Paradigm shift of Claims Management to Digital Space

S.Narayan, sn42@hw.ac.uk
School of Energy, Geoscience, Infrastructure and Society, Heriot-Watt University, Edinburgh, Scotland, UK

Dr.H.C.Tan, h.tan@hw.ac.uk
School of Energy, Geoscience, Infrastructure and Society, Heriot-Watt University, Putrajaya, Malaysia

Prof.L.B.Jack, l.b.jack@hw.ac.uk
School of Energy, Geoscience, Infrastructure and Society, Heriot-Watt University, Edinburgh, Scotland, UK

Abstract
Claims in the construction industry are considered unavoidable and can have severe consequences if not managed properly. Claims management has taken prominence in recent years due to the large number of disputes occurring. Inefficiency and lack of competency of both the process and personnel make claims management a cumbersome affair to both the claimants and respondents. This paper aims to review the transformation of the claims management process from being a manual process to a semi-automated one, and how the advanced information and communication technology (ICT) available can be leveraged to further enhance the management of claims, as well as to address the aforementioned issues. The paper begins by discussing the claims management process in brief and illustrates the need to have a system aided by ICT for reducing manual effort and thereby improving the efficiency and the accuracy of the processes involved. The paper then reviews the existing claims management systems available, the impact of IR4.0 and emerging technologies on claims management practice, before discussing the need for a fully integrated cloud-based claims management system capable of bringing about the aforementioned needs and desired benefits.

Key words
BIM, Claims Management Systems, Cloud computing in construction, Construction claims.

1 Introduction

The construction industry is the largest in the world in terms of volume and resources (Becerik 2004). Governments look to the construction industry to boost their economy by investing in infrastructure projects (Narayan and Tan 2019). However, the industry is fragmented, unorganised and labour-intensive which makes the task of managing and completing a project complex and tedious. The size of projects and related complex processes generate considerable risks and uncertainties. These uncertainties eventually give rise to claims which have a considerable impact on the financial balance of the project (Stojadinović 2018). Furthermore, studies have also shown that a considerable number of claims have been settled only by litigation, which is both costly and time-consuming (Bakhary et al. 2015).

It is a fact that claims management is a tedious process involving a considerable amount of documentation and synthesising a large volume of information (Shahhosseini and Hajarolasvadi 2021). The key element in claims management is the presentation of information for verification and the realisation of claims. This involves extensive documentation and processing it manually involves a sizable volume of resources, which eventually also increases the overall cost of the project

(Shahhosseini and Hajarolasvadi 2021). The increase in cost has a considerable impact on the profit margins (Hadi 2018). Also, the manual processing of claims management poses serious challenges not only to the claimants but the defendants as well, especially if the opposing party is well-prepared aided by ICT-based systems. (Tan and Anumba 2010).

The current trend of moving to the digital space presents an opportunity to have systems that make the processes easy, efficient and expeditious. Furthermore, the digital space has provided an opportunity to integrate the fragmented construction industry by providing boundaryless and compatible working platforms. This paper reviews the journey of the claims management process through the years and the transformation of the process to the digital space. This study aims to review the attempts to transform the claims management process through automation in the last 30 years. This study reviews the claims management process and the challenges encountered thereof. Further, it not only reviews the development of information systems for managing claims but also the individual processes like document management, dispute resolution etc. which form a part of the claims management. Finally, it presents a case for adopting cloud computing technology in managing claims.

2 Claims management – an inevitable process

Claims management is a widely studied domain in the construction industry. Being an integral part of contract administration, the concept of claims gains prominence due to its financial implications, both for the project and the organisation. Most researchers seem to agree that claims are inevitable within a project. Efficient handling of claims management paves the way for the successful closure of a project (Shen et al. 2017). The process of claims management starting from identification to negotiation for closure, if not followed diligently raises the possibility of escalating to a dispute and subsequently a bitter ending (Bakhary et al. 2015).

Claims in the construction industry is an extensively researched area (El-Ghrory et al. 2019). Considerable research has been undertaken to identify the types and causes of claims under various conditions and types of projects. The source of claims can be attributed to any stakeholder and can arise at any phase of the project. All forms of contract have clauses imbibed in them which stipulate processes for dealing with claims. However, the ambiguity in contract clauses and their subsequent interpretation by various parties may give rise to conflict. Thus, the management of claims becomes an essential part of the project management process (Project Management Institute 2016).

