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# ISO 19650.3 and the digitisation of operations in strata-titled residential apartment developments

K. Tanfield<sup>1,2</sup>, C Heywood<sup>2</sup>, G Warren-Myers<sup>2</sup>, M Kalantari<sup>2,3</sup> and D. Shojaei<sup>1,2</sup>

<sup>1</sup>Building 4.0 CRC, Caulfield East, Victoria, Australia

<sup>2</sup>University of Melbourne

<sup>3</sup>University of New South Wales

**Abstract:** The purpose of this paper is to identify shortcomings of the application of ISO 19650.3: Organisation and digitisation of information about buildings and civil engineering works including building information modelling (BIM) Information management using building information modelling Part 3: Operational phase of the assets during the design, documentation, and construction of strata-titled residential developments. The problem is that the original owner/clients of these speculative developments have little interest in the long-term management or operations of these buildings. As a result, these owners are not motivated to ensure that the information required for the development of an asset information model (AIM) is defined, identified, and provided to the future owners of these buildings. This paper compares traditionally accepted development models of most commercial, industrial, and institutional projects to that of apartments sold ‘off-plan’ during construction, using a content analysis of ISO 19650.3 as the theoretical lens. The theoretical application of ISO 19650 to strata-titled residential development identified challenges to the processes identified in this standard. This research made it clear that ISO 19650.3 cannot be applied to speculative development in its current form and that modifications are required if the digitisation of operations of speculative residential development is to be realized.

## 1. Introduction

This study originated from the authors professional experience as a consultant to residential owner’s corporation committees in Melbourne, and from personal observations as an owner and active participant of an owner’s corporation committee, also in Melbourne. The approach adopted for this study was exploratory as it sought to understand why owners’ corporations were not referring to the building information generated during the design and documentation of buildings to better inform repair and maintenance processes.

An attempt to provide for the future digital management of operations of new strata-titled residential apartment developments in Melbourne, Victoria by applying ISO 19650.3 was carried out in recognition of the increasing complexity of these developments, and by extension any subsequent repair and maintenance work that would be required over the life of these buildings. This theoretical exercise was carried out as part of a current PhD that is looking at factors thought to be impacting the post-construction digitisation and management of independently owned but cooperatively managed, medium-rise to high-rise, strata-titled residential apartment developments in Melbourne, Australia.

ISO 19650.3 (and the ISO 19650 series in general) advises that the processes include in this set of standards are ‘applicable to all types of construction projects including individual buildings and large estates’. On application however, it was noted that these standards are designed around traditional concepts of building procurement and delivery, i.e., a single organisational client who both



commissions, and is later responsible for the management of the ‘asset’. Coupled with this model is the assumption that client organisations employ teams of specialists to advise on the various aspects of project information requirements and operation management deliverables identified in these standards and that these teams operate in a collaborative environment working to a common objective.

The reality of strata-titled residential development in Australia is very different. Privately funded strata-titled residential development is predominantly speculative. While the speculative model largely follows the traditional procurement model during the *Delivery Phase of the Assets*, with the developer (as ‘appointing party’ or client) making all of the decisions that impact the end-users, developers then walk away or in some instances, disappear entirely in a practice referred to locally as ‘phoenixing’(1). Either way, the developer is not involved in the management of strata-titled residential apartment development during operations and therefore has no incentive to contract the development of the projects building information model (BIM) or otherwise provide for the BIM-derivative asset information model (AIM) in accordance with ISO 19650.3. The motivations of developers with respect to the identification and provision of the information required for operations (including digital information) in addition to the lack of continuity between the ‘Delivery Phase’ and the ‘Operations Phase’ therefore has a significant impact on the future digitisation of operations for speculative residential developments.

The purpose of this paper is to identify the shortcomings associated with the application of ISO 19650.3 during the design, development, and construction of strata-titled residential apartment developments and to consider the impact of these shortcomings on the development of a digital asset information model for use during the operational stage of these important buildings.

