

Empirical Research Paper

Governmentality in construction claim management: Role of smart data initiatives

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ABSTRACT

Despite efforts to identify and prevent causes, construction claims remain inevitable and repetitive. Therefore, focus has shifted to managing claims with systematic processes, yet challenges related to claim preparation persist. Drawing from political governance, where data analytics promote self-governance to overcome similar challenges, this study contrasts politics with construction claims, aiming to investigate potential for adopting similar data-driven approaches in the construction claim context. Through a systematic literature review in conjunction with ten industry interviews, we present similarities in control mechanisms and disciplinary powers as regulatory elements but reveal dissimilarities in self-governance and utilisation of data analytics. This study proposes categorizing initiatives in claim preparation to people-led, organisational-led, and data-led with data analytics pivotal in each. Through the application of data analytics resembling governmentality within the realm of political governance, the study reveals that the integration of self-governance and smart data analytics presents a potential solution for effectively addressing the challenges inherent in the preparation of construction claims.

1. Introduction

Claims have been widely investigated in the literature, yet still inevitable. Some studies have investigated their causes, aiming to develop various approaches to prevent or minimize them by addressing, isolating or controlling their root causes (Aniekwu, 1995; Fenn et al., 1997; Kumaraswamy, 1997; Yates, 2002; Yates and Epstein, 2006; Taher, 2009; Ayhan et al., 2023; Alqaisi et al., 2024). One of these approaches suggests predicting claims and taking pre-emptive measures, but this often overlooks project uncertainties and tends to offer generalized solutions assume that one solution to resolve cause of a claim in one project fits other projects (Fenn et al., 1997). On the other hand, literature shows that claim causes have a recurring pattern (Yates, D. J. and Hardcastle, 2003; Sambasivan and Soon, 2007; Enshassi et al., 2009a,b; Hadikusumo and Tobgay, 2015; Le-Hoai et al., 2019), and as such, construction claims are not entirely avoidable (Zaneldin, 2006; Wambeke et al., 2011; Zhang et al., 2019; Amucheazi and Nwandem, 2020; Ayhan et al., 2023; Asadi et al., 2023; Cinko et al., 2023; Cevikbas et al., 2024).

Therefore, it is imperative for researchers to identify and investigate unorthodox solutions to equip project practitioners with an optimised process to manage claims. One approach is to develop a framework to systematically manage claims (Kartam, 1999; Kululanga et al., 2001; Aibinu, 2007; Söderlund, 2018; Cevikbas et al., 2024). The proposed framework is based on developing a system for identifying entitlement for a claim and calculating the impact of the claim. This process includes six sequential phases of claim management which are identification, notification, examination, documentation, presentation, and negotiation (Kululanga et al., 2001).

A second approach is to investigate how other domains address similar challenges. Politics share similarities with construction claim management in governance (Selee and Peruzzotti, 2009; Henriksen, 2019). Both domains handle conflicts and disagreements in confrontational environments through analysing large magnitude of data in many types and forms. Moreover, both domains involve extensive regulations making any disagreement susceptible to litigation (Acharya et al., 2006; Lipsky, 2010; Mayka, 2013; Nosheen, 2022). However, the two domains differ in their approach to data in order to protect their interests. While

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modern politics embraces policies driven by data analytics, governance in claim management lacks utilisation of data-driven approaches. Thus, this study characterises a gap in the body of knowledge in relation to systematic utilisation of data analytics in the claim management process.

The purpose of this study is twofold. First, it aims to outline the major data-related challenges facing claim management, emerging resolution patterns in the literature, and whether these patterns have effectively addressed the identified challenges. Second, it investigates how governance in politics manages similar challenges, especially in relation to managing and interpreting large magnitudes of data.

The paper is organised as follows. Section 2 provides a literature review related to the claim management process and the challenges facing this process. Section 3 explores how political domain addresses similar challenges. Section 4 outlines research questions, aims, methodology of the study. Section 5 contrasts the findings of the literature review with opinions of industry experts from multinational construction companies. The findings are then discussed, leading to the study's conclusion.

2. Literature review related to governance in claim management

Governance within the domain of construction claim management can be observed through the processes, regulations and decision-makings outlined in the existing literature (Easton, 1989; Levin, 1998; Kartam, 1999; Kululanga et al., 2001; Bakhary et al., 2015; Wang and Wang, 2023). However, such governance is only implicit and lacks precise definition and structure (Baron, 2003; Bekker and Steyn, 2009; Ruuska et al., 2011). The authors propose a claim management governance structure shown in Fig. 1 which is consisting of claim elements, claim preparation initiatives, and claim management processes. Claim elements highlight the sequence of the events triggering a claim. Claim preparation initiatives represent the efforts associated with making case for a claim. Claim management processes present the framework for managing the lifecycle of a claim from identification of the events to the resolution of the claim.

2.1. Claim elements

Construction claim is defined in the literature as seeking a contractual consideration or compensation or a change or all, by one party to a contract based on an indicated or expressed contract provisions (Diekmann and Nelson, 1985; Taher, 2009; Banwo et al., 2015). Although the contracting parties share the same goal of successfully completing the project, they may not have the same interests. Consequently, claims arise from the divergence of interests between stakeholders, which can lead to unresolved disagreements during project (Acharya et al., 2006; Jaffar et al., 2011). These claims can either be resolved among the parties, resulting in changes to the project contract, or they can escalate into disputes (Acharya et al., 2006; Jaffar et al., 2011; El-Sayegh et al., 2020; Alqaisi et al., 2024). Fig. 2 shows the development of conflicts, claims and disputes during the project duration.

Levin (1998) offers a distinct definition of construction claims, differentiating them into two essential components: entitlement to recovery and the quantification of effects, as visually represented in Fig. 3. The importance of this definition lies in its emphasis on proactive data extraction and utilisation. The initial phase of entitlement assessment relies on data collection for establishing cause and liability. These are linked to contractual obligations and legal principles, as outlined by Levin (1998), which requires an interpretive analysis of textual data. The subsequent phase centres on the extraction of data necessary for quantifying the claim's impact.

It is crucial to emphasize that both components demand well-coordinated data retrieval and analysis. These are essential for establishing the technical causes and the contractual foundations, and for determining the claim's financial and sequential ramifications. The coordinated efforts involve different project teams to manually go through project specifications, tender documents, design drawings and concurrently interpret contract clauses to validate entitlement for extension of time or monetary compensation (McGeorge et al., 2007; Al-Mohsin, 2012; Levin, 1998). Here, a retrospective evaluation of claims is required to identify causes, effects and admissible documents for substantiation of historical events related to the claim. The retrospective analysis is an inherent part of claim preparation, becomes imperative due to the prolonged timeline involved in the claim development, commencing from its initial emergence as a point of disagreement to the eventual divergence of interests among project stakeholders, as illustrated in Fig. 2. Thus, retrospective analysis of claims introduces an added layer of complexity.

The emphasis on the claim elements is to profile the complexity surrounding the data utilisation efforts required to prepare a claim. Therefore, a claim can be defined by the authors as an identified, considered-qualified, quantified and predicted entitlement to recovery from interpretable "contractual grounds for compensation" or "consideration", caused by a presumed liability, yet to be substantiated, because of unplanned change and/or retrospective event.

2.2. Proposed categorisation of claim preparation initiatives

Claim preparation is complex because it involves initiatives necessary for documents retrieval, analysing diverse data types and construct admissible claim case. We propose to divide claim preparation to three initiatives which are people-led, organisational-led, and data-led initiatives as illustrated in Fig. 4. People-led initiatives are efforts primarily driven by action or input of individuals and include event identification, technical qualification, contract interpretation, legal conception and decision making. Organisational-led initiatives are efforts and communications driven by formal structures, procedures, and policies of organisations and can be divided into intraorganizational and interorganizational initiatives. Lastly, data-led initiatives are strategies that are guided by insights and analysis derived from data and include data retrieval, retrospective investigation and admissibility analysis of claim documents.

These initiatives are interrelated and trigger each other (Bakhary et al., 2015). As an example, the event identification will trigger data



Fig. 1. Elements of Governance in claim management from literature.

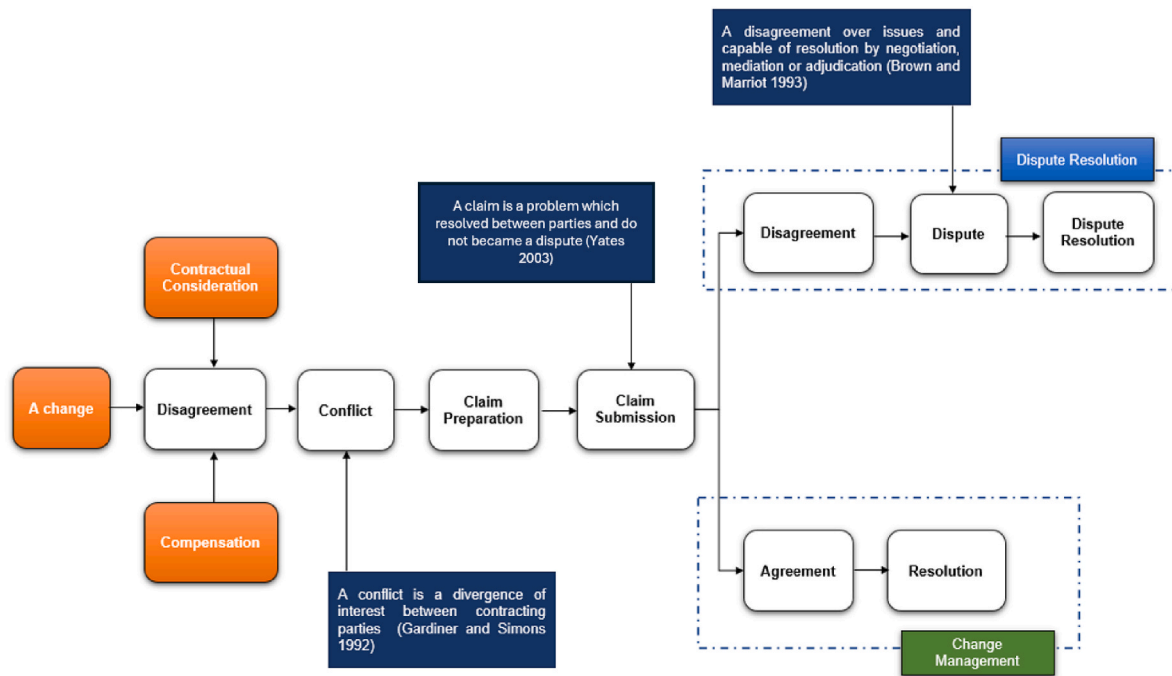


Fig. 2. Conflicts, Claims and disputes defined from literature. Disagreement will be developed to be a conflict. Then the conflict over time, if not resolved, will be developed to be a claim.

