knowledge Management, Technology Adoption	(Eze et al., 2019), (Pacheco and Paul, 2023)
Outsourced IT Operations, Technology Risk	(Aubert et al., 2012), (Biswas and Mukhopadhyay, 2018)
Technology Risk, Opportunistic Behaviour	(Clemons and Kleindorfer, 1992), (Hoffmann et al., 2013)
Outsourced IT Operations, Knowledge Management, Technology Risk, Technology Adoption	(Ali et al., 2022)
Technology Risk, Opportunistic Behaviour, Technology Adoption	(Silic and Back, 2016)
Knowledge Management, Opportunistic Behaviour, Technology Adoption	(Pistoni et al., 2022)
Outsourced IT Operations, Knowledge Management	(Refaiy and Labib, 2009)
Outsourced IT Operations	(Wilkin et al., 2016)
Opportunistic Behaviour	(DuHadway et al., 2022)
None	(Valiente et al., 2012)

Table 2 Sources included in final dataset.

2.6. Reporting the results

The final step in the framework is to report the results; to complete this, statistical analysis was conducted on the output coded matrix extracted from NVivo. This allowed the generation of various charts to report on thematic trends. To complete the discussion, NVivo was used to analyse codes reported on throughout the process.

The results and subsequent discussion follow in the next section.

3.0. Results

This section provides an overview of the results of the SLR using statistical analysis and illustration where necessary to directly address the research questions presented in section 2.1.

3.1. RQ1: What are the trends in the extant research?

RQ1.1: What are the publishing trends surrounding the management of IT in an outsourced model?

There are several pieces of analysis that can depict the publishing trends around the research area as outlined in work undertaken through various reviews (Baho and Abawajy, 2023). Figure 3 illustrates the trend in the publications distributed by year. The result shows a general upward trend in the number of publications per year.

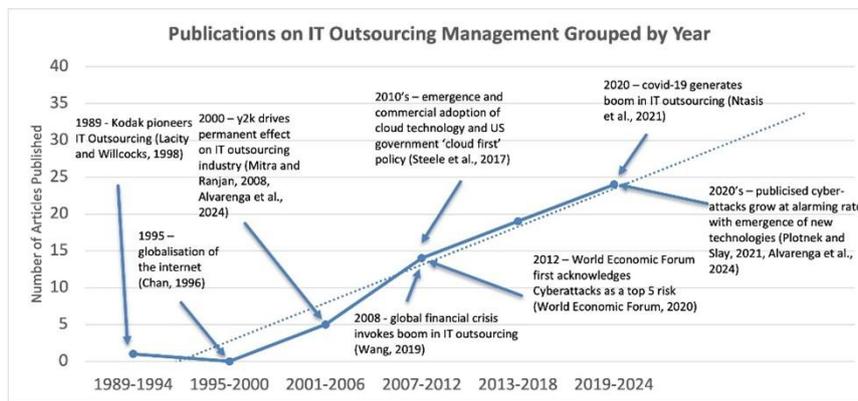


Figure 3 Chart illustrating publications related to IT outsourcing management distributed by year

The growing upward trend in publication indicates that increasing attention is being paid to the general topic of management of IT operations where outsourcing is involved. This could be due to the ever-evolving nature of technology and ramifications of events requiring the use of technology as a solution. Figure 3 overlays a few significant events which have impacted the general field and these in turn could have influenced the interest. A forecast line is also plotted indicating that the interest in this field is predicted to further increase. Figure 4 illustrates the top journals within the dataset. This gives an indication of the top 10 journals in which the dataset sources are published in. In total, the entire dataset contained articles published in 52 journals, and the remaining journals contained only 1 published article per journal.

