# CONVERTING COMMERCIAL AND INDUSTRIAL PROPERTY INTO RENTED RESIDENTIAL ACCOMMODATION: DEVELOPMENT OF A DECISION SUPPORT TOOL

## ABSTRACT

**Purpose:** This research sought to develop a decision-making tool that assesses the economic feasibility of converting commercial and industrial buildings into rented residential accommodation. This tool also enables developers to provide high-quality rented residential accommodation that contribute to the gentrification of formerly industrialized inner city or developeding areas.

**Methodology:** The overarching epistemological approach adopted used inductive reasoning and a postpositivist philosophical design to structure the research problem and devise new theories about the phenomena under investigation. From an operational perspective, a two-phase 'waterfall' research approach was adopted. Phase one used extant literature to identify development factors and variables for consideration, risks posed and conversion appraisal criteria. Two case studies formed the basis of a cross comparative analysis viz. a new build, and conversion of a former industrial building into rented residential accommodation. Phase two identified development appraisal criteria, conducted a cost analysis and, premised upon the findings, developed a decision support appraisal tool as a 'proof of concept'.

**Findings:** The research combined key decision factors and variables that assist property developers when evaluating whether to convert commercial and industrial property into rented residential accommodation. The appraisal tool's functionality was validated via a focus group discussion with senior property developers to ensure that assessment criteria and development weightings were appropriate. Feedback revealed that that tool was suitable for purpose and should now be adopted in practice and refined as appropriate and with usage.

**Research limitations/implications:**

The appraisal tool presented could yield a far more accurate means of decision making which, in turn, could ensure that predicted investment returns are received (thus reducing errors and lowering risk for investors). Future work is required to robustly test and validate the tool's accuracy in practice. It is envisaged that future projects will provide a rich stream of data for such testing.

**Originality:** This work constitutes the first attempt to conceptualise a decision support tool for rented residential property development.

**KEYWORDS –** Building conversion, commercial and industrial buildings, residential, gentrification, development rights, proof of concept.

## INTRODUCTION

The Ministry of Housing, Communities and Local Government (MHCLG, 2017) reported that the United Kingdom's (UK's) requirements for net housing gains have continued to surge due to: a population increase (Ons.gov.uk, 2018a; Abbasi *et al.,* 2021); high rates of homelessness (MHCLG, 2018; Liu *et al.,* 2021); and a systemic failure to accommodate the current housing requirements of 340,000 net dwellings produced per annum (House of Commons Library, 2018). It is imperative that the production of net housing is expedited to ensure that the current shortage of 98,870 houses produced per year is resolved to stimulate future socio-economic growth. A prevailing disparity between net housing required and produced continues to expand unabated each year (*ibid*). This production shortage has forced the UK Government to assess alternate means of increasing the net production of housing (Nazir *et al.,* 2020; Hughes *et al.,* 2021). For example, political strategies such as the enactment of permitted development (PD) rights, which derive from a general planning permission act granted by Parliament (House of Commons, 2019). This legislative instrument essentially allows a host of permitted construction works to be undertaken while circumventing the need for planning permission (*ibid*). However, the foremost benefit of permitted development rights (Marsh *et al.,* 2020) is the ability to facilitate the conversion of commercial and industrial properties into residential properties whilst bypassing the conventional planning permission process. The implementation of permitted development rights saw a vast increase in net housing production which was derived directly from the preceding conversion works (MHCLG, 2018). Net conversions/or building change of use works have generated 172,580 dwellings as of 2018-19 – or circa 17% of net dwellings produced throughout the same five-year period i.e., 2014-15 to 2018-19 (MHCLG, 2019). These statistics suggest that developers are increasingly receptive to the conversion of commercial and industrial property into residential property following the implementation of permitted development rights.