## 2. Terminology

A general lack of agreement on even common terms is widely acknowledged as an ongoing problem throughout the construction industry(2). Terminology that affected this research extended from the generic use of expressions such as ‘assets’ and ‘asset information models’, to the multitude of terms associated with strata-titled residential apartment developments in academic literature. These issues continued through the identification of ‘operations’ in residential apartment buildings, and by association, the lack of acknowledgement of the managers responsible for ‘operations’ in this sector. This section looks at terminology associated with each of these areas and the implications of an understanding of these terms on the application of ISO 19650 to strata-titled residential developments.

### 2.1. *Strata-titled residential developments*

The term ‘strata-titled residential apartment developments’ is used here to refer specifically to speculative residential developments (3) i.e. residential developments resulting from short-term developer/client ownerships where each unit is sold by separate ‘strata-title’. In this model, common areas, which is all land, structure, fixtures, and fittings located outside of the private envelopes or lots, are required to be managed by a separate legal entity made up of all new owners and overseen by a representative committee of these owners. Terms associated with these legal entities include Owners Corporations, Body Corporates, and Condominium Corporations [4]. The term Homeowners Associations is also used in the USA but as it is used in the UK to refer to Registered Social Landlords or Private Registered Providers of Social Housing. (5), the term Owners Corporation is used here. Terms associated with the executive committees of management of these legal entities include the Committee of the Owners Corporation (6), the Body Corporate Committee (7), the volunteer board of unit owners/elected owners (4) and/or Condominium Board of Managers (4).

### 2.2. *The ‘operational phase’ of assets*

The operational phase of an asset is defined in ISO 19650 series as “that part of the life cycle (of a building) during which an asset is used, operated and maintained”, with ‘asset’ identified as an “item, thing or entity that has potential or actual value to an organisation”(8).

The assets associated with Owners Corporations are the common property. Residential common property usually includes all shared areas such as foyers, car parks, and gardens. The common

property also includes the whole of the external building envelope, where ‘assets’ are identified as roofs, external walls, windows, external doors, external claddings, balcony balustrades, associated fixtures and fittings (including landscaping) and all shared services. Many new residential buildings also include swimming pools, gyms, and shared office facilities, all of which would be included in definitions of common property. These areas are not usually associated with ‘assets’ or ‘operations’ in the same sense as sports arenas, office buildings, industrial plant or institutional developments as these areas are seldom formally overseen by a specialist manager. The ‘management of operations’ in strata-titled properties refers specifically to the legal obligations of the Owners Corporation as defined in the Victorian Owners Corporations Act, namely the carrying out of repair and maintenance of these common area assets (6).

### 2.3. Managers of strata-titled residential apartments

The managers associated with strata-titled residential apartments as identified to date include strata managers, body corporate managers, condominium managers, property managers, real-estate agents, building managers and occasionally concierges. The first three are associated with Owners Corporations while, in Australia, property managers and real estate agents are associated with the leasing of individual private apartments and the management of tenants. There is currently no empirical evidence that identifies how many residential apartment buildings in Melbourne include building managers or concierges, or other professional management types such as asset managers or facility managers but preliminary investigations suggest that most small, medium-rise and high-rise apartment developments in Melbourne only engage managers that identify as strata managers. The ISO 19650 series of standards only recognise asset managers and facility managers and uses the term ‘asset management’ to cover both management types [9].

## 3. Structure of paper

This paper opens by introducing the problem of applying ISO 19650 for the digitisation of strata titled residential apartment developments by identifying a ‘disconnect’ between the requirements of a standard designed around traditional procurement, and the speculative nature of new strata-titled residential apartment developments in Melbourne, Victoria. The role and motivations of developers with respect to the identification and provision of the information required for operations (including digital information) in addition to the lack of continuity between the management of the ‘Delivery Phase’ and the management of the ‘Operations Phase’ was highlighted (Introduction). This was followed by an explanation of key terms used during this paper (Terminology).

The next section presents the methodology adopted in the approach to the identification of the shortcomings in the application of ISO 19650.3 to strata titled residential apartment developments and introduces the comparative structure of this paper (Methodology). A ‘State of the Art’ literature review that examines research on assets, operations, and the evolution of the digital management of operations is presented in Section 5. Content analysis comparison (Section 6) details the process followed in the analysis of ISO 19650.3 and details the steps taken in the comparison of the management organization of traditional procurement with the management organization of speculative residential development. This is followed by the results of the content analysis of the eight key information management activities identified in Section 5 of ISO 19650.3 (Section 7) The precarity of the asset information model is highlighted in this section.