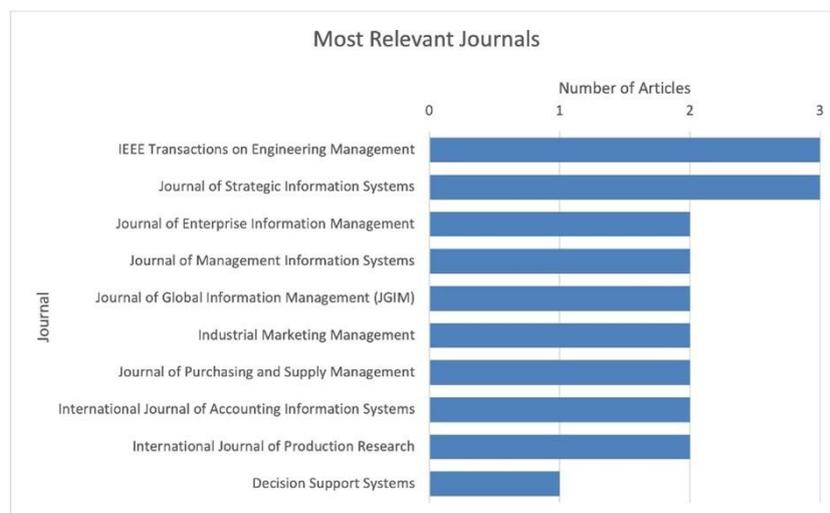


Figure 4 Chart illustrating the most relevant sources.

Table 3 outlines the CABS academic journal ranking (CABS, 2021) and SJR (SJR, 2024) H-index for the most relevant journals. This shows that the entirety is internationally recognised (2 star) with the majority being either 3 star (internationally excellent) or 4 stars (world leading).

Journal	H-Index	Ranking	No. of Documents
Journal of Strategic Information Systems	107	4	3
Journal of Management Information Systems	170	4	2
IEEE Transactions on Engineering Management	112	3	3
Industrial Marketing Management	177	3	2
Journal of Purchasing and Supply Management	100	3	2
International Journal of Production Research	186	3	2
Decision Support Systems	180	3	1
Journal of Enterprise Information Management	82	2	2
Journal of Global Information Management (JGIM)	46	2	2
International Journal of Accounting Information Systems	65	2	2

Table 3 H-Index and CABS ranking for most relevant sources.

This indicates that there is a respected interest in the research field and positively reinforces it as a research direction.

RQ1.2: What types of methodologies are used to evaluate research surrounding the management of IT in an outsourced model?

As with any research topic forming part of a literature review, there is a plethora of research methodologies used across the dataset. In this instance, Figure 5 illustrates the spread of methodologies used in the dataset.

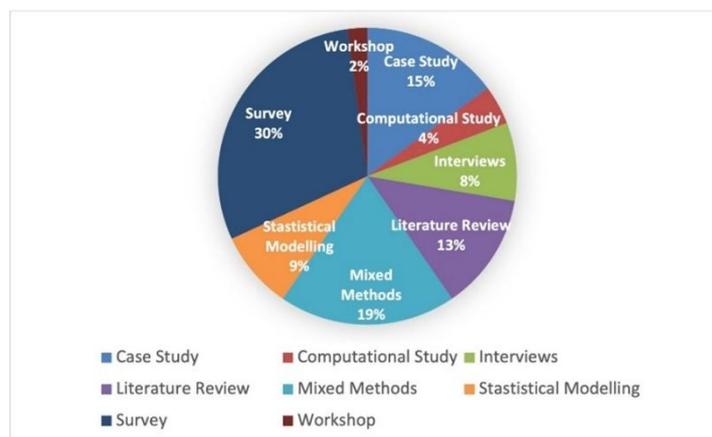


Figure 5 Chart illustrating distribution of research methodologies

As seen above, most of the methodologies used across the research are qualitative with surveys being widely used. Mixed methods are frequently used to allow for the inclusion of a quantitative element to confirm hypotheses output by an exploratory (qualitative) element such as seen in the study undertaken by Refaiy and Labib (2009) whereby postal survey data alongside interviews was used to prove that the sharing of tacit knowledge has a positive impact on maintenance performance while also taking into account organisational aspects.