The lack of resources in terms of knowledge, technical know-how and lack of competency of staff make the claims management process challenging and problematic for both the claimants and respondents (Tan et al. 2018). Studies have shown that lack of awareness has resulted in claims being overlooked which have eventually cost the parties concerned dearly (Tan et al. 2018). The lack of contract knowledge and awareness among staff is a major problem in the identification of any claim (Bakhary et al. 2015). Timely notification of claims, a basic step in claims management, has also been a perennial problem faced by most contractors (Hayati et al. 2019; Bakhary et al. 2015; Chovichien and Tochaiwat 2004). Coupled with the poor knowledge of staff and poor documentation processes adopted, especially onsite, further jeopardizes the successful completion of the claims management process (Bakhary et al. 2015). Improper, inefficient and incorrect storage of information and records are a stumbling block in the preparation of proper documentation for claims examination and presentation (Hayati et al. 2019). Poor negotiation skills and inadequate documentation put the claimants on a backfoot and can eventually end up manifesting a loss for the claimants (Hayati et al. 2019).

Studies have suggested that claims management should be treated with the utmost importance for successful project closure. This effort should ensure that the process does not escalate into litigation (Bakhary et al. 2015). Project Management Book of Knowledge (PMBOK) construction extension (2016) presents an elaborate process to manage construction claims (Project Management Institute 2016). It suggests adopting the claims management process from the beginning of the project (Project Management Institute 2016). The importance of documentation and timely administration of a contract for claims has been stressed time and again by various researchers. Minimising the manual process ensures that the process of claims management is carried out accurately and with alacrity (Hayati et al. 2019; Tan and Anumba 2011).

3 The shift to digital space

The financial constraints coupled with the increasing age of our workforce globally is forcing a shift towards automation in all industries including construction (Woodhead et al. 2018). The rapid development of IT in recent years has enabled the processes to be digitised with considerable success and at a cheaper cost. The call for the adoption of IT across the construction industry is not new. The adoption of IT to support claims management was suggested in the late 1980's to early 1990's by various researchers. AbouRizk and Dozzi (1993) illustrated how a simulated model of actual scenario could help resolve construction dispute thus providing a strong basis for adopting IT in construction.

3.1 Claims Management System – Need

Time is a critical element in the process of claims management. All the forms of contract stipulate a time limit for the claims management process. Studies have shown that much of the time is spent on locating the documents and history for claims preparation (El-Ghrory et al. 2019). This leaves insufficient time for the preparation of the documents, and it results in a poor presentation for claims. Carrying out the processes manually not only consumes resources, but also tends give leeway for errors such as overlooking records or missing of documents. Automation of processes like storing and retrieving of documents reduce the time taken for these processes (Vidogah and Ndekugri 1998). Studies have suggested that adoption of information technology have aided in the improvement of project management processes (Ren et al. 2001). A well-designed decision support system can improve the efficiency and accuracy of decisions.

3.2 Claims Management System – Requirements

A claims management system (CMS) should have several features which make the system potent and user friendly. A good CMS should have a centralised database, provide contractual support, facilitate online claims transmittal, categorise claim types, track claims status, raise reminders and alerts, be user friendly and facilitate customisation (EL-Ghrory et al. 2019; Tan et al. 2011). Further, the system should cater to all major forms of contract and be commercially viable (Tan et al. 2011). Finally, a good CMS should minimise the manual processes by automating as many of these processes as possible.

3.3 Claims Management System – Early developments and Support

The earliest systems developed for managing claims and disputes were primarily rule-based expert systems (Alkass et al. 1995; Diekmann and Kim 1992; Arditi and Patel 1989; Kim and Adams 1989). The drawback of these systems was the handling of grey areas in contract administration (Bubbers and Christian 1992). Further, the lack of sufficient data proved to be a handicap in generating rules for all possible situations (Bubbers and Christian 1992). The low capability of computer hardware restricted the volume and types of data processing (Alkass et al. 1995). The limited infrastructure

facilities and lack of integration meant that the whole process was still predominantly manual and provided modest benefits (Alkass et al. 1995). Despite the concept of the expert system being considered in its twilight stage, the development of newer technologies has kept research in this area alive till recently. For instance, Elziny et al. (2016) developed an expert system (DRExM) utilising Visual Basic, MS Access and Visual Rule Studio, to manage dispute resolution in Egyptian construction projects.