Discussion (Section 8) considers the findings of the comparative analysis and the proposed use of strata-title specific predefined asset information requirements (AIR’s) as a possible or useful alternative. Finally, Conclusions/Limitations (Section 9) summarizes the research discussed and closes with a look at some of the issues associated with the digitisation of repairs and maintenance in strata-titled residential development that have not been addressed elsewhere.

## 4. Methodology

The methodology adopted for this study was a comparative content analysis of ISO 19650.3 (9). The analysis of ISO 19650.3 started with a translation of *Figure 3- Interface between parties and teams for the purpose of information management* into a representation of the organisational structure inherent

in speculative residential apartment development. This diagram was then compared to a translation of Figure 3 into a representation of the organisational structure of traditional building procurement and delivery model, i.e., a single organisational client who both commissions, and is later responsible for the management of the ‘asset’.

The results of this first experiment led to a similar assessment of *Figure 4 – Information management process to support the operational phase of assets*. This was followed by a ‘what if’ analysis (10) of *Section 5 Information management process to support the operational phase of assets* whereby the theoretical perspective of an owner of a new apartment, who was also an active member of the Owners Corporation Committee, was used to respond to the directives suggested in this section. The results of these studies were again compared to the theoretical responses of a client owner of a traditional procurement model. The difference in the structure and resources available to each of these ‘owners’ as identified in this research prompted a more detailed comparison of the ‘operations’ of each of these two organisational structures and the impact of these differences on the application of ISO 1956650.3.

## 5. Literature Review

The organisation and digitisation of information pertaining to operations in strata-titled residential apartment developments has received little academic attention to date. A review of over 1600 journal articles, discussion papers, reports, training course outlines, and websites relating to ‘digitisation/digitalisation’, ‘building information modelling’ (BIM), ‘strata-titled residential developments’, ‘assets’, ‘operations, and management of operations’ published between 1908 and 2022 and collected for PhD research on the digitisation of repairs and maintenance in strata-titled residential apartment developments, identified several reasons for this oversight that have contributed to the discussion on the application of ISO 19650.3 in this context. This literature review was conducted following a search of this database.

### 5.1. Asset information modelling for operations

A search of the PhD database focused on references to ‘assets’ and ‘operations’. This search identified forty-nine journal articles published between 2017 and 2022. This timeframe was selected to ensure context with the ISO 19650 series of standards. Recognising that multi-storey residential buildings over three storeys height are classified in Australia as Class 2 ‘commercial construction’(1), these articles were then tagged either ‘residential’ (11 articles) or ‘non-residential’ (38 articles) depending on whether the article included substantial references to high-rise residential apartment developments.

The first analysis of the forty-nine journal articles identified, focused on the use of the terms ‘assets’ and ‘operations’. It was noted that both ‘assets’ and ‘operations’ were predominantly associated with ‘management’ (all 49 articles) and ‘information’ (49), followed by ‘value’ (45) ‘managers’ (45) and ‘user experience’ (43). These results were not surprising as the use of the building information model tailored to produce an asset information model (AIM) for operations, was identified as a primary objective of the earliest conceptual building information system (11). Building Information Modelling (BIM) which evolved from this conceptual system, is a carefully crafted digital model of the proposed building or redevelopment work that is created by architects and engineers during the design and documentation stages of new building work to ensure maximum efficiency during construction. BIM has been widely recognised as the ‘data repository’ (12), ‘digital record’ (13) or ‘enabler’ (14) that is in the best position to facilitate the transfer of all of the building information required for the management of buildings and infrastructure post-construction. The asset information model (AIM) is generated from the BIM model.