Although industrial building conversion can contribute to net dwellings produced, there is an absence of existing guidance on the appraisal, construction and occupation processes which can be utilised – and what factors and variables should be included. Yet, such guidance could offer significant commercial, socio-economic, political and environmental benefits (e.g., converting existing properties requires only minor reconstruction works). Minor reconstruction

reduces the construction programme because multiple structural elements are retained (Remøy and van der Voordt, 2007) thus, lowering overall project costs and environmental impact. However, the structural elements' suitability for conversion is dependent upon the current condition of the acquired commercial/industrial property. Consequently, professional surveys are procured to substantiate the property's conversion suitability (Hoxley, 2016). Information and data accrued from these surveys can then be utilised to inform a cost analysis of the proposed construction works. Several social benefits can also be attained from the conversion of industrial and commercial buildings, for instance, gentrification of a former industrial area increases property values, reduces vacancy rates and encourages further development and refurbishment of surrounding areas (Lees *et al.,* 2013). The conversion of existing properties as opposed to demolition and reconstruction, via the reuse of existing sub- and superstructures and the concomitant waste reduction (Remøy and van der Voordt, 2007), is also advantageous from an environmental perspective.

Against this aforementioned discourse within existing literature, this current research develops a 'proof of concept' decision making tool for developers who seek to assess the feasibility of converting formerly commercial and industrial buildings into rented residential accommodation. To realise this aim, a case study of practice is reported upon and used as the basis for this innovative tool. Concomitant objectives are to: provide informative guidelines and economic incentives for other developers who are considering the conversion of industrial/commercial properties into rental residential properties; and stimulate wider polemic discussion on the gentrification of former industrialised areas of large developed cities.

## UK HOUSING REQUIREMENTS

Net housing supply consistently falls behind net housing growth within the UK, despite Government efforts to constrain the continually widening discrepancy (Jones and Richardson, 2014). The UK government's white paper entitled *'Fixing our broken housing market'* derives a somewhat obvious conclusion that for far too long, the nation has failed to build sufficient houses to accommodate growing demand (Department of Communities and Local Government, 2017). Whilst this statement is unanimously agreed upon, emerging political 'cross-party' disputes have hindered the development of a common agreement on potential solutions (Jones *et al.,* 2018). Such discourse may be due to the genuine disparity between political solutions or could be part of wider political machinations to 'score points' and secure power at future general elections. Regardless of the underlying reasons, increasing net housing

output is arguably one of the greatest challenges confronting the UK government (Wilcox *et al.,* 2015).

Statistics estimate that 340,000 new dwellings per annum are required within England (House of Commons Library, 2018) whilst the current net housebuilding output (as of 2018-19) resides at a mere 241,130 dwellings (MHCLG, 2019) (refer to Figure 1). This statistic illustrates a dearth of 98,870 homes per year. Although the net dwelling output continues to increase annually (figures from 2017-18 to 2018-19 exemplify an 8% increase in output) (MHCLG, 2019), the current new build output and rate of growth is insufficient to accommodate the current/forthcoming demand for housing (for rent or sale) within the UK. Housing shortages are by no means a new phenomenon and in 2015, the Conservative Government vowed to: *"...deliver 300,000 net additional homes a year on average"* as well as produce: *"a million homes by the end of 2020 and half a million more by the end of 2022"* (GOV.UK, 2018). As of November 2019, the net output of additional homes was 870,320 (MHCLG, 2019). This suggests that whilst the current Government may be on track to reach forecast housing targets (circa one new million homes), these objectives are inadequate when compared to the constantly expanding housing requirements (Stephens *et al.,* 2018).

UK housing requirements have several determinants such as population increase and homelessness which stimulate and influence the overall need for housing (Stephens *et al.,* 2018). Since 1982, the UK's population growth has increased annually and from 2005 onwards the growth rates reside at circa 0.6% to 0.8% (Ons.gov.uk, 2018b). 2017-18 alone demonstrated a population growth of 395,400 (Ons.gov.uk, 2019a), implying that an equal number of dwellings are required to house new citizens. To accentuate this observation, it is notable that in 2017, there were 27.2 million households in the UK, constituting growth rates of circa 6% since 2007 - comparable to a 6% growth rate in the population during this same period (Office for National Statistics, 2018a). The preceding statistic suggests that as the population grows, housing requirements advance in an almost parallel manner. Therefore, the suggestion of 340,000 additional homes required per year may under-estimate the demand, subsequently furthering the argument that net housing supplies are persistently outperformed by net housing demands. The previously cited population increase combined with a rate of 56,500 homeless households within the UK (MHCLG, 2018) illustrates the urgent need for an increase in net homes produced.