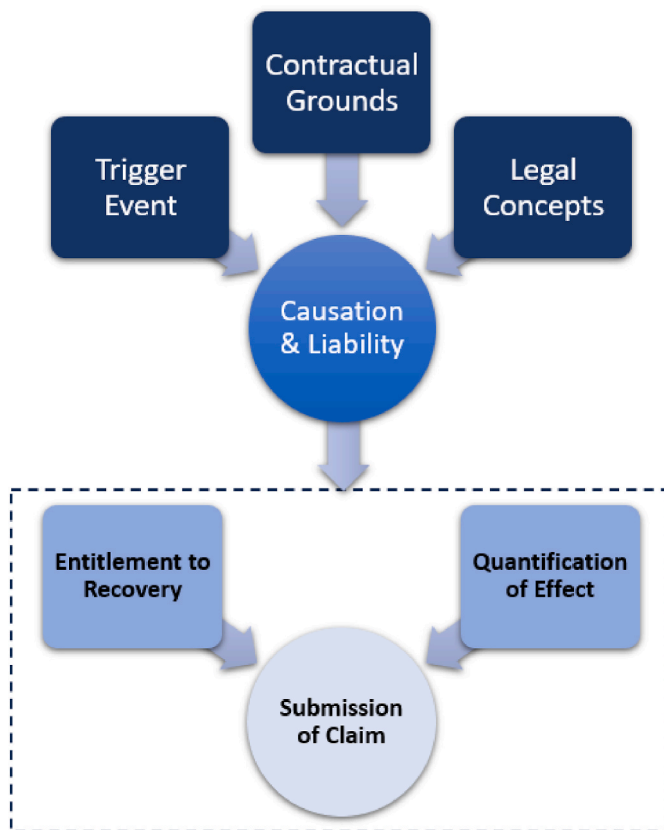


Fig. 3. Claim elements as adopted from Levin (1998). The main two components of the claim are driven by sub-elements related to causation and liability. The sub-elements are formed from a trigger represented by claim event and legal concepts.

retrieval and analysis (Thomas and Wright, 2016; Söderlund, 2018). Once the event is assessed from technical standpoint, it will be examined from contractual perspective for determination of entitlement and obligation in view of the technical assessment (Jenkins, 2021).

2.2.1. People-led initiatives

This study argues that a significant component of claim preparation process is categorized as people-led initiatives because it is driven by the experience of project practitioners. They encompass tasks such as identification of the event causing the claim, establish the contractual grounds, quantify the impact, substantiation of records, decision making, presenting results and negotiating, all which are dependent on human expertise (McGeorge et al., 2007; Al-Mohsin, 2012). People-led initiatives require high-level of individual expertise that must be coupled with intensive collaboration amongst various project team members. The intensity of collaboration comes not only from the back-and-forth discussions among themselves to establish the basis of the claim (Brook, 2016), but also from the need to address clarifications required by the client to substantiate the claim (Al-Zwainy et al., 2018; Ahmed et al., 2019; Maqsoom et al., 2020). These initiatives are utilised throughout the claim preparation duration and are extended until a resolution is achieved (Gunduz and Elsherbeny, 2020).

2.2.2. Organisational-led initiatives

Organisational-led initiatives require communications between project teams and other stakeholders (Bakhary et al., 2017). These initiatives intend to formalise correspondences between project teams within their organisations (intraorganizational) and with external organisations of the project stakeholders (interorganizational) in order to officially notify about the claim and communicate plans to mitigate its impact (Bies, 1986; Vidogah and Ndekugri, 1998; Schuster, 2010; Al-Zwainy et al., 2018; Shaikh et al., 2020; Wang and Wang, 2023). The interorganizational correspondences are typically a contractual requirement and must be issued in compliance with a pre-agreed time-bar to avoid missing any likely entitlement associated with the claim. These correspondences are built on top of the intraorganizational correspondences initiated by project practitioners in accordance with

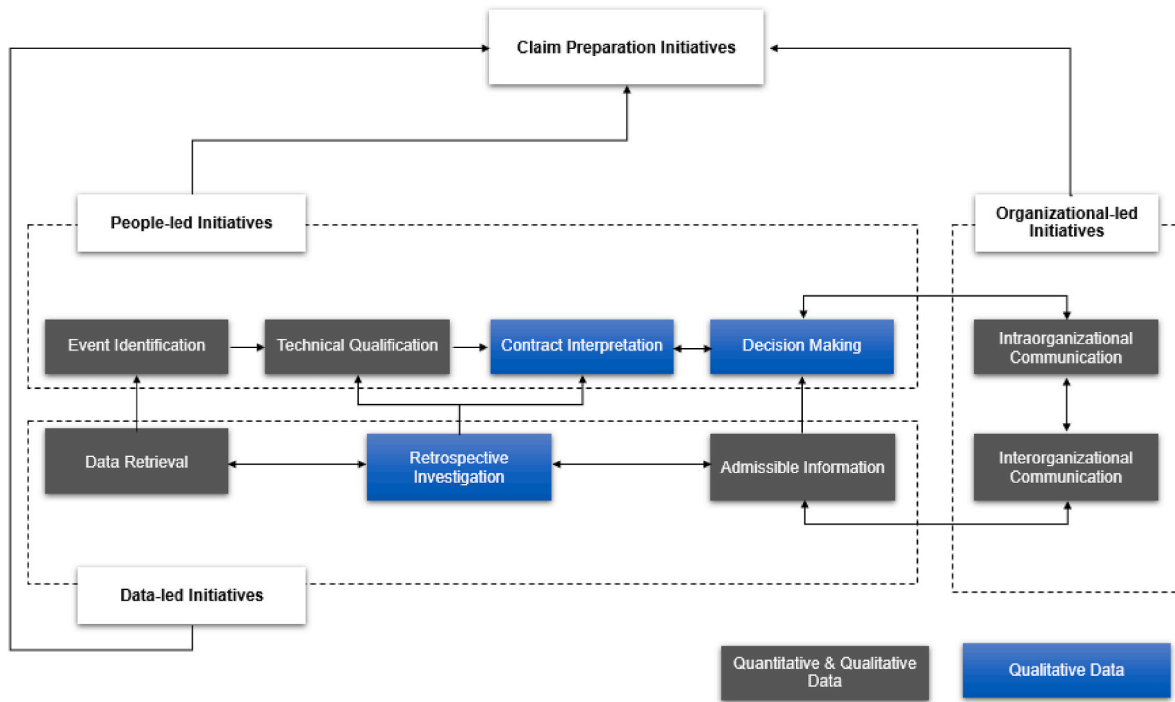


Fig. 4. Claim Preparation initiatives from contractor's perspective.

their internal organisational policies and procedures for claim and data management (Schuster, 2010; McManus and Blank, 2016; Söderlund, 2018).

2.2.3. Data-led initiatives

In addition to data embedded in both people-led and organisational-led initiatives, claim preparation involves data-led initiative to make smart use of a big set of project records and data (Hayati et al., 2017). These initiatives include data collection, extraction or retrieval, collection, data analysis, and retrospective data tracking (Mukhtar and Ahmed, 2017). The retrospective data tracking involves establishing the rationale supporting the claim. This, combined with other data-led initiative, form the basis for the claim supported by date-stamped documentations to validate the claim's admissibility. (Enshassi et al., 2009a,b; Braimah, 2013; Wang and Wang, 2023).

Data is embedded in all initiatives, as illustrated in Fig. 4. This integration enables the use of data at every stage of claim preparation, including retrieving, interpreting, collecting, and organizing claim documentation. Moreover, data supports the project team in decision-making through predicting the outcome of claims. Consequently, to extract the information required for claim preparation from the large magnitude of data, it is necessary to transform available claim data to smart data. Smart data is derived by collecting, filtering, cleansing and organizing datasets from extensive structured and unstructured data sources. This data sources in claims are project specifications, contract, construction methodologies, program of works, reports, diaries, drawings, regulation requirement and cost estimates. However, the extraction and analysis of smart data require advanced analytics, such as machine learning and text mining to support in interpreting, extracting, substantiating, decision-making and presenting claim documentation besides predicting claim outcomes. For instance, using specific tools like natural language processing (NLP) for text mining and predictive algorithms for outcome forecasting can significantly improve claim preparation. Thus, the authors identify smart data initiatives as strategies that employ smart data analytics in claim preparation.

2.3. Examining the claim management process through the lens of preparation initiatives

Literature related to construction claims focuses on factors and variables across claim's lifecycle and aiming to resolve conflicts and avoid disputes (Easton, 1989; Levin, 1998; Kartam, 1999; Bakhary et al., 2015). Claim management constitutes of six sequential phases. It includes identification (trigger), notification (contractual grounds), examination (contractual grounds and legal concepts), documentation (entitlement to recovery and quantification of effect), presentation, and negotiation (Kululanga et al., 2001). Each phase has multiple substages and requirements that must be fulfilled (Abdul-Malak and Abdulhai, 2017). Fig. 5 outlines claim management linked to claim preparation initiatives from a contractor's perspective.

As seen, the first phase is the identification (Arditi and Patel, 1989; Riad et al., 1991; Kululanga et al., 2001) in which an event triggers a claim case. This involves assessing whether the event can form a claim case from technical and contractual perspectives. At this point, project team provides the contractor's organisation and its management with contractual basis that is believed to qualify the event for pursuing the claim. Some organisations may engage their legal team at this stage to re-establish their legal interpretations and consolidate their decision for proceeding to the claim preparation process.

The second phase is the notification (Kululanga et al., 2001; Hayati et al., 2017) and includes communications from the contractor advising the event corresponding to the claim case and providing a provisional analysis to the client within a specific period as per the contract. The notification mechanism is considered an early warning and will depend on the contract type. The third phase is examination and includes a retrospective investigation to organise the supporting facts and records in a chronological order (Enshassi et al., 2009a,b). This includes technical and contractual analysis to ensure there are contractual grounds for the claim.