One of the key elements to ensure the successful administration of claims is the documentation supporting claims and management of information. The early stages looked at digitising the process of administering and storage of documentation (Bjork 2001). Bjork (2001) also suggested the use of the internet for document management. It was purported that the digitisation of document management would yield a saving of 5 – 10% of the project cost (Bjork 2001). Database Management systems like MS Access, SQL server etc. provided a viable database management system which could be adopted for efficient documentation and further support the claims management process (Al-Sabah et al. 2003).

3.4 Claims Management System – Advancement and Maturity

The next stage of advancement came with the improved technologies such as Artificial Neural Networks (ANN) (Palaneeswaran et al. 2006), Fuzzy logic (Cheung et al. 2001), Data mining Techniques (Al Khaldi et al. 2019) etc. ANN, a step above the prior expert system, provided a platform for synthesising more complex processes with multi-variant functions. It was considered a 'thinking system' and had the potential to evaluate all possible outcomes. One drawback of ANN was the overfitting of data which make the results unreliable (Palaneeswaran et al. 2006). Palaneeswaran et al. (2006) suggested the adoption of ANN for predicting cost overrun and contractual claims. Chapalkar et al. (2015) presented a model for predicting the outcome of construction claim disputes using ANN. The model showed an accuracy of over 75% when the prototype was tested on existing cases (Chapalkar et al. 2015).

Cheung et al. (2001) adopted fuzzy logic to propose a construction dispute evaluation model for predicting disputes due to claims. Nasirzadeh et al. (2019) proposed a system using a hybrid-fuzzy-SD method to assess the financial consequences of claims. Al Khaldi et al. (2019) adopted data mining techniques to identify the main causes of construction claims in Egypt. With CMS attainting maturity, project management systems were designed to support claims management. Abdel-Khalek et al. (2019) proposed a method to prepare and analyse claims using Primavera Contract Management (PCM) program and Primavera P6. However, despite their maturity, all these systems were stand-alone, and a considerable number of processes were still manual and decentralised. With decision making become more centralised, a common platform for the process became the need of the hour.

3.5 Web based Claims Management Systems

A lack of adequate communication, knowledge transfer and integration etc. presented a strong case to move towards web-enabled systems (Alshawi and Ingirige 2003). The period of 2000 – 2010 saw an increased interest in the research of the application of web-based systems in the construction industry. These applications ranged from systems for managing information and knowledge (Ozorhon et al. 2014; Chassiakos and Sakellaropoulos 2008, Ahuja et al. 2006, Scott et al. 2003), document management systems (Forcada et al. 2007), contract management (Kwok et al. 2007), predicting construction claims (Chau 2007), project monitoring (Palaneeswaran and Kumaraswamy 2008) to complete project management (Nitithamyong and Skibniewski 2004; Chan and Leung 2004).

The web-based claims management system proposed by Tan and Anumba (2010) consists of a transaction system to manage the workflow and documentation and also allows capture of the knowledge from each process (Tan and Anumba 2010). The system also has the potential of integration with BIM which can enhance the effectiveness of claims management process. Even though this system has been developed based on the PAM contract as used in Malaysia, the concept can be applied to other forms of contract as well. Hayati et al. (2018) developed a prototype claims management system to minimise disputes in Design and Build infrastructure projects. This system provides for risk identification and prevention, contract management, claims administration and documentation and dispute resolution (Hayati et al. 2018). Though, developed for a Design and Build form of contract only, the authors opine that the system can be adapted for other forms of contract with further research and development (Hayati et al. 2018).

Though Web-based systems present many advantages, especially real-time knowledge transfer, they are not without drawbacks. Internet access, stability and bandwidth is a major problem in the implementation of web-based applications (Nitithamyong and Skibniewski 2004). Further challenges to the adoption of web-based systems in practice include system reliability, password barriers, software interoperability and collaborative maturity (Nitithamyong and Skibniewski 2004).