RQ1.3: In which countries are research surrounding the management of IT in an outsourced model undertaken?

Coding for the country in which the primary research was undertaken, rather than the country that the authors originate from allow illustration of where the global focus resides concerning the research area of management of IT operations utilising outsourcing.

Figure 6, supported by Table 4 illustrate the distribution by research location.

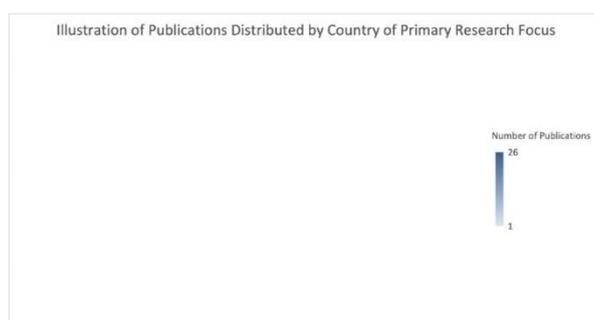


Figure 6 Country heatmap illustrating research location.

Of the 63 studies, a large number (26) did not specify the country or location in which the research was carried out, a further 4 studies were self-identified as being world-wide studies while 4 concerned covering Europe in its entirety. As such, these 34 studies could not be incorporated into Figure 6 but are contained in Table 4.

Country	Number of Publications
Not Specified	26
United States	10
Europe	4
United Kingdom	4
Worldwide	4
Australia	3
Canada	2
China	1
Germany	1
India	1
Italy	1
South Korea	1
Nepal	1
Netherlands	1
Pakistan	1
Poland	1
Portugal	1
Taiwan	1
United Arab Emirates	1

Table 4 Number of publications by the location of the research

RQ1.4: What sectors have attracted the most research attention?

Like the coding structure for country, it was also possible to code for the primary research focus in terms of sector. In this instance, four codes were used; agnostic is where both private and public sector

organisations were studied but not differentiated. Private and public sector were tagged accordingly, if the primary research focused entirely on that sector, and not specified was used where the authors did not specify. This split is illustrated in Figure 7.

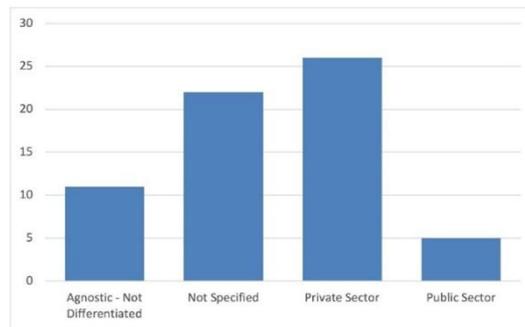


Figure 7 Chart illustrating the research split by sector

As seen above, the data indicates that most of the research either focuses primarily on private sector organisations or does not specify from which sector the research data originates. It can also be noted that of the five articles with a public sector focus, only the work undertaken by Ali et al. (2022) actually collects and uses primary data from within a public sector organisation. These numbers suggest there is a potential barrier to research in the public sector concerning outsourced IT operations management.

RQ1.5: What are the key theoretical frameworks used to assess the research area?

Like the above, it is possible to use the data to understand the trend in theoretical focus for the subject area of outsourced IT operations management. Figure 8 illustrates the split of theoretical frameworks used as a lens to the research showing the top five frameworks used. Any frameworks in the ‘other’ category are equally split twelve ways and each is only used as a lens once in the entire dataset. Some of these are Nash Bargaining Theory (Clemons and Kleindorfer, 1992), Reliability Theory (Qin et al., 2018) and Industry Clockspeed Theory (Kauffman and Tsai, 2009).