The fourth phase is documentation (Kululanga et al., 2001; Al-Mohsin, 2012; Chappell, 2017), which requires extensive data collection, retrieval, and analysis. The data analysis process is mostly unautomated and performed on ad-hoc basis by project teams. It is

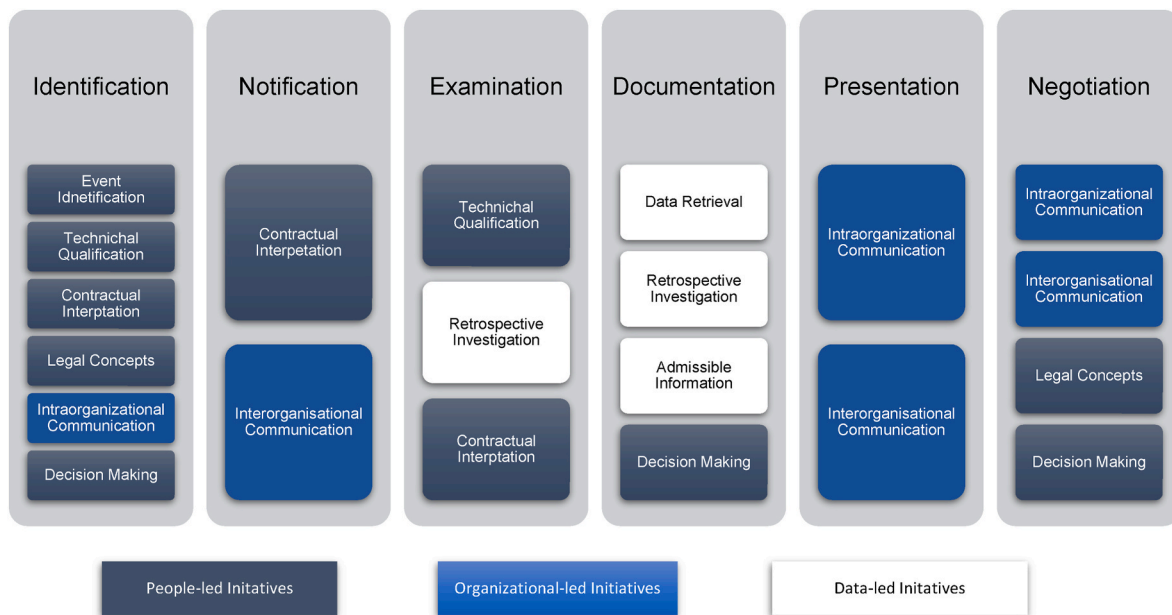


Fig. 5. Construction Claim Management Process identified from literature linked to claim preparation initiatives.

necessary in this phase to gather admissible evidence demonstrating the measures undertaken by the contractor, to mitigate or minimize the impact of the claim on project time, cost and quality but despite these efforts, there were uncompensated impact that need to be addressed. The fifth phase is the presentation which is a direct communication between the contractor and client (Chappell, 2017). In this phase, all supporting documents and claim narrative is issued to all project stakeholders for their review and assessment. Effective communication in the claim case relies significantly on the clarity of substantiating evidence and facts and their logical arrangement.

The final phase is negotiation. The interpretation of legal concepts and the admissibility of claim documentations can invigorate the claimant position in the negotiation (Cunningham, 2017). This phase requires substantial decision making from all stakeholders to reach a resolution, primarily based on data and interpretation. Failing to provide high-quality data with a clear correlation to the claim case may escalate to become a dispute and resolved by litigation.

2.4. Challenges surrounding claim management

Governance in construction claim management can be observed through the claim preparation initiatives and management process, hence, it is imperative to identify the challenges facing both elements of governance. From literature review, seven challenges were identified as outlined in Table 1.

Challenge 1 is the cost and time required to prepare claims. The preparation of a claim requires collaborative efforts from multiple project team members tasked with identifying, retrieving, and analysing data relevant to the claim (Ahmed et al., 2003; Zaghoul and Hartman, 2003; Müller and Jugdev, 2012; Chapman et al., 2016; Nandini et al., 2022; Ayhan et al., 2023). This multi-layered process typically involves the project manager, construction manager, cost control team, project planning team, contract administrators, quantity surveyors, and site engineers. Furthermore, expertise from external parties specializing in claim management may also be recruited.

Furthermore, claim preparation is a time-intensive task, often taking several months from the initial notices to the finalization of all claim documents (Ali et al., 2024; Awwad and Thabet, 2024). Barakat et al. (2019) argued that FIDIC standard conditions stipulate a contractual requirement of 84 business days from the identification of the claim

event to the submission of a fully detailed claim. Hence, considering the extensive involvement of numerous team members and external parties over an extended period, claim preparation is inherently resource-intensive and costly.

Challenge 2 is the difficulty in linking the claim events to the contract conditions. It is important to highlight that construction contracts have complex legal jargons and terms, written by legal entities, which are difficult for project practitioners to interpret (Rooke et al., 2003; Raj et al., 2009; Rosenfeld, 2014; Ahuja and Gaurav, 2022; Nandini et al., 2022; Narayan et al., 2023). Therefore, there will be ambiguity in substantiating the claim case during the preparation process, leading to unpredictable outcome.

Challenge 3 is the lack of expertise in managing claims from initiation to resolution. It is often the case that project teams lack specialists dedicated to claim management. When a need to raise a claim arises, project leaders typically begin searching for support from their organisation or external consultants. The issue is that claim management is not recognized as a management function in terms of allocating resources (Easton, 1989; Levin, 1998; Vidogah and Ndekugri, 1998; Kartam, 1999; Rooke et al., 2004; Cheung et al., 2008; Lumineau & Malhotra, 2011; Lumineau and Henderson, 2012; Lumineau and Quélin, 2012; Seo et al., 2021).

Challenge 4 is related to the magnitude and type of data. Cheung et al. (2008); Bakhary et al. (2017) argued that claim documentation may include general and particular contract conditions, engineering specifications, project schedules, meeting records, measurement methodologies, request for information, progress reports, change logs and correspondences. The documents in construction projects are produced in large quantities and in textual or schematic formats (Bakhary et al., 2013; Alqaisi et al., 2024). In addition, there are contradictions amongst contractual clauses, project specifications, and technical documents and these increase the complexity of manual data analysis during claim preparation process (Khalef and El-adaway, 2021; Ryoo et al., 2010) argued that while projects information and record sources are meant to be complementary, project specifications, standard engineering codes, manuals, and guidelines tend to be misaligned and contradictory in their context due to different requirements imposed by multiple project stakeholders or to comply with legal requirements.

Challenge 5 is the quality of project records. Poor documentation management is often a common cause for inadequate substantiation of

Table 1
Literature highlights major challenges facing claim management process.

| Challenge Label | Challenge Description | Literature |
|-----------------|---|---|
| 1 | Cost and time required to prepare claims | Ahmed et al. (2003); Zaghoul and Hartman (2003); Zanelidin (2006); Müller and Jugdev (2012); Chapman et al., 2016; Serrador and Pinto (2015); Arcadis (2022); Ayhan et al., 2023; Ali et al. (2024); Awwad and Thabet (2024). |
| 2 | Preparing claims according to the contract conditions | Vidogah and Ndekugri (1998); Rooke et al., (2003); Turner (2004); Toor and Ogunlana (2008); Raj et al., (2009); Shakeri et al. (2014); Bakhary et al. (2015); Zhang et al. (2019); Nandini et al. (2022); Narayan et al. (2023) |
| 3 | Lack of expertise in managing claims | Thibaut and Walker (1975); Easton (1989), Levin (1998); Vidogah and Ndekugri (1998); Kartam (1999); Cheung et al. (2008); Malhotra and Lumineau (2011); Lumineau and Henderson (2012); Lumineau and Quélin (2012); Zhang et al. (2019); Seo et al., 2021; Loulakis and McLaughlin (2023); Cinko et al. (2023); Narayan et al. (2023). |
| 4 | Magnitude and type of data | Hjelt and Björk (2007); Cheung et al. (2008); Ryoo et al. (2010); Banwo et al. (2015); Bakhary et al. (2017); Kim et al., 2022; Narayan et al. (2023); Awwad and Thabet (2024); Alqaisi et al. (2024) |
| 5 | Quality of project records | Vidogah and Ndekugri (1998); Cheung et al. (2008); Hassanein and El Nemr (2008); Gibson (2015); Bakhary et al. (2017); Dastyar et al., 2018; Amucheazi and Nwandum (2020); Mijwel Aljumaily et al., 2022; Cinko et al. (2023); Narayan et al. (2023); Cevikbas et al., 2024 |
| 6 | Lack of utilisation of intelligent data analytical techniques in claim management | Vidogah and Ndekugri (1998); Sun and Meng (2009); Abdel-Khalek et al. (2019); Adel et al., 2023; Li (2022); Narayan et al. (2023); Shuai (2023) |
| 7 | Lack of a structured organisational process for claim management | Kululanga et al., 2001; Baki (1999); Mathur et al. (2014); Hashem et al., 2016; Söderlund (2018); Stamatou et al. (2019); Kock et al. (2020); Seo et al. (2021); Parchamijalal et al. (2023); Asadi et al. (2023); Wang and Wang (2023). |

claim supporting documents (Bakhary et al., 2017; Cheung et al., 2008; Hassanein and El Nemr, 2008; Vidogah and Ndekugri, 1998). Niu and Issa (2015) argue that developing claim documentation is inefficient because of lack of expertise and systems. Retrieving claim related documents will require inefficient and tedious manual work that may result in errors and missing documents, impacting the level of claim substantiation.

Challenge 6 involves the underutilization of data intelligence and analytical techniques in claim management process. Data and record management systems are poorly designed to support claims (Vidogah and Ndekugri, 1998; Sun and Meng, 2009). These systems have been designed to be data organizers and data communication platforms; but they often lack data learning and pattern recognition

features. Therefore, there is a need to deploy special techniques and methods to process low-quality and/or big data to build a claim case (Narayan et al., 2023; Shuai, 2023).

Challenge 7 is the absence of a structured organisational process for claim management. Kululanga et al., (2001) observed that while construction contractors recognize the importance of structured claim preparation methodologies, they often fail to implement consistent processes. This inconsistency stems from the perceived complexity of claim management (Easton, 1989; Levin, 1998; Vidogah and Ndekugri, 1998; Kartam, 1999; Cheung et al., 2008). Seo et al. (2021) argue that adherence to well-structured processes enhances performance, defining consistency as systematic adherence with high compliance and formality. Such consistency fosters shared understanding among stakeholders (Kock et al., 2020).