3.6 BIM and Claims Management – A comprehensive solution?

The advent of BIM over recent years has propagated a new paradigm in the field of project management in the construction industry (Wong et al. 2014). Originally, the use of BIM was predominantly for design, however, further developments in recent years have added additional dimensions which envisage the project in its entirety starting from concept through to facilities management (Shahhosseini and Hajarolasvadi 2021). The 3D element of BIM can assist contractors to monitor the project virtually and improve the process of site management (Gardezi et al. 2013). The fourth (4D) and fifth (5D) dimensions offer assistance towards monitoring of projects in terms of time and cost respectively (Gibbs et al. 2013, Gardezi et al. 2013). BIM also provides an additional tool in the process of retrieving information, which is a key element in claims management.

Marzouk et al. (2018) illustrated the need to adopt BIM in claims management with a case study. Their aim is to facilitate forecasting of the possibilities of claim events through visualisation (Marzouk et al. 2018). Gardezi et.al. (2013) proposed the adoption of BIM as a conflict resolution tool for the Malaysian construction industry. Their framework proposed BIM as an integrated project delivery tool that can efficiently manage and evaluate the onsite construction process and minimise the causes of disputes due to claims (Gardezi et al. 2013). Ali et al. (2020) developed a BIM-based CMS for managing Extension of Time (EOT) claims. Autodesk Revit was used as the BIM platform with the BIMCMS as a plugin (Ali et al. 2020). However, the system still had some manual features which limited its full potential (Ali et al. 2020).

The advantages presented by BIM, especially concerning information stored, make it a potent tool in managing projects more efficiently (Shahhosseini and Hajarolasvadi 2021; Gibbs et al. 2013). Studies have shown that BIM enhances the overall performance of the project in terms of design, onsite coordination, quality control and compliance, delays and budgets and safety (Eadie et al. 2013). Improved performances in the project, directly and indirectly, co-relate to reduced claims. The added advantage BIM presents is the virtual visualisation which gives the decision-makers a feel of reality. The need for trained personnel, high capital investment, legal issues and cultural reluctance are some of the issues which make wide implementation of BIM a challenging affair (Eadie et al. 2013). Further, like other systems, lack of immediate benefit can prevent the stakeholders from investing in BIM.

4 Industrial revolution 4.0 – the future

The current age is often referred to as the Industrial Revolution 4.0 (IR4.0), the first three being mechanisation, electrification, and mass production and finally electronics and digitalisation (Alaloul et al. 2020; Woodhead et al. 2018; Oesterreich and Teuteberg 2016). The essence of IR4.0 is the move towards the digital space with the help of the latest technologies. IR4.0 presents tremendous opportunities for the construction industry across seven factors namely political, economic, social, technological, environmental, legal and security (Alaloul et al. 2020). Concepts and technologies like IOT (Woodhead et al. 2018), Big Data (Narayan and Tan 2019), Blockchain (Belle 2017) and Smart technologies (Maskuriy et al. 2019) are gaining visibility in the construction industry. Studies have shown that technologies like BIM, cloud computing, mobile computing, modularisation are in vogue and being commercialised (Oesterreich and Teuteberg 2016). Considering the fragmented nature of the construction industry with multiple stakeholders and multiple layers of decision-making levels, the implementation of IR4.0 processes does present a viable solution for convergence.

4.1 Cloud computing in project management – opportunities and challenges

Cloud computing, one of the key technologies within the IR4.0 scenario, presents a multitude of advantages for the construction industry. The primary opportunity cloud computing presents is that it promotes sustainable construction by going paperless (Rawai et al. 2013). Cloud platforms provide an opportunity to manage remotely; a facility that becomes very useful for organisations involved in running projects which are geographically diverse (Garyaev and Rybakova 2018). Cloud space also enables an efficient, economic way of managing resources as it facilitates the sharing of digital spaces (Rawai et al. 2013). Cloud-based BIM technology enables an advanced level of project management with better collaboration, communication, and visualisation (Wong et al. 2014). Access to the internet, stable connectivity, data security, financial viability and problems encountered by third-party service providers are some of the challenges in cloud computing (Narayan and Tan 2019). The handling of a cloud, both hardware and software, platform by a third party does raise scepticism among end-users in terms of security (Narayan and Tan 2019). The lack of clarity on the ownership, responsibility and liability of cloud-based BIM models does present some legal challenges (Wong et al. 2014).