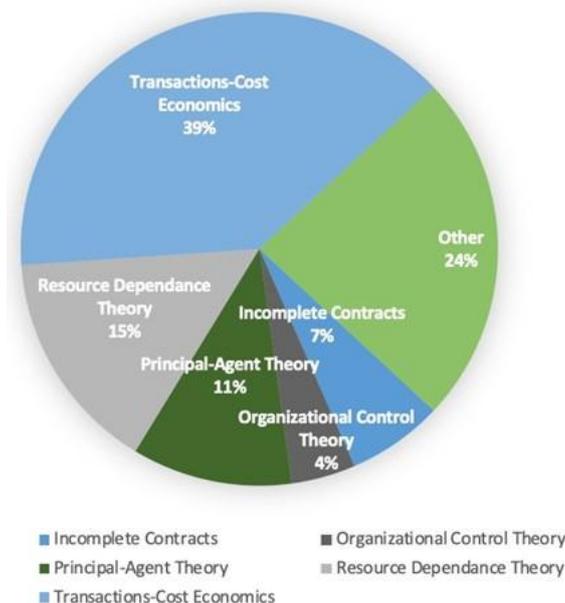


Figure 8 Chart illustrating the split of theoretical frameworks used in the dataset.

The theoretical framework which is used most widely across the dataset is Transaction Cost Economics (TCE) with the reasoning being relevance to the subject area. TCE takes costs for multiple aspects of the product or service such as negotiating costs, uncertainty and run costs to help the organisation decide the

sourcing or governance structure (Aubert et al., 2012). In the dataset, a large proportion of the sources focus on using TCE as a framework to enable strategic decisions and sourcing strategies (Hansen et al., 2019, Haq et al., 2019, Khan et al., 2019) while fewer focus on the inter-organisational relationships and risks during the implementation/run phase of the contract (Chang et al., 2017, DuHadway et al., 2022). This could be an opportunity for further research in the field due to the modern adoption of generic contracts (Bui et al., 2019).

4.0. Discussion

Building on the findings presented in the results section, this section critically examines the key themes emerging from the literature surrounding IT operations in outsourced models. By synthesising insights across the dataset, the section explores how organisations navigate challenges such as opportunistic behaviour, technology risk, and knowledge management, and how these intersect with technology adoption.

RQ2: What are the main Research themes surrounding the management of IT operations in an outsourced model?

Upon analysing the articles contained in the dataset it is possible to answer RQ2 by outlining the main themes surrounding the main topic outlined in section to summarise extant research and identify research gaps to feed in to RQ3. Attention is paid to how these themes interact rather than treating them in isolation, reflecting the interconnected nature of outsourced IT operations.

IT Operations

IT operations encompass all the activities and responsibilities involved in managing and maintaining an organisation's IT infrastructure and services. As with other business processes, multiple sourcing strategies can be adopted to undertake IT operations on behalf of a company including a fully IT Outsourcing (ITO) model which is defined by Schneider and Sunyaev (2016, p.3) as “the significant contribution by external vendors in the physical and/or human resources associated with the entire or specific components of the IT infrastructure in the user organization”

Keeping in line with general outsourcing literature, many authors identify the decision to outsource IT operations is largely based on costs, particularly labour and production (Aubert et al., 2012, Mathew and Chen, 2013, Yigitbasioglu et al., 2013), however, some authors have challenged the above, suggesting that insourcing IT operations could better meet user requirements (Ravichandran, 2005), retain knowledge about assets or the IT estate (Qu and Pinsonneault, 2011, Schneider and Sunyaev, 2016) or simply avoid inflated transaction costs and opportunistic behaviour (Handley and Benton, 2012, Öbrand et al., 2019).

Across the dataset, it becomes clear that the decision to outsource is tightly coupled with downstream management challenges such as cost and organisational capability, this is not a new concept in supply chain literature. However, organisations often underestimate the capability required to effectively manage outsourced operations, creating conditions in which technological uncertainty and opportunistic behaviour become more likely. This shows that IT operations form the backbone upon which all other themes (risk, knowledge and opportunism) interact.