However, one domain was facing similar challenges while managing complex ties between stakeholders but succeeded in addressing these challenges. This domain utilised a solution to extract advance knowledge from diverse sources of data to steer decision-making towards effective and informed governance practices. This domain is politics, specifically, governance in politics. Governance in politics utilised smart data analytics to address similar challenges and provided a solution to develop effective and informed governance practices. Thus, the authors suggest that smart data analytics can play the same role in claim management process creating the required level of governance. Hence, in the following section, we will investigate the role of data utilisation in politics and the elements of governance in politics. Also, the similarities between the elements of governance in politics and claim management will be outlined. In addition, the authors will highlight what can be adopted by claim management from governance in politics to help practitioners in managing decision making during all phases.

3. Literature review related to governance in politics

3.1. Role of data utilisation in politics

In politics, there are many facets of the use of data. Some of these facets of data utilisation come in form of statistics that fuel many aspects in politics. Many of these political aspects are using data for predictions and planning purposes such as election forecast, insights for public initiatives and strategies, data-informed campaigns for policies and litigations. Also, data is used to assist governmental institutions in executing economic decisions, such as adjusting banking interest rates to accommodate economy inflation. Collectively, processed information tends to be used to form politically and sound acts. Thus, processed information is the vehicle for politicians to be responsive to population' preferences (Selee and Peruzzotti, 2009).

Role of data utilisation in politics can take different forms. The authors suggest dividing them into two categories: observational and conducive. Firstly, observational role in data utilisation refers to insights gained from data analytics. This can be represented by the statistics available in the Australian Bureau of Statistics entries about homelessness and education disparities for various groups in the society (Walter and Walter, 2021). These should normally provide insights for establishing data-based strategies for developing an adequate and fair response without seeking political preferences.

Secondly, conducive role in data utilisation where data can influence and direct a decision toward a certain result. This role can be utilised to propose recommendations and factor predictions, based on specific characteristics, into decision-making. As an example, big data analysis used in predicting heart diseases can influence political decision-making towards deploying and financing preventive care. Also, it was shown in Facebook-Cambridge Analytica scandal where data was used for tailored political advertisement (Henriksen, 2019). In this scandal, collected data was used to target a segment of population who will respond similarly to a specific message (Henriksen, 2019). Therefore, while the observational role of data provides in-depth understanding through

interpreting data, the conducive role provides probabilities of different future scenarios based on such understanding.

A critical facet of data utilisation in politics is to steer sovereign decision making by data analysis, modelling and prediction (Muniz da Conceição, 2022; Han, 2023). This sovereign decision making represent the exercise of authority through political and economic power (Scott and Leung, 2012; Amsler, 2016). This is in alignment with definition of data introduced by Ruppert et al. (2017) which defined data as an object whose production interests those who exercise power. Thus, the link between data and governance in politics tends to be an adamant link (Muniz da Conceição, 2022). In summary, data utilisation in decision making steers governments towards flexible and adoptable decision making for development and effective implementation of sound policies (Selee and Peruzzotti, 2009).

A good example of how data is utilised in decision making is what was adopted by the US Department of Transportation who introduced a safety data initiative (SDI). This SDI uses data collection and analysis combined with data visualisation tools to better understand hotspots for accidents on roads. This helped in diagnosing related behaviours and related factors that might have been a contributing factor of these accidents. Building on this insight, it can identify potential risk areas, and enable more rapid and effective interventions (Department of transportation, 2023). Examples of data utilisation in political governance are plentiful, such as in reshaping effective superannuation policies, investment in new infrastructure, and job creations. In all cases, data is utilised through advance knowledge extraction, modelling and prediction methods for rational decision-making.

3.2. Elements of governance in politics

Governments are continuously looking at how to predict and manage risks and to respond to complex problems in a fast-paced environment through political governance systems. Governance in politics constitutes two elements which are control mechanisms and disciplinary powers. These two elements complement each other and linked to data collection, analysis, modelling and prediction.

Control mechanisms in a political regime operate under the authority of executive, legislative, and judicial systems, obliging adherence to legal and governmental procedures. These mechanisms facilitate reporting by institutions and the populace to political systems and governmental bodies (Kemp, 1986; Blom-Hansen and Olsen, 2015). Core components such as Legislative Control, Judicial Control, and Procedural Control ensure transparency among governmental institutions and facilitate corrective action to maintain policy coherence (Hömann and Sieberer, 2020). For example, the Australian government utilizes data analytics to propose policies to the legislature, which, upon approval, transition into Acts, subject to scrutiny and potential amendment during parliamentary proceedings (Legislative Control). Upon enactment, these Acts become operational, subject to judicial review (Procedural Control) (Henriksen, 2019).

Similarly, disciplinary powers constitute another governance pillar in politics, regulating behaviour through incentivization and sanctions (Ball, 2003; Rose et al., 2006). This includes Hierarchical Observation, Normalizing Judgment, and Examination, exemplified by the Australian Competition and Consumer Commission enforcing the Competition and Consumer Act 2010 to ensure fair supplier-consumer relations (Han, 2023). These disciplinary measures, akin to control mechanisms, are intertwined with data utilisation for informed decision-making (Mitchell, 2006; Scott, 2010; Henriksen, 2019).

Additionally, Michel Foucault's concept of governmentality introduces a third governance pillar, emphasizing techniques that promote self-governance through clarity and motivation, fostered by shared data (Foucault, 2007). This process involves cultural practices, knowledge dissemination, and technological development to encourage informed commitments and conflict resolution. Governmentality underscores the role of data in steering individuals towards effective

self-governance practices (Rose et al., 2006). Governmentality can be defined as governing by principles of rationality which is driven by data analytics to promote self-governance by considering the interests of population, and understanding these interests through the population's culture, rather than depending on superordinate principles (Foucault, 2007; Kalpagam, 2014).

In essence, governance in politics revolves around data-driven decision-making to ensure clarity, accountability, and equality amidst various challenges. Regulatory elements and governmentality both rely on data, albeit in different capacities, highlighting the conducive role of data in effective governance practices.

In summary, governance in politics involves exercising power through decision-making based on data-driven analysis (Rose et al., 2006). It aims to foster clarity, accountability, and equality while addressing monetary, social, and environmental challenges. It consists of two elements: disciplinary powers, which regulate through incentives and sanctions to ensure accountability, and control mechanisms that subordinate to political systems and create compliance with procedures. Both elements are linked to data collection, analysis, and modelling. In addition, governmentality adds a third pillar, promoting self-governance through clarity and motivation, driven by shared data and informed obligations. Consequentially, extracting knowledge from diverse sources of data is permeating all governance elements in politics.

Conversely, these elements are driven by different roles of data. As suggested by the authors, regulatory elements in political governance are driven by observational role of data, while governmentality is utilising the conducive role of data. In conclusion, governance in politics relies on advance knowledge extraction from diverse sources of data to steer decision-make towards effective and informed governance practices.

3.3. Adoption of governmentality in project management

Governance has been adopted in project management research and practice (Lindkvist, 2004; Fleming and Spicer, 2014; Muller et al., 2017; Clegg, 2019) to enable project teams to consider organisational objectives in their decision making. At the same time, it serves to increase individual willingness to self-govern, i.e. to take responsibility for tasks and results (Fleming and Spicer, 2014; Clegg, 2019). Embracing self-governance in project teams can provide a strategic solution to lack of work autonomy. Not only a governance practice to enhance project teams commitments, but also minimize conflict between project teams and stakeholders (Fleming and Spicer, 2014; Muller et al., 2017; Clegg, 2019).

Governmentality in projects can be achieved by adopting the three-process defined by Foucault (2007), similar to politics, which are culture-driven practices, Knowledge deployment and developing technologies for self-governance. Firstly, culture-driven practices can be achieved in projects through the similarities in the working experience between the projects teams gained from working in the same industry. Project leadership is a contributor to the culture-driven practices. Pinto et al. (1993) highlight that developing operating rules by project leaders, for the project team to follow, will promote a higher level of cooperation and will establish the ideas and communication within project team. This can be used as the informal code of conduct for project team members to align their behaviours and create the team culture (Ajmal and Koskinen, 2008). This is first process to achieve governmentality.

Secondly, knowledge deployment can be achieved through data sharing (Clegg, 2019). This can be achieved through many forms such as banners visualising the desired outcome of the project, graphical posters for the desired values to be adopted by project team, training and project related social events. Additionally, all team members need to be engaged in communication facilitated by project leadership to transfer knowledge (Ajmal and Koskinen, 2008). Lastly, the third process is developing technologies for self-governance. Technologies for self-governance are

the results of the application of gained knowledge by project teams to achieve the desired KPI. Thus, the knowledge deployment and its application will support the project team to achieve the project KPIs.

The successful deployment of governmentality can have positive impact on outcomes of the project (Muller et al., 2017; Clegg, 2019). In addition, it is argued by the authors that three-process of governmentality are deployed through data. In consequence, governmentality was adopted in project management, similar to governance in politics, by promoting self-governance through clarity and motivation, driven by shared data and informed obligations.

3.4. Similarities & dissimilarities between claim management and governance in politics

Claim management and governance in politics have several similarities. For instance, both domains managing diverged interests between stakeholders (Foucault, 2007; Selee and Peruzzotti, 2009; Acharya et al., 2006; Jaffar et al., 2011; El-Sayegh et al., 2020). This divergence in interest increases the probabilities of conflict that can lead to disputes. In consequence, the effective deployment of claim management process and effective governance in politics can be distinguished by the reduction in disputes caused by conflicts (Rose et al., 2006). Additionally, both domains are surrounded by high magnitude of data that can aid rationality in decision making. Besides, both domains are normalised by the similarity in regulatory elements which are control mechanisms and disciplinary powers. Therefore, there are similarities between claim management and governance in politics.

Control mechanisms in claim management is represented in contract clauses, dispute resolution and claim procedures. Firstly, contract clauses include contractual obligations, entitlements and organise the procedures to raise claims and disputes. It works as a control measure similar to the legislative control in governance in politics. Secondly, the contract always includes procedures for dispute resolutions. This is a control measure similar to judicial control in governance in politics which responsible for adjudicating disputes. Thirdly, contracts stipulate and organise raising and submission of claims. This is similar to the procedural control in governance in politics. Additionally, as a control mechanism in politics, the judiciary exercises judicial review over executive and legislative action and the legislature reviews the functioning of the executive. Similarly, in claim management, dispute resolutions are embedded in the contract to exercise review over contract interpretation and performed works to determine entitlements and obligations. Finally, control mechanisms are present in both domains, and it requires advanced knowledge extraction from diverse sources of data to rationalise decision-making (Fleming and Spicer, 2014; Clegg, 2019). However, governance in politics is more advanced in utilisation of data analytics comparing to claim management.