4.2 Cloud based systems for claims management – the emerging paradigm

In the last 25 years, considerable efforts have been made to facilitate the automation of claims management process or part thereof. Every stage of development endeavoured to bridge the gaps and further improve on the previous stage. Expert Systems attempted to replicate human expert knowledge. Artificial Neural Networks attempted to improve upon Expert Systems to make systems look more human. Web-based systems looked at improving the efficiency in communication, access, and knowledge transfer. BIM further improved the claims management process through visualisation. Furthermore, newer technologies are being adopted to develop systems to improve upon the existing concepts like more advanced Expert System shells.

Most of the systems developed so far focus on only one or a few areas of claims management. An integrated system which encompasses the complete solution of knowledge storage and transfer, CMS and BIM for visualisation can provide wide-reaching benefits for effective claims management. However, adoption of such a system, despite the underlying benefits, would be a challenge due to the high initial investment on the system. Though, studies have focused on improving the process using ICT, the rate of return of investment is still not clearly illustrated, thus deterring the stakeholders from adopting ICT systems. Cloud-based systems present a possible solution with ready to use systems and could attract a greater number of users towards adopting ICT. The user would pay only for the service which would be far less compared to investing in the entire system and eliminate the

problems related to ICT, especially for small and medium enterprises (Jardim-Goncalves and Grilo 2010).

The implementation of a cloud-based framework within the construction industry commenced after 2010 (Kumar et al. 2010). Cloud computing, though a relatively new concept in IT, is now rapidly evolving (Garyaev and Rybakova 2018). Current studies are focussing on implementation of cloud-based systems in various aspects of construction industry including claims management. The conceptual model for a cloud-based knowledge brokering platform for managing construction claims proposed by Tan and Anumba (2018) provides the much-needed thrust to the process of claims as it combines both the knowledge transfer system and the CMS. Chen et al. (2019) have proposed a contract management system based on a cloud Enterprise Resource Planning (ERP) system and developed for small and medium-sized enterprises in China. Li et al. (2020) have proposed a cloud-based conceptual model for managing the higher dimension knowledge in BIM.

5 Conclusion

It has been widely acknowledged that the digital space is the future of the world, and the current pandemic has given a glimpse of things to come. The adoption and implementation of IR4.0 is being extensively explored across both geographies and industries. In the past construction industry has been slow to adopt newer technologies, however, the current scenario presents an opportunity to change this perception. Studies have identified claims to be one of the most disruptive processes in construction industry and carrying out the processes manually creates further challenges. Considerable losses are incurred due to poor management of the claims process by both the claimant and the defendants. The competitive nature of the industry illustrates the need for automation of the claims management process and increased use of ICT. The review of literature of current systems suggests that significant effort has been made in the research of automating the claims management processes or part thereof with moderate success. The processes in construction industry are still predominantly manual with organisations still reluctant to adopt ICT for various reasons. There is another school of thought which opines that all process cannot be automated especially in areas of claims management like negotiation and dispute resolution (El-Ghrory et al. 2019). ICT systems will not be able to replicate human decision-making processes which in a way contradicts the IR4.0 paradigm and smart construction which attempt to minimise human intervention. Studies have suggested that adoption of ICT for communication, storage, document management can help save resources in terms of time, space, and cost. Though, in the process of decision making, having systems to replicate human thinking is still a challenge, adoption of ICT does help in analytics. Thus, this calls for a balanced approach in the adoption of ICT systems to achieve optimal result. Cloud computing has the potential to facilitate a wider adoption of ICT in construction. Cloud computing, which provides software, platform and infrastructure as service, can alleviate common problems of ICT faced like heavy investment and interoperability and thus provide a wider reach of use of ICT (Jardim-Goncalves and Grilo 2010). Cloud computing being the future, a system based on cloud computing would assist in further improving the claims management process.

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