Opportunistic Behaviour

Throughout the dataset, several types of opportunistic behaviour are identified such as shirking (Aron et al., 2005, Handley and Benton, 2012, Mathew and Chen, 2013), poaching (Aron et al., 2005) and the withholding of information (Kauffman and Tsai, 2009, Mathew and Chen, 2013, Haq et al., 2019), all of which can occur ex-ante (pre-contract) or ex-post (post-contract) (Aron et al., 2005, Kloyer and Scholderer, 2012, Qin et al., 2018, Khan et al., 2019). There is a limitation of research focus throughout the dataset, where IT operations is concerned whereby most articles focus on the decision to outsource (ex-ante) either IT operations as a business process, or an IT software development project with little focus given to ex-post management of suppliers and opportunistic behaviour for IT operations.

Causes of opportunistic behaviour are commonly outlined during the introduction or literature review section of the articles included in the dataset often acknowledging issues such as information asymmetry (Fauchart, 2006, Nepomuceno et al., 2022, Pistoni et al., 2022), vendor lock-in (Handley and Benton, 2012, Chang et al., 2017) and the uncertainty of the IT industry (technological risk) (Ravichandran, 2005, Khan et al., 2019, Yang et al., 2020).

The above types and causes of opportunistic behaviour are addressed by mitigation methods such as monitoring and control changes (Aron et al., 2005, Fauchart, 2006, Rustagi et al., 2008), better contracts or financial incentives (Kauffman and Tsai, 2009, Frigant, 2011), and improved knowledge capability of the client firm (Mathew and Chen, 2013, Yigitbasioglu et al., 2013, Adams and Graham, 2017). Although these mitigation methods are confirmed as effective, they are generalisations not specific to the unique IT industry where technological innovation and uncertainty is extremely high (Lean and Tucker, 2005). With that, modern ways of working are not considered in recent literature and specific mitigations such as organisational design, and knowledge strategy are not prescribed in a modern way.

Building on the above, the key insight emerging from this review is that opportunistic behaviour is amplified when organisations lack the knowledge capabilities necessary to interpret supplier actions. Therefore, knowledge asymmetry is not just a product of opportunism, it is also an enabler, creating a cycle. This highlights the importance of examining opportunistic behaviour not in isolation, but as dynamically linked to both technological uncertainty and knowledge management competence.

Technology Risk

In today's digital world, technology risks not only impact the IT infrastructure of an organisation, but can have negative effects on the business processes they enable (Worrell et al., 2013). There are many different flavours of technology risk such as cyber-security risks (Tang et al., 2018), the speed at which the industry is evolving (Lean and Tucker, 2005, Ravichandran, 2005, Frigant, 2011, Qu and Pinsonneault, 2011) and finally industry capacity and capability limitations (Hong et al., 2010). Lewis and Accorsi (2011) find that most systems are exploited through widely known vulnerabilities despite patches being available. This is supported by Jacobs et al. (2020) who found that firms have more vulnerabilities than resources to fix during their study to find improvements in exploit prediction which could put them at further risk of higher transaction costs or exploitation by an opportunistic IT supplier (Hong et al., 2010). Chang et al. (2017) argue, however, that it is impossible to fully specify IT contracts due to technological risk which indicates a risk management gap between the polars, one which is not reported on in the dataset.

Mitigations to technology risk are largely reported in the dataset to be the management of vulnerability databases such as The Common Vulnerability Exposure (CVE) and the National Vulnerability Database (NVD) (Syed, 2020, Leverett et al., 2022, Lin et al., 2023). To do this, however, firms must increase investment in technology and alter procurement strategies when outsourcing their IT operations (Kauffman and Tsai, 2009, Qu and Pinsonneault, 2011). Most of the dataset focuses on the private sector response to this, and does not stipulate how this could be undertaken best in the public sector where budgets are low and politically driven, and where goals are to reduce IT operations and infrastructure costs (Lean and Tucker, 2005, Ali et al., 2022). Building on this, Mantha and García de Soto (2021) find that cyber risk is intensified on construction projects where public safety is concerned further magnifying the gap in research.