Disciplinary powers are the measures embedded in the contract to provide the stakeholders the right to raise, review and examine claims. This is similar to hierarchical observation in governance in politics. In addition, they are preventing contracted parties from pursuing claims with no basis or low-probability of success. This will steer the stakeholders towards a balanced relationship. Adaway and Kandil (2009) stated that 50% of claims can add an additional 30% to the original contract price. While this can be tempting, it also could be a disciplinary power. It prevents organisations from pursuing claims because there is the same 50% chance to lose the claim. This means wasting the resources invested in claim preparation, and even worse, can lead to a dispute. This is similar to normalizing judgment in governance in politics. Also, contracted parties have the right to examine the claim to validate the entitlements and obligations (Wang and Wang, 2023). This is similar to examination as a disciplinary power in governance in politics. Finally, disciplinary powers are present in both domains, and they require advanced knowledge extraction from diverse sources of data to rationalise decision-making. However, governance in politics is more advanced in utilisation of data analytics comparing to claim

management.

The three-process of governmentality, which are culture-driven practices, Knowledge deployment and developing technologies for self-governance, are missing in claim management. Firstly, “finger-pointing” culture in claim management is driven by uncertainty about entitlements and obligation which hinders clarity and limiting effective culture-driven practices. Secondly, claim management lacks advanced analytical techniques to prepare claim documents or examine their admissibility. Additionally, techniques to predict claim outcomes are absent. As a result, organisations may pursue unviable claims without recognizing their low-probability which is contributing to high dispute management costs, as argued by CRC (2009). This is limiting knowledge deployment and self-governance to pursue viable claims which are the second and third process in governmentality as shown in Table 2. Thus, drawing from governmentality in politics, where data analytics promote self-governance to overcome similar challenges, this study contrasted governance in politics domain with construction claims.

4. Study questions, aims and research methodology

4.1. Study questions and aims

The main purpose of this study is to investigate how current research focus on addressing the challenges facing claims management. This study will answer the following questions:

- What are the elements of governance in construction claim management?
- What are the major challenges facing claim management? how has existing research addressed these challenges?
- What is the other domain that has encountered similar challenges and successfully addressed them? What learning can be drawn from this domain to address the challenges associated with claim management in construction?

By investigating literature and interviewing industry experts, this study aims to:

- Identify the current themes in literature related to claim management through review and analyse the published articles related to construction claims.
- Evaluate how the identified themes in current research are addressing the challenges in claim management process.
- Highlight how smart data analytics utilisation in political governance domain resolves similar challenges to what claim management is facing.

Table 2

The absence of the three-process of governmentality in claim management.

| Absence of governmentality in claim management | | |
|---|--|---|
| Lack of culture driven practices | Lack of knowledge deployment | Absence of technologies promoting self-governance |
| <ul style="list-style-type: none"> • Finger-pointing culture driven by uncertainty about entitlement and obligation. | <ul style="list-style-type: none"> • Adversity among stakeholders due to the divergence in interests will demote cooperation and data sharing. • Pursue unviable claims without recognizing their low-probability due to lack of advanced analytical techniques to analyse and prepare claim documents or examine their admissibility. | <ul style="list-style-type: none"> • Technologies such as smart data analytics are absent. The smart data analytics can drive decision making by predicting the outcome of potential claims. • Predicting the claim outcome can magnify the conducive role of data in claim management and promote self-governance. |

4.2. Research methodology

To achieve the aims of this study, dependent multistep research methodology will be adopted as shown in Fig. 6. First phase is a systematic literature review to outline the challenges facing construction industry in managing claims and collect relevant studies and paper to determine the themes in recent research. Second phase is to interview industry practitioners who have expertise in claim management and project management. These two phases will be qualified to answer the research questions and reach a conclusion providing an in-depth understanding of claim management and research latest themes.

4.3. Data collection from literature

The study adopts a systematic literature review approach to examine existing research in claim management (Tranfield et al., 2003; Paul et al., 2021). This method aims to understand existing literature and synthesize findings to structure existing knowledge, identify patterns and answer specific questions (Tranfield et al., 2003; Klein and Muller, 2020; Paul et al., 2021). We adopted steps similar to three-steps approach (Tranfield et al., 2003) which can be summarised in 3 steps: planning, conducting and last step is reporting and dissemination. In this study, first step was to form the study questions as per section 4.1. Second step was to select the databases to search for peer reviewed papers and conference papers. Literature was gathered from Scopus, Web of Science and ASCE's Journal of Construction Engineering and Management database. Third step was to develop the search criteria to retrieve many relevant peer reviewed papers. Fig. 6 is showing Key words and filters for searching the databases. We excluded articles focused on quantifying claim-related costs or time.

Fourth step was to collect the results of searching ASCE which were

83 papers, from Web of Science which were 91 papers and from Scopus which were 202. Fifth step was to identify relevant papers based on selection criteria. The selection criteria were to remove any duplicated papers between the databases, manually examining abstract, method and conclusion sections and tag each paper with relevance of the papers to the study. Selected papers were utilising structured interviews and/or case studies. These steps resulted to have 194 papers relevant to this study and can answer the study questions.

For reporting and dissemination of collected papers, a thematic analysis, which is a widely used technique for pattern identification (Braun and Clarke, 2006), was utilised. This method offers flexibility and can be approached deductively or inductively (Clarke and Braun, 2013). The deductive approach was employed, as expected themes were pre-identified. Finally, each paper was tagged with a category and sub-category as pre-identified which are; Identification of Claim Causes; Management of Legal Documents; Court-based Reference; Utilisation of Machine Learning Techniques in Research Methodology; Utilisation of Machine Learning Techniques in claim management; Claim Management Process; Dispute Commercial Implication; Decision Making; Claimed Cost; Claimed Time; Tools used in claim management; Claim Category and Measures for claim avoidance.

4.4. Data collection from interviews

The second phase of the research methodology is a series of interviews that were conducted with industry experts. Authors prepared following questions before interviews:

Q1. What experience does your team have in construction claim management?

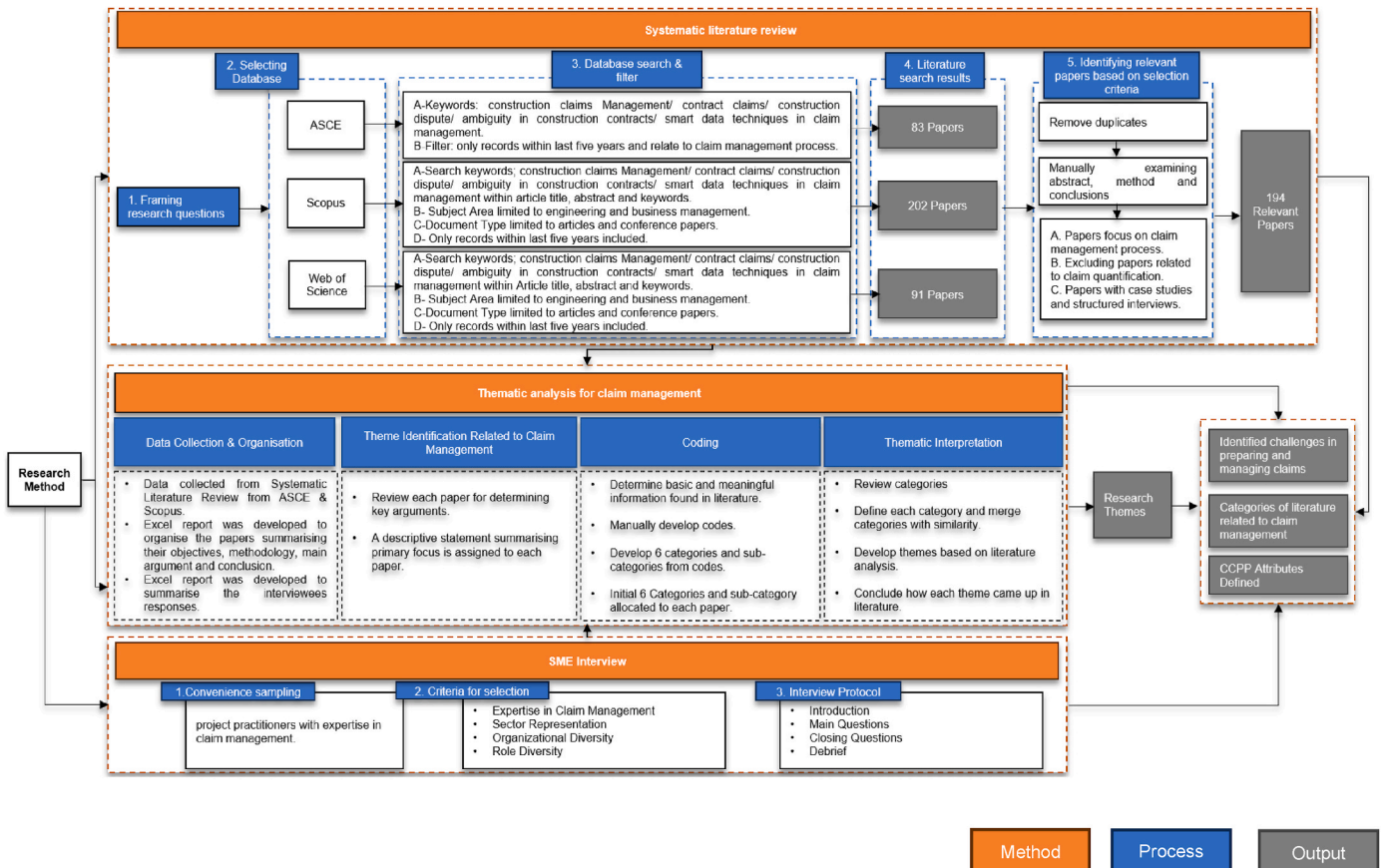


Fig. 6. Research method.

- Q2. How does your team identify and validate factors leading to construction claims?
- Q3. What evidence collection methods are used, and which team members participate?
- Q4. Does your company follow a standardized claims management process? If so, how is it implemented and how long does it typically take?
- Q5. What critical factors influence construction claim outcomes?
- Q6. What challenges do project teams face in managing construction claims, and how are they overcome?
- Q7. How does your team ensure completion and submission of necessary claim documentation? Can smart data analytics streamline this process?