Given the prevailing shortage of available dwellings, it is essential to note that house prices have also contributed to the UK housing crisis (Whitehead and Williams, 2011). Net dwelling prices have risen considerably over the past years: Q1 2014 exhibited a net dwelling price of £263,000 whilst Q1 2019 displayed a net dwelling price £302,000 (Ons.gov.uk, 2019b). This demonstrates a rise of £39,000 per dwelling or circa 15% growth in cost which exceeds the rate of inflation at 9.7% (Ons.gov.uk, 2019c) and average income growth of 4.2% (Ons.gov.uk, 2018b). If the prevailing cost increase in housing continues unabated to surpass wage increases and rates of inflation, the affordable housing shortage will be further exacerbated. Shelter (2015) argues that a considerable number of currently available listings are unaffordable for both families and single people alike, and housing price hikes is affecting overall affordability drastically. Molloy (2018) suggests that: *"increases in the 'price' of housing would not occur if the supply of housing were perfectly elastic."* Hence, if the demand for 340,00 (or more) net dwellings supplied per year was accommodated, there simply would be no increase in the average price of housing, therefore mitigating the current affordability strain.



<Insert Figure 1 here>

**UK Government policy**

The Single Department Plan (cf. GOV.UK, 2019a) endeavored to implement several core policies to resolve this urgent need for net and affordable housing – refer to Figure 2. These policies are encouraging and indicate that the current Government is focusing upon pertinent factors, which could stimulate a rise in net housing gains and the reduction of dwelling prices. However, it is important to assess the HM Treasuries budget policies to gauge whether the government's commitments are obtainable. The HM Treasury has intervened regarding the funding of the MHCLG. Capital provided in the autumn/fall budget 2017 exemplified capital funds of £8.6B (HM Treasury, 2017) allocated to the MHCLG whilst the budget 2018 demonstrated capital funds of £9.5B (HM Treasury, 2018) allocated to the MHCLG. This revision of the budget proposals depicts an increase of £0.9B in funding allocated for 2018-19, suggesting that the Government is apportioning the required funds to accommodate core policies.

<Insert Figure 2 here>

The Single Department Plan has spearheaded planning reform within the UK, with the aim of establishing a planning system which supports the UK's housing supply objectives. By improving and simplifying the current planning system, the net delivery of homes within the UK should increase (Assets.publishing.service.gov.uk, 2019). Among these vast planning reforms, permitted development rights have received particular interest with developers, because it can circumvent the planning process when converting commercial and industrial properties into residential properties under the current legislation (House of Commons, 2019). The implementation of permitted development rights has generated 60,410 dwellings as of 2018-19 (MHCLG, 2019), which equates to 6.9% of net dwellings produced throughout the same four-year period i.e., 2015-16 to 2018-19 (MHCLG, 2019).

## RESEARCH APPROACH

The overarching epistemology adopted inductive reasoning (cf. Edwards *et al.,* 1998; Roberts *et al.,* 2019; Burton *et al.,* 2021; Posillico *et al.,* 2021) and a postpositivist philosophical stance (cf. Al-Saeed *et al.,* 2020; Smith *et al.,* 2021) to devise new theories about the phenomena under investigation, namely: identifying factor and variables underpinning decisions taken when developers consider whether to develop a commercial/industrial to a rented residential accommodation project or not. Interpretivism (cf. Williams, 2000; Edwards *et al.,* 2017) was also used to meaningfully interpret the results of a systematic literature review (cf. Bayramova *et al.,* 2021; Van de Meij *et al.,* 2021; Edwards *et al.,* 2021) and so define and delineate the key decision-making criteria developers' use when reaching a conclusion.