Although BIM software has been around since the 1990s (15), only thirty-two of the forty-nine journal articles identified included references to BIM. All the articles that included references to BIM however were associated with the group tagged ‘non-residential’. One reason given by authors for excluding residential buildings from their study investigating the use of BIM to manage asset data was that ‘large and public buildings had more complex assets than residential buildings’[36]. Where digital solutions were proposed for operations in residential developments, these were limited to digital

building manuals [30]. A notable poor performer in the forty-nine journal articles was research associated with ‘asset information’ (14 articles) with ‘assets’ associated predominantly with articles on infrastructure (36 articles).

### 5.2. *Management of operations*

The manager type associated with the ‘assets’ and ‘operations’ identified in articles located was predominantly the facility managers (24 articles) followed by asset managers (9 articles) with some articles referencing both facility managers and asset managers. As with BIM, both facility managers and asset managers were predominantly associated with the ‘non-residential’ articles, despite references in the ‘residential’ articles to ‘operations’ (17), ‘assets’ (18), ‘facilities’(19) ‘maintenance/maintenance management’(20), ‘intelligent buildings’, and ‘building information systems’ (18).

As noted under terminology, the main managers associated with the residential buildings in the literature were strata managers, building managers and property managers, however Owners Corporations and their associated Committees (or boards) of Managers were also identified as having significant management roles (21). In Australia, the roles and responsibilities of these two distinct management types, i.e. owners and their employed managers, have been identified as being very confusing [41]. In practice, the strata management company is often erroneously identified as the ‘Owners Corporation’ rather than the representatives of the Owners Corporation, and as a result is often perceived to be solely responsible for repairs and maintenance in apartment developments.

At least one article suggested that strata managers or condominium managers are facility managers (23). This view was not supported by a review of the preferred training, qualifications or competencies required for either of these manager types, with strata managers generally requiring certificate level competencies achievable in 160 hours (24) and facility managers requiring diploma level qualifications typically achieved after one year of study (25).

The nature, education and/or experience of owners involved with Owners Corporations, through their associated Committees of Management (Board of Managers) was also highlighted in the articles. One of the first studies to explore the management of repairs in residential strata titled development in Australia noted that “Owners corporations are making vital decisions regarding the management and maintenance of tens of thousands of residential properties, amounting to billions of dollars in assets around Australia.” (22). A few years later, the same authors referred to apartment owners as “a collective of amateur property managers.” [25], with another author noting that owners corporations committees are ‘run by volunteers with little or no building management experience’ [4].

### 5.3. *Knowledge gap*

A detailed review of a substantial database failed to identify any literature that considered the digitisation or digitalisation of operations in strata-titled residential apartment developments, either in accordance with ISO 19650.3 or at all. Authors of articles on digitisation/ digitalisation and BIM failed to include an assessment of how digitisation should be applied to complex high-rise residential apartment developments with non-commercial organisation structures. Similarly, articles that identified issues in the management of increasingly complex residential building work failed to identify BIM as a solution to these problems, preferring instead to recommend 2d digital building manuals.

The tagging of articles on operations and assets into ‘residential’ and ‘non-residential’ and the subsequent identification of different types of development (speculative/ traditional) different concepts of operation (repairs and maintenance/commercial facilities or industrial plant operations) and different approaches to the management of operations (strata managers/ facility managers and asset managers) in each group, suggested that there are fundamental differences between commercial-scale strata-titled residential development and traditional commercial development.

The following section shows the implications of these differences by comparing the application of ISO 19650.3 on each of the procurement models.

## 6. A content analysis comparison of the application of ISO 19650.3 to speculative residential development to that of traditional procurement

The first stumbling block in the application of ISO 19650.3 to strata-titled apartment buildings was identified in the introduction of this standard: “this document is designed to enable an appointing party (the client) ...to establish their requirements for information during the operational phase of an asset... (in a) collaborative environment to fulfil commercial goals.” It was noted that the ISO 19650 series assumes that the production and management of information will take place within commercially structured organisations with ‘asset and project management’ and ‘information management’ teams.