Importantly, this review reveals that technological uncertainty intensifies relational risks. When organisations do not fully understand emerging technologies, or the technicalities/interdependencies of their IT estate, they become more reliant on suppliers. This directly drives exposure to the knowledge asymmetry cycle as described above, demonstrating a bidirectional relationship where technology risk feeds information asymmetry, which in turn exacerbates relational risk of opportunistic behaviour.

Technology Adoption

Technology adoption of an organisation is somewhat underreported throughout the dataset, the focus is on transformative adoption such as the adoption of cloud computing (Marinč, 2013, Schneider and Sunyaev, 2016). Other authors are indicating that the technology procurement strategies of organisations and suppliers is changing with a shift to transactional licencing models of Software as a Service (SaaS) and Open Source Software (OSS) from traditional bespoke build strategies with suppliers becoming more pre-emptive in their offerings of services (Yigitbasioğlu et al., 2013, Silic and Back, 2016).

Ali et al. (2022) find that there is a direct correlation between the internal comprehension of IT and the perceived complexity of cloud computing adoption and therefore the sourcing strategy. Despite stating that organisations need to create effective knowledge management strategies and processes to mitigate this, they do not investigate into what, if anything could be undertaken to improve this, or what effects the various decisions have on the public organisations. There are several barriers to technology adoption reported on throughout the dataset largely down to costs or organisations willingness to invest in R&D. More specifically, Acharya et al. (2022) acknowledged that financial constraints of public organisations impacting on decisions to invest in technology due to costs deprioritising technology agendas. What the report does not investigate however, is the risk in non-investment or action and what public organisations could do to bolster organisational capability in technology risk to support investment decisions.

Knowledge Management

As organisations must react to external factors such as policy changes, environmental developments and risks such as technological risks, it is imperative that they effectively manage knowledge and treat it as a strategic resource (Pacheco and Paul, 2023). Throughout the dataset, it is reported that organisations. Ravichandran (2005) states that to use or operate technology, firms must go further than theory and understand deeper, and practically how the technology works to diffuse the knowledge meaningfully within the organisation. This supports the ideas outlined in the above sections and promotes the idea of higher transaction costs when IT suppliers are involved. In this case, it is observed that IT suppliers may operate opportunistically and withhold information to initiate supplier lock-in (Clemons and Kleindorfer, 1992) or shirk responsibilities if they believe their client would be unable to detect or understand, as highlighted by Handley and Benton (2012).

Delving deeper into this issue, there are several barriers to knowledge management with regards to IT operations teams such as organisational barriers to understanding with examples being technical appreciation from a user perspective or business knowledge from a developer side (Al-Karaghoulī et al., 2005). Other organisational factors include losing employees and capability when outsourcing the activity (Aron et al., 2005, Fauchart, 2006, Cheng and Chen, 2016). Other barriers to knowledge management may also be cost (Lean and Tucker, 2005, Meenan et al., 2010), or as outlined above, a supplier acting opportunistically.

To promote knowledge management, and improve the management of IT operations, organisations can use tools to manage knowledge, an example is the case study reported on by Meenan et al. (2010) whereby a bespoke wiki website was used to manage knowledge about supporting tools used in a radiology department. This tool was shown to be effective; however, the authors note that information is required to be constantly and consistently updated for it to be effective. This supports the above, however, the authors fail to report how this was implemented organisationally, or what the resource (staff or technical capability of workers) or financial overheads were to ensure success. Pistoni et al. (2022) propose that to combat suppliers behaving opportunistically and withholding information, specific contracts could be put in place to promote knowledge transfer and moderate the relationship. This does not however address the issue whereby the organisation would still be subject to unknown unknowns due to lower capability as reported in previous sections and therefore rely heavily on trust. It is not reported in the dataset how an organisation can optimally organise the internal IT operations department and what minimum level of technical capability is required to manage suppliers and reduce the risk of this type of opportunism.

Across the dataset and the above discussion in the other thematic areas, knowledge management emerges not only as a theme but as the key mitigation mechanism linking technological and relational risks. Specifically indicating that absorptive capacity and organisational capability could reduce vulnerability to opportunism by enabling organisations to detect shirking or information withholding.