4.4.1. Target population and sampling strategy

The targeted population is project practitioners in construction industry with expertise in claim management. The sampling strategy for this study was convenience sampling (Etikan et al., 2016). Convenience sampling is a type of non-random, nonprobability sampling in which members of targeted population are easily accessible and potential participants willing to engage in the study. Convenience sampling is appropriate for this study because this form of sampling may be the most efficient way to access a hard-to-reach populations such project practitioners with expertise in claim management. Table 3 is showing the interviewees' selection criteria.

4.4.2. Criteria for selection

4.4.2.1. Expertise in claim management. Participants with experience in construction industry and managed claims starting from identifying the claim event till resolution were selected. Their experience can provide valuable insights into complexities of claim management.

4.4.2.2. Sector representation. Participants with experience in construction industry, specifically, expertise in infrastructure sector in Australia due to the complexity, magnitude and size of these projects. The relevance of infrastructure projects to this study is underscored by the Australian Government's commitment, allocating AUD \$256.6 billion across all states over a four-year period from 2023 to 2026, according to the 2023 budget.

4.4.2.3. Organisational diversity. Participants from different organisations representing contractor, client and consultancy organisations were selected to capture different interpretations on managing claims. However, more interviewees from the contractor side were targeted because they are responsible for claims preparation.

4.4.2.4. Role diversity. Participants with different roles and different organisations who involved in claim management were selected in this study. Roles identified in this study as the most relevant are contractor-side project directors, project Managers from both client and contractor sides, project controls Leads, claims and dispute managers and contract managers. As a result, the authors selected 10 interviewees who met these criteria. Six interviewees were from a large general contractor working in infrastructure projects in Australia across all states. This large contractor working in three different continents and has more than 10 thousand employees. These six interviewees involved in claim management and preparation within their projects in different states in Australia. In addition, two interviewees are from a client-side organisation. This organisation is a government organisation in New South Wales. Finally, the last two interviewees are from a project management consultancy working across four different continents and currently are working in Australia in different States.

4.4.3. Interview protocol

Interviews were conducted in a structured approach to ensure the comparability of data collected from all ten participants. The authors interviewed the participants individually. The interview structure was divided into four parts:

- A. Introduction: Participants were briefed on the study's aims, the interview structure, and provided with assurances of confidentiality. They were also asked to consent to participate and for the publication of the results.
- B. Main Questions: This section included the core questions along with follow-up questions designed to delve deeper into participants' expertise in claim management. Topics covered included their processes for managing claims, factors contributing to the success of claims, challenges encountered, the severity and complexity of these challenges, and the potential role of data analytics in claim management.
- C. Closing Questions: Participants were asked if they wished to add any further details and their opinions on the study's aims and questions.
- D. Debrief: The interview concluded with an explanation of the next steps and an expression of gratitude to the participants for their contributions.

The authors conducted the interview data analysis manually. The analysis started with collecting all the interviewees responses in tabulated text added against each question. Then the authors conducted a thematic analysis by manually coding the responses. The manual coding started with allocating each response to a claim management phase, then based on the interpretation of the authors, key words were highlighted. Then, second codes that represent the persisting identified challenges were allocated to each response based on the interpretation

Table 3
Interviewees Criteria for selection.

| Participants | Industry Experience (Years) | Expertise in Claim Management | Sector | Organisation | Role |
|---------------------|-----------------------------|---|----------------------------|--------------------------------|-----------------------------|
| Participant 1 | 25 | Involved in managing claims from identification phase till resolution | Infrastructure | Contractor | Projects Director |
| Participant 2 and 3 | 18, 16 | Responsible to quantify and substantiate the impact of claims | Buildings & Infrastructure | Contractor | Project Control Leads |
| Participant 4 | 18 | Involved in managing claims from identification phase till resolution | Infrastructure | Contractor | Project Manager |
| Participant 5 | 25 | Extensive expertise in claim management | Buildings & Infrastructure | Contractor | Claims and Disputes Manager |
| Participant 6 | 17 | Responsible for managing claims contractually adhering to contract requirements | Infrastructure | Contractor | Contract Manager |
| Participant 7 & 8 | 15, 17 | Involved in managing claims from identification phase till resolution | Infrastructure | Client | Project Manager |
| Participant 9 & 10 | 18, 19 | Responsible to quantify and assess the impact of claims | Buildings & Infrastructure | Project Management Consultancy | Project Control Lead |

of the authors. Table 04 is showing the first and second codes and their definitions. Finally, responses were summarised in descriptive statements and coded into the seven challenges then allocated to each claim management phase.

The authors identified the severity level as the difficulty caused by the presence of the challenge in performing claim management tasks within claim management phases. The authors quantified the severity level of each challenge based on three elements which are time requirement, cost requirement and expertise requirement. The time requirement is representing the duration required to perform the tasks associated with the claim management phase. The cost requirement is representing the cost required to perform the tasks associated with the claim management phase. The expertise requirement is representing the experience in managing claims from coordinating project team efforts and performing data analysis to timely decision making. Table 5 is showing the severity elements and associated values with their definition. From Interviewees' responses, each challenge in each phase will be scored based on the value associated with the severity elements in Table 5. A challenge scores from 1 to 3 will be identified as low severity level, while a challenge scores from 4 to 6 will be identified as medium severity level. Finally, a challenge scores from 7 to 9 will be identified as high severity level.

5. Results

5.1. Outcome of systematic literature review

A deductive approach was adopted to pre-identify the categories as shown in Table 6. Similarly, the same used to pre-identify the sub-categories as shown in Table 6. These categories and sub-categories are Root Causes of Claims; Contractual Attributes; Utilisation of Machine Learning Techniques in claim management; Organisational Attributes; Operational Attributes; Claim Avoidance. It is important to categorise literature related to claims to identify the main themes in research.

Root Causes of Claims: literature focus is to identify the root causes of claims to create awareness in the industry about these causes.

Contractual Attributes: literature focus on contract interpretation divergence; case-based reasoning utilising court cases related to claims; admissibility of evidence. The aim is to highlight the need for enhancement in the contractual knowledge within the participants in construction industry and to provide case studies.

Utilisation of Machine Learning Techniques in claim management: the literature focus on utilising machine learning techniques in predicting the result of claims are relevantly low. In contrast, many scholars are utilising these techniques in their research methodology for determining dependencies.

Organisational Attributes: Literature focus on claim management process, decision-making mechanisms and dispute resolutions. The dispute resolution was included in this category because disputes will be managed by organisation management due to the commercial sensitivity and associated costs which are beyond the project team spectrum.

Operational Attributes: Literature focus on highlighting claims related to specific type of projects, type of claims, claim cost and claim duration.

Table 04 Codes and their definition as used in interviewees manual analysis.

| Code 1 | Code 1 Definition | Code 2 | Code 2 Definition |
|--------|----------------------|--------|-------------------|
| ID | Identification phase | CH 1 | Challenge 1 |
| NO | Notification phase | CH2 | Challenge 2 |
| EX | Examination phase | CH 3 | Challenge 3 |
| DO | Documentation Phase | CH 4 | Challenge 4 |
| PR | Presentation Phase | CH 5 | Challenge 5 |
| NE | Negotiation Phase | CH 6 | Challenge 6 |
| | | CH 7 | Challenge 7 |

Table 5 Definition of severity elements and associated values.

| Severity Element | Allocated Value | Definition |
|-----------------------|-----------------|---|
| Time Requirement | 1 | Required duration from project team to perform the tasks within the claim management phase is low with no requirement for any additional resources outside of project team. |
| | 2 | Required duration from project team to perform the tasks within the claim management phase is medium with no requirement for any additional resources outside of project team. |
| | 3 | Required duration from project team to perform the tasks within the claim management phase is high along with requirement for additional resources outside of project team. |
| Cost Requirement | 1 | Cost associated with project team resources to perform the tasks within the claim management phase is low with no requirement for any additional resources outside of project team. |
| | 2 | Cost associated with project team resources to perform the tasks within the claim management phase is medium with no requirement for any additional resources outside of project team. |
| | 3 | Cost associated with project team resources to perform the tasks within the claim management phase is high along with requirement for additional resources outside of project team. |
| Expertise Requirement | 1 | Coordination of project team to manage the claim management phase is not complicated and within the project team. Low magnitude of data retrieval and analysis. Decisions are made without great efforts and determined within the project team |
| | 2 | Coordination of project team to manage the claim management phase is complicated but within the project team. Medium magnitude of data retrieval and analysis. Decisions are made with efforts and determined within the project team |
| | 3 | Coordination of project team to manage the claim management phase is complicated and may require additional resources. High magnitude of data retrieval and analysis. Decisions are complex to be made |

Table 6 Thematic map of pre-identified categories in literature related to claim management.

| Category | Category | Subcategory |
|------------|-------------------------------------|--|
| Category 1 | Root Causes of Claims | Identification of Causes |
| Category 2 | Contractual Attributes | Management of Legal Documents Court-based Reference |
| Category 3 | Utilisation of Smart Data Analytics | Utilisation of Machine Learning Techniques in Research Methodology Utilisation of Machine Learning Techniques in claim management |
| Category 4 | Organisational Attributes | Claim Management Process Dispute Commercial Implication Decision Making |
| Category 5 | Operational Attributes | Claimed Cost Claimed Time Tools used in claim management Claim Category |
| Category 6 | Claim Avoidance | Measures for claim avoidance |

Claim Avoidance: similar to the literature focus on root causes of claims, but in this category the literature is highlighting mechanisms to avoid claims in relation to specific causes.

Consequentially, categories 1, 2, 4 and 5 are the main themes in claim management literature, based on the reviewed papers. While

category 1 is focusing on root causes of claims, Category 2 is the highest present category in the reviewed papers and focusing on contractual attributes predominantly management of legal documents and the divergence in stakeholders' interpretation of contracts. Category 4 is focusing on organisational attributes, predominantly claim management process. Category 5 is focusing on operational attributes. It is important to highlight that a second to last category is the utilisation of smart data analytics. Fig. 7 is showing the categories and their presence in reviewed papers in this study.

5.2. Persisting challenges facing claim management from industry's point of view

The interviewees and existing literature highlight similar challenges in claim management within the construction industry. Table 7 is showing quotations from interviewees that highlight these challenges. In Table 8, the authors show the challenges related to each phase of the process based on the interviews conducted from construction industry. The hatched numbers are representing the challenge facing the phase. For instance, the cost and time required to prepare a claim is a constant element across the process, therefore, challenge 1 is related to all phases. Similarly, Challenges 2 and 3 are related to all phases, because the lack of knowledge of contract provisions and managing claims can impact all phases.