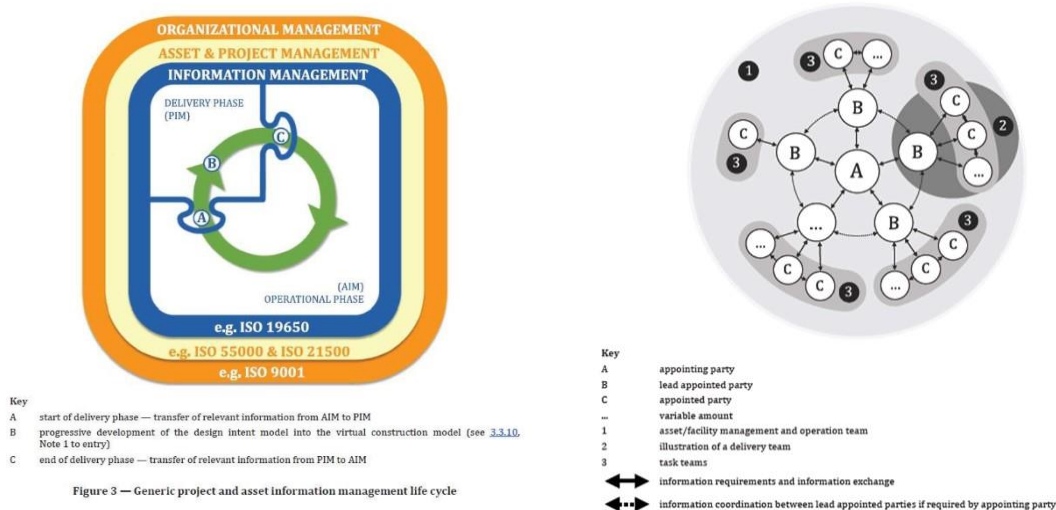


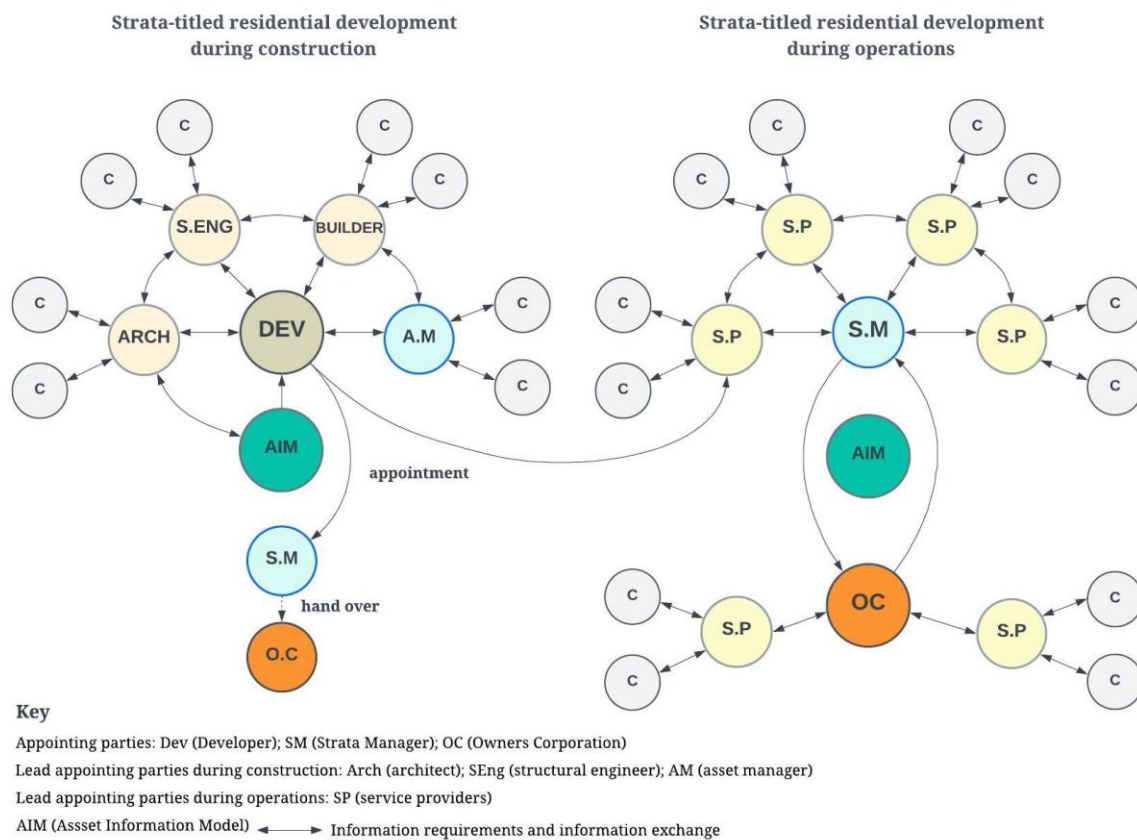
Figure 3 — Generic project and asset information management life cycle