Other practical knowledge management tools mechanisms are also shown to enable this capability such as codified knowledge (documentation, shared repositories, knowledge transfer) can directly weaken supplier power, enable knowledge retention to break the cycle as described above by preventing internal capability erosion over long-term relationships. This positions knowledge management as the central explanatory mechanism through which organisations navigate technological risk in outsourced IT operations, an insight not previously synthesised in the literature.

Conceptual Model

In totality, the above discussion indicates that risk in outsourced IT operations, which as described earlier is the operation and management ex-post, is not a set of isolated issues, but an interconnected system. Illustrated by a simple conceptual model, Figure 9, technological uncertainty increases information asymmetry which in turn increases the opportunity set for supplier opportunism.

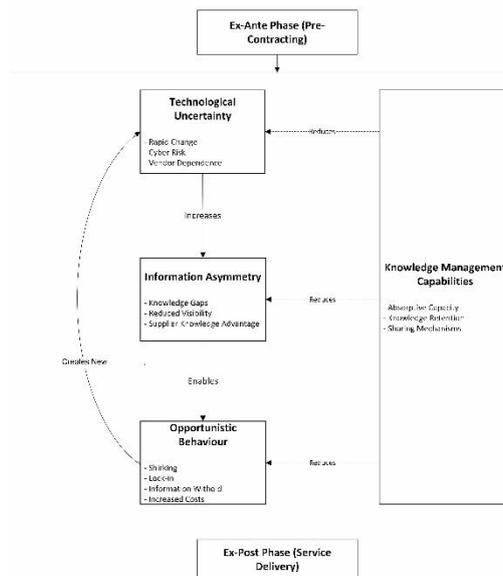


Figure 9 Knowledge management-centric risk mitigation in outsourced IT operations

This illustrates that the organisation’s knowledge management capabilities moderate both effects. Where knowledge management is weak, organisations struggle to direct and monitor, but where knowledge management is strong, organisations can better interpret uncertainty, prioritise remediation and understand supplier behaviour.

RQ3: What are the Thematic gaps in the extant research for future research direction?

Upon addressing RQ1-2, there are several gaps which have been identified in the extant literature. Thematic gaps have been identified by illustrating Table 2 in

Figure 10

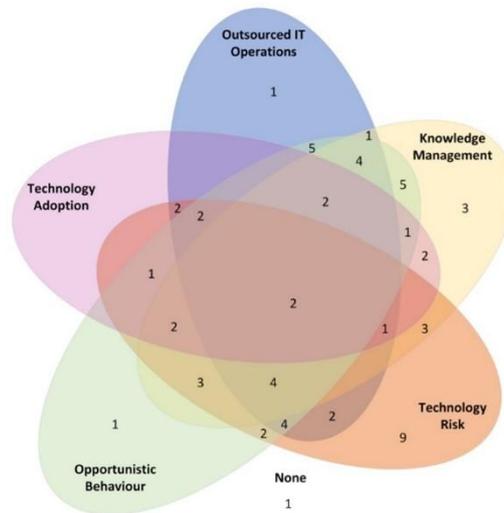


Figure 10 Venn diagram illustrating thematic split of dataset

Here, there are several thematic areas which have not been explored in isolation, these are:

1. Outsourced IT Operations + Technology Adoption
2. Outsourced IT Operations + Technology Adoption + Opportunistic Behaviour
3. Technology Adoption + Technology Risk
4. Technology Adoption + Technology Risk + Knowledge Management
5. Technology Adoption + Opportunistic Behaviour
6. Opportunistic Behaviour + Technology Risk
7. Opportunistic Behaviour + Knowledge Management
8. Outsourced IT Operations + Technology Risk + Knowledge Management

It is also worth noting that of the eight thematic gaps above, technology adoption appears five times, further indicating that the area of technology adoption is underreported in the extant literature in the field.