A significant challenge was identified by interviewees which is the lack of understanding of contracts. This challenge is hindering the efficiency of claim management. This challenge is difficult for all project stakeholders, as articulated by Raj et al. (2009), due to the complexity of legal language in construction contracts. Divergence in interpreting contract clauses among stakeholders demands cohesive interpretation techniques, which potentially leveraging the requirement for smart data analytics.

Interviewees and literature converge on the critical need for expertise in claim management, encompassing contract terms, procedural understanding, records management, and quantification. They advocate integrating claim management as a core function of project management, akin to risk and contract management. This aligns with the literature's plea for specialized team members to oversee claims throughout the project lifecycle. Embedding claim management within project management ensures sufficient resourcing and cultivates expertise, countering the prevailing ad-hoc approach. This echoes Van

der Hoorn and Whitty's (2016) who emphasized on managing collective experience to address the persistent challenge of expertise shortage in claims management.

The lack of consistent organisational processes in claim management hinders project teams. Establishing structured processes enhances performance, ensuring predictability and control. Seo et al. (2021) emphasize the importance of process consistency for improved outcomes. Additionally, Kock et al. (2020) highlight the role of formalized processes in fostering shared understanding among project stakeholders. This addresses the persistent challenge of inconsistent organisational processes in claim management, as identified by both literature and interviewees. Severity levels for each challenge in claim management phases were assessed by interviewees, providing insights into their impact, as detailed in Table 8.

6. Discussion

Existing literature predominantly focuses on the elements of claims and the phases of claim management (Easton, 1989; Levin, 1998; Kartam, 1999; Kululanga et al., 2001; Bakhary et al., 2015; Wang and Wang, 2023). While Levin (1998) proposed deconstructing a claim into its fundamental elements to better understand the phenomenon of claims in the construction industry, Kululanga et al. (2001) identified specific phases for the effective management of claims. Building on existing literature, this study proposes a governance structure for claim management, encompassing claim elements, preparation initiatives, and management phases.

To develop a governance structure for claim management, the study introduced claim preparation initiatives categorized as people-led, organisational-led, and data-led. These initiatives are subsequently linked to the phases of claim management and their associated tasks. The proposed governance structure offers practical benefits, including the identification of tasks that require specialized expertise in claim preparation and the emphasis on the extensive use of data in every aspect of the process. Furthermore, the study highlights the importance of effective communication between stakeholder organisations and their project teams. In contrast, one interviewee mentioned that their organisation may voluntarily avoid pursuing claims, preferring instead to resolve conflicts through negotiation. This approach is aimed at maintaining strong commercial relationships with clients to secure future business opportunities. The tasks outlined within the proposed claim

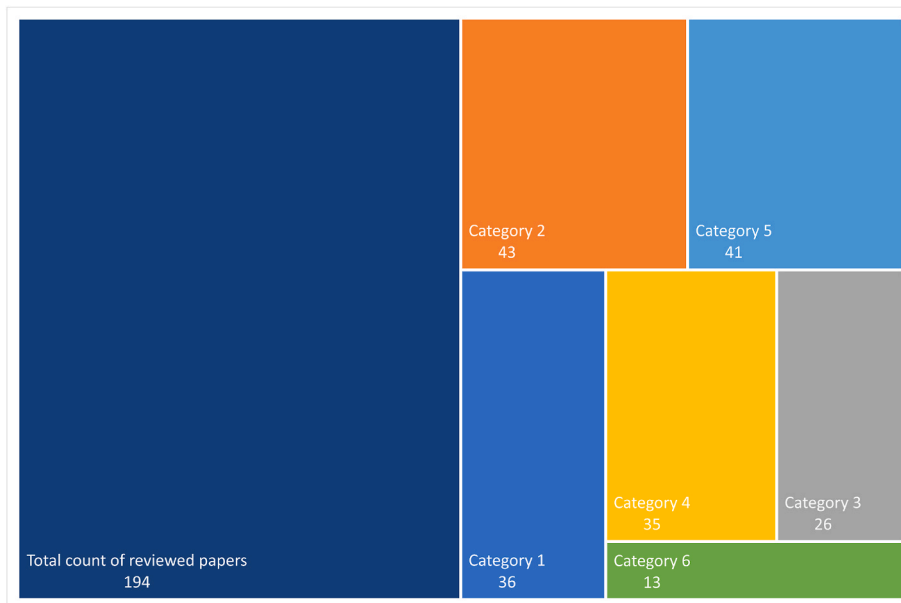


Fig. 7. Categories presence in claim management literature.

Table 07
Coding interviews results.

| Code 1 | Code 2 | Key Words from Quotations | Key words from Interpretation | Interview Question | Quotations | Interpretation | Interviewee |
|--------|--------------------|--|---|--------------------|--|--|---------------|
| ID | CH2, CH3, CH4, CH7 | Contract clauses | | Q1 | <i>"I encountered several claims during my career ... each claim was prepared differently in different projects within the same organisation ... my involvement in claims was to lead the team but responsibilities and accountabilities are often tangled and not clear in regard to prepare the claim ... it requires going through diaries, meeting minutes, tender documents, drawings, then to interpret contract clauses .. quantify the impact of the claim cost and time wise."</i> | | Participant 4 |
| ID | CH 1, CH2, CH3 | Time, A meeting, Cost, Identify, Contract | *Time to identify was minimal *No additional cost *Contract interpretation | Q2, Q3 | <i>"a construction manager identified part of the site has contaminated soil during the weekly team meeting and there was no allowance for such site condition in the estimate. Later we organised a meeting with the contract admin along with construction manager to discuss. It did not take much time to know we need to raise a claim to get extension of time and cost to apply the right treatment however it was not clear if this problem was mentioned during the tender phase ... also we were not able to be sure that it is not our responsibility since we had an opportunity to do site survey and geotechnical studies."</i> | 1. Time to identify the claim event was minimal 2. Few team members were involved for few meetings. 3. No external members or additional cost. 4. Managing this phase was not difficult but requires understanding of the contract | Participant 4 |
| NO | CH 1, CH3 | Delay, Met, Early warning, Time-bar | *Time to identify was minimal *No external resources, so no extra cost. * Early warning as a notification | Q2, Q3 | <i>"We had a delay in the delivery of one of the lifts coming from Europe and there were delays due to COVID, I met with the commercial manager and the project planner to assess the situation. When we added the delay to the critical path so we asked the contract admin to issue an early warning even if we still assessing the situation so we can avoid time-bar."</i> | 1. Time to identify the claim event and prepare the early warning was minimal 2. Few team members were involved for few meetings. 3. No external members or additional cost. 4. Rush to issue early warning to meet time-bar in the contract without detailed review | Participant 1 |
| EX, DO | CH4, CH5, CH6 | Poor Records, Experience, Tools, Hundreds of documents | * Time consuming tasks. * Magnitude of data. *Contract interpretation * Analysis techniques | Q6, Q7 | <i>"I was asked to support the team to prepare a claim ... the company paid liquidated damages and they wanted to pursue the responsible sub-contractor for compensation. The project team was blaming this sub-contractor for the delays but when I looked at what documents they had to build their claim, I found very poor records ... inconsistent reports or incomplete program of works with excessive float which indicate broken logic in the programI have to go through hundreds of documents to build the claim ... we had to rehire some of team members to support the claim ... we had to examine the legal aspect so a lawyer was involved eventually.. we could not build the claim because we did not have sufficient records or evidence ... it was oblivious the project team did not have experience in managing extension of timealso, there is no smart way to extract information from unorganised documents. "</i> | 1. Time consuming tasks were conducted to examine the claim. 2. Involvement of various team members. 3. External resource was utilised - extra expenses. 4. Contract interpretation. 5. Prepare evidence to support the argument from different sources and going through hundreds of documents. 6. No tools to analyse the data (manual analysis). | Participant 5 |
| PR, NE | CH2, CH3, CH7 | Poor Records, Contractual Grounds, Evidence, Negotiation | | Q5, Q6 | <i>"When the contractors submit their claims, most of the time I don't find a cohesive narrative based on contractual grounds. Also, if the contractor advised regarding their contractual grounds, they do not mention what mitigation steps were taken to reduce the impact of the claim event ... this plus poor records can cause the failure of the negotiation ... it makes difference when the contractor is prepared with evidence and understanding of the process ... it is important that the contractor understands their flexibility to reach an agreement."</i> | | Participant 6 |

preparation initiatives are designed to support organisations in preparing for such negotiations. In doing so, the study answers its first research question regarding the elements of an effective governance structure for claim management.

Despite extensive research in claim management, the authors

identified seven significant and ongoing challenges that remain unresolved. Recent publications and findings from interviews with project practitioners in this study align with and confirm the persistence of these challenges (Seo et al., 2021; Arcadis, 2022; Parchamijalal et al., 2023; Asadi et al., 2023; Cevikbas et al., 2024). Seo et al. (2021) interviewed

Table 8
Challenges facing claim management with their severity level linked to claim management phases. Hashed numbers within each phase represent associated challenges.