**Figure 1.** Reproduction of ISO19650.3 Figure 1- Generic project and asset information and Figure 3 Interface between parties and teams for the purpose of information management.

This is highlighted in *ISO 19650.3 Figure 1 – Generic project and asset information management life cycle* which is reproduced in both ISO 19650.2 and ISO 19650.3. This assumption stems from the history of this standard which was initially developed to address the whole of life costs of UK government buildings, facilities, and infrastructure (27).

Following from this observation, the first question that needed to be answered was which ‘client’ should be considered the ‘appointing party’ in the context of operations in strata-titled residential developments. ISO19650.3 *Figure 3- Interface between parties and teams for the purpose of information management* (included in Figure 1 above) is a representation of the organisational structure of the traditional building procurement and delivery model, i.e., a single organisational client who both commissions, and is later responsible for the management of the ‘asset’.

A translation of this diagram into a representation of the organisational structure inherent in strata-titled residential apartment development during construction, was compared to a similar translation of Figure 3 into a representation of the organisational structure inherent in strata-titled residential apartment development during operations. These two organisational structures are shown in Figure 2 below.



**Figure 2.** Translation of ISO 19650.3 *Figure 3* showing the ‘parties and teams’ of strata-titled residential development during the construction and operation stages.

The ‘appointing party’ during construction is clearly the developer who, as well as being the client (if not also the contractor), is the sole representative of the owners’ corporation at registration of the plan of subdivision, which is the legal trigger for the development of an owners’ corporation in Victoria. As most developers are commercially structured organisations with ‘information delivery teams’ associated with the ‘definition and procurement of construction’ (if only as part of the building development process), developers have access to all the resources required to determine what information they, or the future owners, will require during the delivery phase of apartment developments. The developer is also the only ‘active’ Owners Corporation Committee member during construction (Figure 4 - left). In this role, developers are reported to be making all of the decisions that impact the end users, including identification and engagement of the strata-managers, in addition to determining the quality of the building work (26). However, as the developer is not responsible for the management of the property once the last apartment is sold, attention turned to the managers of strata-titled developments during operations (Figure 2 - right).

The stated purpose of ISO19650.3 is “to enable an asset owner, asset operator or outsourced asset manager to establish their requirements for information during the operational phase of an asset.” As the primary legal function of an Owners Corporation is to ‘manage and administer.... repair and maintain... the common property’ (6), technically the Owners Corporation should be the ‘appointing party’. However, an Owners Corporation Committee is the developer until the transfer of property sales and once ‘transferred’ the Owners Corporation Committee is run by volunteer apartment owners. In addition, Owners Corporations are not commercially structured organisations (6) and do not have access to any organisational infrastructure. Identifying the role of the appointing party during operations as a management function, the strata manager, as appointed delegate of the Owners Corporation, is in the best position to carry out this function. However, it is not clear how and when



the information that is required for operations would be identified, or how the building information model would be managed as strata managers are not trained in either building construction, facility management or digitisation.

The next step was to review the information management processes detailed in Sections 4 and 5 of ISO 19650.3. ISO 19650.3, *Figure 4 – Information management process to support the operational phase of assets* (not shown here) identifies eight key information management activities, seven activity groupings and ten decision points, questions, and actions. These activities and decision points are further detailed in Section 5. The standard recommends that these processes ‘operate within or link with such enterprise systems or organizational functions as necessary to optimise (their) implementation’. An analysis of the eight key information management activities was undertaken to identify who should be responsible for each activity or decision and what systems or organisational functions would be required to ‘optimise their implementation’ during operations.