The discussion of the research themes in in response to RQ2 outline several thematic gaps which can be mapped directly to the above, these can be found in Table 5.

Gap in Research	Thematic Gaps
Effective management of IT suppliers ex-post and the maintenance required on the IT estate.	1
Using knowledge management and organisational design to mitigate technological risk and supplier lock-in.	8
Using Knowledge management to reduce supplier opportunistic behaviour	7
Using knowledge management to bolster organisational capability to make informed decisions on technology adoption to mitigate technology risk	4

Table 5 Matrix of research gaps to thematic gaps in research

Beyond the thematic combinations, the synthesis analysis highlights a deeper conceptual gap. Most studies focus on ex-ante IT outsourcing decisions, leaving the ex-post operation phase, where information asymmetry and opportunistic behaviour materialise largely unexplored, and although knowledge management is often mentioned as a mitigating factor, little research examples long-term knowledge retention or management strategies in connection with the relationship illustrated by Figure 9 despite its importance in limiting supplier dependence and detecting opportunistic behaviour. This is more deeply

enhanced by public sector underreporting due to the longevity of IT operation contracts feeding into the cycle cadence outlined by Figure 9.

5.0. Future Research

Due to the low number of articles reporting primarily on public sector organisations within the field, there is an indication of a barrier to research here providing three possible gaps, the first being to research into how the public sector approaches IT operations when adopting an outsourcing model. Secondly, how this is comparative with the private sector, and finally more broadly, what barriers to research are preventing publication in this field.

As analysed in section 4, there are several thematic areas which researchers may wish to focus on. Any of the eight gaps in groupings of research themes could be a starting point, however, more specifically as an output of literature analysis, there is one main research gap which should be investigated further. The relationship between knowledge management, technological uncertainty, knowledge asymmetry and opportunistic behaviour during the ex-post phase of IT operations in the public sector.

Other areas to focus on as output from the analysis specifically centre around knowledge management within IT operations teams. How can these internal teams use knowledge management tools and techniques to mitigate uncertainties such as technological uncertainties, supplier lock-in and opportunistic behaviour, and how can this feed into technology adoption strategies and processes to ensure the organisation remains current and effective.

6.0. Conclusion

This paper presented a literature review, systematically analysing extant research in IT operations management when outsourcing the business process, specifically delving into the issues highlighted above. Findings reveal that as organisations continue to harness the power of technology in a world where technology development and innovation is increasing exponentially, they must continue to effectively manage their IT estates. Since the boom of IT outsourcing began in 1989, organisations have been enabled by IT supply organisations to utilise domain experts to innovate and run their IT estates to support and enhance their business processes with cost saving benefits.

This approach to managing IT does not come without its uncertainties however, with a trade-off in technical/specialist knowledge about the IT estate weaning with longer contracts and therefore the capability for effective decision making and technology uncertainty mitigation declining within the client organisation. Some argue that this is in the best interest of the supplier organisation and hence promotes opportunistic behaviour to drive higher transaction costs or supplier lock-in situations. Across the reviewed literature, knowledge management emerges as a critical mechanism to mitigate these risks, reducing information asymmetry and supporting more informed decision making both ex-ante and ex-post.

Gaps have been identified in the literature, specifically around knowledge management within the IT operations function with links out to supply chain management, technology risk management and technology adoption. More generally, research into the public sector is underreported giving researchers another lens to investigate current research themes with or adopt those previously listed. Notably, the ex-post phase of contracting, where most technological and relational risks materialise remains underreported, even more particularly in the public sector.

This paper has highlighted several challenges faced by IT operations and addressed these with mitigations. However, with the growth of the IT industry and therefore custom for IT supply chain organisations, that comes with an indication of continued growth and momentum in research within the field and expectations are this is set to increase over coming years to further enable organisations to operate optimally. As IT operations outsourcing continues to expand, future research should examine ex-post management, long term knowledge retention and sector specific differences will be essential for practitioners looking to strengthen organisational capability and mitigate uncertainty in outsourced IT operations.

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