| Claim Management Phase | Challenge Label | Severity | | | Challenge Severity Score | Severity Level of the challenge | Severity Reasons |
|------------------------|-----------------|----------|------|-----------|--------------------------|---------------------------------|---|
| | | Time | Cost | Expertise | | | |
| Identification | 1 | 1 | 1 | 1 | 3 | Low | Low time and cost requirements - Only cost associated with project team |
| | 2 | 2 | 1 | 3 | 6 | Medium | Very sever - Require proper understanding of contract entitlements and obligations - May cause missing Opportunities to raise a claim or raising low-probability claims |
| | 3 | 1 | 1 | 3 | 5 | Medium | Managing this phase is not difficult but require expertise to coordinate the efforts between project team - Require decision making |
| | 4 | NA | NA | NA | NA | NA | NA |
| | 5 | NA | NA | NA | NA | NA | NA |
| | 6 | NA | NA | NA | NA | NA | NA |
| | 7 | 1 | 1 | 3 | 5 | Medium | Decision making will require intraorganizational communication |
| Notification | 1 | 1 | 1 | 1 | 3 | Low | Low time and cost requirements - Only cost associated with Contract admin/legal - Time to prepare Early Warning |
| | 2 | 2 | 1 | 2 | 5 | Medium | Very sever - Require proper understanding of contract clauses - Can cause missing required time bar |
| | 3 | 1 | 1 | 1 | 3 | Low | Managing this phase is not difficult but require expertise to coordinate the efforts between project team |
| | 4 | NA | NA | NA | NA | NA | NA |
| | 5 | NA | NA | NA | NA | NA | NA |
| | 6 | NA | NA | NA | NA | NA | NA |
| | 7 | 2 | 1 | 2 | 5 | Medium | Lack of organisation process can cause non-compliance with contract clauses - Require effective intraorganizational and interorganisational communications |
| Examination | 1 | 3 | 3 | 3 | 9 | High | Cost and Time intensive - Retrospective investigation aligning the facts, conducting technical and contract checks to ensure there are grounds for the claim |
| | 2 | 3 | 3 | 3 | 9 | High | Intensive contract checks for entitlement and obligation - Contract understanding to establish the grounds for claim- Legal consultation |
| | 3 | 3 | 3 | 3 | 9 | High | Managing this phase is very difficult and require expertise in claim management to coordinate the efforts between project team |
| | 4 | 3 | 3 | 3 | 9 | High | Prepare evidence from several sources such as contract conditions, specifications, project schedules, meeting records, measurement methodologies, progress reports, change logs and correspondences - Contradiction between documents can impact admissibility of evidence. |
| | 5 | 3 | 3 | 3 | 9 | High | Retrieving relevant documents is time consuming process - Interpretation of documents based on expertise. |
| | 6 | 3 | 3 | 3 | 9 | High | All efforts are manual – No systematic data analytical techniques to help the project team – All efforts based on expertise that is not common or exist in most of project teams |
| | 7 | 3 | 3 | 3 | 9 | High | No clarity of what next steps and what is the effect of the claim on commercial ties between organisation – No centralised support for project team from their organisation – All efforts will be managed based on the project team expertise |
| Documentation | 1 | 3 | 3 | 3 | 9 | High | Collecting relevant documents is cost and time intensive process |
| | 2 | 3 | 3 | 3 | 9 | High | Collection of evidence according to the contract requires extensive expertise in contract management |
| | 3 | 3 | 3 | 3 | 9 | High | Lack of expertise can impact the admissibility of evidence and collection of data |
| | 4 | 3 | 3 | 3 | 9 | High | Extensive time required for organisation of data from different sources |
| | 5 | 3 | 3 | 3 | 9 | High | Difficult to build a claim from project records that poor in quality |
| | 6 | NA | NA | NA | NA | NA | NA |
| | 7 | 3 | 3 | 3 | 9 | High | Lack of structured process may cause inconsistency in collection of data required for each phase of the claim |
| Presentation | 1 | 2 | 2 | 1 | 5 | Medium | Time and cost associated with claim presentation. |
| | 2 | 1 | 1 | 1 | 3 | Low | This phase will require understanding of contract clauses |
| | 3 | 3 | 2 | 3 | 8 | High | Presenting the information in a narrative style meeting will require expertise in claim management and dispute resolution process. |
| | 4 | NA | NA | NA | NA | NA | NA |
| | 5 | NA | NA | NA | NA | NA | NA |
| | 6 | NA | NA | NA | NA | NA | NA |
| | 7 | 1 | 1 | 1 | 3 | Low | Lack of structured process may cause weak presentation of the claim |
| Negotiation | 1 | 1 | 2 | 2 | 5 | medium | Cost and time required for negotiation involving mediator |
| | 2 | 2 | 1 | 3 | 6 | Medium | This will require understanding of contract regarding dispute resolution |
| | 3 | 3 | 3 | 3 | 9 | High | This phase will require expertise in dispute resolution process and techniques in negotiation |
| | 4 | NA | NA | NA | NA | High | NA |
| | 5 | NA | NA | NA | NA | High | NA |
| | 6 | NA | NA | NA | NA | High | NA |
| | 7 | 1 | 1 | 3 | 5 | medium | Lack of structured process may limit the negotiation process |

21 project practitioners, each with an average of 17 years of experience in the construction industry, representing various international organisations operating in South Korea. Although their study primarily aimed to identify performance indicators for claim management, it also highlighted key challenges in the field. Similarly, Narayan et al. (2023) conducted a qualitative literature review from 1995 to 2021 and identified five comparable challenges. In conclusion, the existing research has not yet fully addressed the challenges facing claim management. By identifying these persisting seven challenges, the study answers its second research question regarding the major challenges in claim management.

The authors in this study argue that these challenges are not addressed because of the absence of smart data analytics in claim management. Smart data analytics refer to machine learning techniques that can support in analysing the magnitude of data and its different types involved in claim preparation providing a cohesive claim argument based on a precise interpretation of contract, substantiable claim documents and predictability of claim outcome. As an example, machine learning techniques such as natural language process (NLP) can interpret contract clauses, while support vector machines (SVM) can classify and analyse unstructured documents. Logistic regression and decision trees can predict claim outcome based on specific criteria. As highlighted in this study, data is integrated in all claim preparation initiatives which provides the opportunity to deploy smart data analytics or their outcome in each preparation initiative.

Narayan et al. (2023) argued that information technologies can enhance the efficiency of claim management and address the challenges. Also, the authors in this study argue that utilisation of smart data analytics can address most of these persisting challenges. Efficient analysis by machine learning techniques for poor quality records and different type of data will reduce the cost and time associated with claim preparation. Utilising NLP in claim preparation will help project practitioners in understanding contract jargons and prepare the claims according to contract clauses. Predictability of claim outcome using machine learning techniques, such as logistic regression, will support decision making. Also, the use of these analytics can promote the compliance and consistency across different claims which can lead to a structured organisational claim preparation process.

In evaluating the current research themes in claim management, an analysis of 194 papers showed a concerning trend: only 13.4% focused on utilisation of smart data analytics in claim management, while 22.2% concentrated on contractual attributes such as contract interpretations, and 18% on the claim management process. Additionally, 18.6% represent the causes of claims, 21.1% represent operational attributes of claim management with the remainder 6.7% is exploring claim avoidance. This result reveals a significant gap in the literature regarding the use of smart data analytics in claim management, underscoring the need for increased focus in this area. Thus, the authors suggest that future studies are required to investigate and define the role of smart data analytics in claim management.

Lastly, the study explored how the political domain addresses similar challenges, particularly in governance. It was noted that governance in politics overcomes similar challenges by adopting data-driven decision-making. Furthermore, the concept of governmentality in politics, promoting self-governance through clarity and motivation driven by shared data and informed obligations, was highlighted. However, the authors are neither trying to measure the success of elements of governance in politics nor arguing regarding the efficiency of political policies derived from the three-process of governmentality in politics. The authors suggest that adopting governmentality in claim management through utilisation of smart data analytics to develop data-driven analysis and decision-making provide a resolution to the of the persisting challenges identified in this study. Thereby, the study answers its final research question by exploring how other domain has effectively addressed similar challenges.

6.1. Study practical and societal implications

The study presented a governance structure for claim management, linking it to claim preparation tasks categorized under people-led, data-led, and organisational-led initiatives. These initiatives offer project practitioners valuable insights into the requirements for claim preparation. Moreover, the study emphasized that data is integral to all initiatives, creating an opportunity for the use of smart data analytics, such as machine learning techniques. Such opportunity has the following implications:

- Reduce construction disputes: By assisting project teams in predicting claims outcome and supporting decision-making during claim preparation, contractors can focus on pursuing viable claims with a higher likelihood of success. This predictive capability improves the efficiency of the claim preparation process and can reduce potential conflicts.
- Reduce claim preparation costs and time: By avoiding the expenditure of resources on low-probability claims, project teams can optimize efforts and minimize waste. Additionally, the use of smart data analytics to prepare claim documents and evaluate their admissibility will further streamline the process, reducing both time and costs involved in claim preparation.
- Foster autonomy and collaboration in claim management: by adopting governmentality in claim preparation. This approach can be achieved through cultural design that relies on clarity and transparency (Clegg, 2019). The use of smart data analytics will enhance clarity and transparency by providing greater accessibility and traceability of data. This can facilitate effective communication and collaboration between project stakeholders. This cultural design also encourages autonomy in claim preparation, enabling teams to operate independently while preparing and managing claims. As a result, governmentality will serve as a reciprocal strategy for managing claims, helping to avoid disputes and litigation.

6.2. Study limitations

Despite the insights provided regarding claim management through literature review or interviews, the study acknowledges several limitations. The application of smart data analytics in claim management is still requiring further empirical studies to validate the efficiency of these techniques. Additionally, there is a need to develop more comprehensive data-driven models that can be used to optimize claim management process. Future research in claim management should focus on investigating the deployment of these models and their practical benefits and limitations. This will support in addressing the identified challenges facing claim management. In addition, it will provide the opportunity to deploy consistent organisational claim management process. Also, there is a limitation of using convenience sampling in this study since it can be influenced by subjectivity and limited generalizability due to non-representative nature of the sampling method.

7. Conclusion

There is a stagnation in offering practical resolution for the persisting challenges facing claim management. The themes in the current literature closely mirror research conducted decades ago. Also, there is a notable absence of convincing evidence regarding the effectiveness of any suggested remedies to claim management challenges (Kululanga et al., 2001; Ahmed et al., 2003; Zinedine, 2006; Toor and Ogunlana, 2008; Bakhary et al., 2015; Seo et al., 2021). In contrast, the literature related to governance in politics demonstrates a swift adoption of modern solutions. These solutions are closely linked to the realm of smart data analytics. The authors argue that the adoption of smart data analytics in the claim management process has the potential to resolve this stagnation and drive improvements.

The governance in claim management in construction industry is neither well defined nor structured and surrounded by lack of clarity and self-governance, and more importantly lack of smart data analytics utilisation. These can explain why the seven challenges facing claim management preparation, identified through literature review and revealed during interviews, have persisted.

This study analysed the governance in claims in construction industry, specifically in infrastructure projects, by dismantling claim definition and claim preparation initiatives, and reassembling them into people-led, data-led and organisational-led initiatives. This serves to set the stage for unorthodox solution to address the claim preparation challenges. It was found that governmentality has a real potential to address the identified challenges through embedding smart data analytics in the claim preparation initiatives across the claim's lifecycle.

In addition, the authors suggest adopting claim management as a project management function and considering the claim management process as early as project initiation (Okere and Giroux, 2023). Also, it will help the construction industry to have dedicated resources in major projects for claim management. This will build strength and expertise among construction practitioners, particularly in relation to managing claims. However, the authors acknowledge that such suggestion requires further future investigation.

CRedit authorship contribution statement

Joseph Awed: Writing – original draft, Conceptualization. **Alireza Ahmadian Fard Fini:** Writing – review & editing, Writing – original draft, Supervision.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT in order to reduce the words count in the paper. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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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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