### 7. Results of the content analysis of the 8 key information management activities

A content analysis of the eight key information management activities was used to continue the comparison. In this case the information management requirements of traditional procurement were compared with both the procurement and operations stages of speculative development. The results of this comparison and the impact of the role of the developer on the digitisation of operations in speculative apartment developments are set out in Table 1 below.

**Table 1.** Results of the content analysis of *Section 5: 8 key information activities* comparing input required during traditional procurement with that available to speculative procurement.

ISO 19650.3 SECTION 5: INFORMATION MANAGEMENT	TRADITIONAL PROCUREMENT	SPECULATIVE DEVELOPMENT	
		PROCUREMENT	OPERATIONS
5.1 ASSESSMENT AND NEED	FM/AM	Excluded from contract (assumed)	No engagement with the end-users or managers
5.2 INVITATION TO TENDER/ REQUEST TO PROVIDE SERVICE	FM/AM	Developer sells service to highest bidder (suggested)	No engagement with the end-users or managers
5.3 RESPONSE TO INVITATION TO TENDER/ REQUEST TO PROVIDE SERVICE	Approved subcontractors	Not required	No engagement with the end-users or managers
5.4 APPOINTMENT	FM/AM and CLIENT/OWNER	Developer	Developer as sole representative of the OC
5.5 MOBILISATION	FM/AM/ Approved subcontractor	Developer approved contractor/ subcontractor	Developer/ SM or OC engaged subcontractor
5.6 PRODUCTION OF INFORMATION	FM/AM/ Approved subcontractor	Not required	Ad-hoc - only if specifically requested by OC/ SM
5.7 INFORMATION MODEL ACCEPTANCE BY APPOINTING PARTY	?	Not required	BIM not required to be included in handover to new OC (OC Act 2020 (2021) – no specialist services or facilities required.
5.8 AIM AGGREGATION	FM/AM	Not required	BIM not required to be included in handover to new OC (OC Act 2020/21 (2021) - – no specialist services or facilities required

The results show that speculative procurement has a significant impact on the application of ISO 19650.3 to strata titled developments, and in turn on the digitisation of operations of these buildings.

The exclusion of the end-users and managers of speculative development from any participation in Section 5 Stages 5.1 - 5.3 means that future managers and management committees have no opportunity to determine either their organisational data requirements or any other digital information requirements, or to establish what their common data environment might look like, identify their preferred information exchange requirements, or participate in discussions that establish what links to enterprise systems will be required.

In respect to 5.2 *Invitations to Tender/ Request to Provide Service*. If this was applied to the provision of ongoing maintenance services such as fire services, new apartment owners would be entirely at the mercy of these service providers, who, if they have paid the developer to secure the service, are likely to inflate the cost of their services during operations to recuperate this cost. This suggests that, like the developers, these service providers would be equally unmotivated to participate in the production, delivery or exchange of any digital information that would facilitate the production of an asset information model, even if this model was made available to the new apartment owners.

In summary, the proposed digitisation of operation in strata-titled residential developments through the application of ISO 19650 identified significant challenges to the processes identified in this standard. It is clear this standard cannot be applied to speculative development in its current form and that modifications are required in several areas if the digitisation of operations of strata-titled residential apartment developments is to be realized.

## 8. Discussion

The explicit identification of the digital information required for the development of the building information model and the production of both the project and asset information models, appears to be key to the success of the ISO 19650 series of standards and yet there appears to have been little attempt to identify the information that would be most useful during operations of strata-titled residential properties. This is particularly true of information pertaining to repairs and maintenance of the physical building envelope. This is somewhat surprising as the management of repairs and maintenance of the physical built asset was the original function of building management. This is also reflected in the identification of the two predefined processes or “trigger events” in Figure 4 of ISO 19650.3 – one to denote an event that can be scheduled in advance (e.g., maintenance) and a second to denote an event that cannot be foreseen (e.g., repairs) (8).

The situation above suggests that the use of strata-title residential development specific predefined asset information requirements (AIR's) is a possible and useful alternative. The UK BIM Framework document Guidance Part D refers to the use of pre-definition twice: once in respect to the identification of information delivery milestones and the second in reference to the use of pre-defined ‘spatial or financial information’ in reference to the decisions the client is expected to make at these milestones (28). However, the incorporation of predefined AIR's at the start of a project had previously been identified as unfeasible on the basis that ‘clients requirements vary too much’ and that as a result, ‘no single set of predefined requirements were available’ (29). Given that the development of AIR's is identified as the responsibility of the client who in traditional procurement employ operations and maintenance teams to carry out this task, failure to identify AIR's makes any recommendations for the development of this information by individual Owners Corporations and their managers very difficult.

Locally, it was recently reported that the Australasian BIM Advisory Board (ABAB) were looking to address the ‘fragmented development of protocols’ and the associated ‘waste of time, effort and unnecessary costs’ reported to be a result of the lack of coordination of information requirements (30). This suggests that the development of pre-defined AIR's authored in consultation with a large group of similarly affected owners, managers and even service providers, and the inclusion of these AIRs in the development of a single building type such as strata-titled residential apartment developments, would offer an opportunity to identify an approach to this information that could potentially address these issues for all concerned.

One benefit that has been identified as likely to occur with the successful digitisation of operations in residential apartment developments, specifically the use of BIM through the asset information

model in this context, is the potential for a shift in mindset. BIM, and by association technologies associated with BIM (e.g., COBie) are generally perceived to be complicated. The leading stakeholders that are currently associated with BIM include construction professionals (architects, engineers, and contractors) (31) and specialist managers (FMs, AM's). Issues reported to be affecting the uptake of BIM in the construction industry include 'lack of management, lack of motivation in the construction industry' and "negative perceptions" which was translated as referring to 'ease of use' or 'perceived ease of use' (32). The inclusion of 'negative perceptions' among the most frequently cited issues in interviews with BIM users was hardly surprising given BIM's historic associations with the US military, NASA(33) and the UK Government. A shift to an association of BIM with residential development may provide the rebalance needed to rectify this perception and encourage engagement by more in the construction industry.

## 9. Conclusions/ limitations

The aim of this research was to identify shortcomings in the application of ISO 19650.3 during the design, documentation, and construction of strata-titled residential developments. While the theoretical application of ISO 19650.2 was not successful in this context, further analysis of this standard suggested that the development of pre-defined AIRs in consultation with end users, and the proposed inclusion of these AIRs at the start of these projects is a solution that could overcome the limitations of this standard. The predefinition of asset information requirements for a single building type such as strata-titled residential apartment developments, is suggested as a way to provide end users with a say in the information included in asset information models that are developed for use during operations of residential apartment buildings. There are, however, a few issues that have not been addressed.

The first issue relates to the asset information model. The issue identified is the storage, access and maintenance of any digital information model that is provided to the Owners Corporation, for use during operations. As noted above, an Owners Corporation is not a traditional organisation, and does not have access to any of the any of the business structures associated with traditional organisations. In addition, while some have suggested that owners who intend to serve on Owners Corporation committees should be required to undertake training (4), any suggestion that a temporary volunteer owner should be trained in the maintenance and management of an asset information model seems a step to far.

In response to this issue, it is argued that the alternative proposed solution, 2d digital building manuals, equally require digital storage, access by all those involved in the management of the building, and maintenance. In addition, it is noted that 2d building manuals, digital or otherwise, represent the very information problem that facility managers, asset managers and their organisational clients are looking to solve. Building manuals are not the 'single source of truth' approach advocated by some leading advisors and it is unclear where the suggestion to reintroduce this format came from.

The second issue relates to the first. As strata-management companies have the structure and capacity to store digital building information, it is not clear why strata managers are not being trained to manage this information in an asset information model and to better advise Owners Corporations with respect to their primary repair and maintenance obligations. This issue is part of a broader investigation into the roles and responsibilities of all managers associated with the repair and maintenance of residential buildings, as it has significant implications on the sustainability and longevity of critical residential assets that are already globally identified as being in seriously short supply.

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