From an operational perspective, primary qualitative and quantitative data were collected via a cross comparative case studies (cf. Woodside, 2010; Edwards and Love, 2016) between a 'new-build' rented residential accommodation property and a converted commercial to rented residential accommodation property. These developments target a niche opening for affordable rented residential property for students in two of the UK's largest and formerly industrialised cities. However, these two properties developed are also suitable for other affordable home users including social housing, single parents and the elderly. Accommodation created was to a higher standard than the average student dormitory thus affording greater flexibility for the developer to broaden their portfolio of clients if future market conditions dictate that diversification is needed to maximise rental incomes generated.

For these case studies, a development company (with developments in the Midlands and Southeast of England) participated in this research. The participating company has a £10-20m a year turnover and employs 25+ staff, specialising in the conversion of commercial properties into residential, student and care home accommodations for rent or sale. The researcher was actively engaged as a participant action researcher (PAR) (Williamson and Prosser, 2002; Pärn and Edwards, 2017; Newman *et al.,* 2020) and embedded within the company as a consultant. As an approach for undertaking the research, a two-phase waterfall process was adopted (refer to Figure 3). In phase one, a two-stage process was conducted to search for information on:

i) Development assessment criterion (including risks posed and appraisal elements) used in decision support; where such information was sourced from extant literature; and
ii) Real life case studies. A review of two case studies that have: re-developed commercial/industrial property into residential property; and developed residential property from a new-build perspective were used.

This body of knowledge accrued then formed the basis of qualitative and quantitative analysis of the case study projects, allowing pertinent appraisal elements and elemental cost data to be extracted and analysed. In phase two, a three-stage iterative process was adopted, viz:

i) apply development appraisal criteria– (emergent from phase one) for the development of the appraisal tool;
ii) conduct elemental cost analysis to cross compare between new build and conversion property developments; and
iii) test and validate the appraisal tool (as a 'proof of concept') using secondary data sources and primary data sources obtained from a focus group attended by senior developers. Focus group results helped to finalise the model produced.

<Insert Figure 3 here>

**PHASE ONE - PROPERTY DEVELOPMENT CRITERION**

Property development can be conveniently conceptualized into two dichotomies viz: 1) the physical operations such as construction or engineering works; and 2) the making of a material change of use (Reed and Sims, 2015). In both instances, public and private developers must

appraise their development opportunities to ensure they are viable from an economical (refer to Table 1) and risk (refer to Table 2) perspective, to meet project cost, quality, safety and programme aspirations. Assessing these development factors can hinder the property development rate, but they are essential to mitigate the likelihood and severity of financial losses.

<Insert Tables 1 and 2 here>

Several of the aforementioned appraisal elements are affected by government policies and wider macro-economic and micro-economic climates (e.g., planning fees, land costs, and inflation rates). Several researchers have analyzed the effect of government policy, house prices, interest rates and availability of funds on the supply of residential properties (Whitehead, 2011). Much of the research undertaken suggests that the onus resides with Government to ensure that property development is encouraged – via the implementation of policies which cultivate a facilitating economic climate that stimulates developers' propensity to construct residential properties for rent or sale.

**Conversion of commercial and industrial property into residential property**

There are two predominant reasons for the observed growth in developers' interest to undertake property conversion works. First, a general planning permission granted in 2015 (House of Commons, 2019) allowed a host of permitted development works to be undertaken whilst circumventing the need to acquire conventional planning permission (*ibid*). Second, the increased availability of underperforming/vacant commercial and industrial properties (Remøy and van der Voordt, 2014) accelerated construction and occupancy durations (when compared to new-build projects). Third, decreased construction costs (Remøy and van der Voordt, 2007) combined with a shift in the wider economic and occupational landscape has driven both the supply of, and demand for, centrally located residential conversion projects (Wilkinson *et al.,* 2014). This has allowed developers to reduce their exposure in underperforming sectors such as commercial and industrial, whilst capitalizing in thriving market sectors such as residential. Consequently, market orders within the residential, commercial and industrial property sectors display divergence in supply and demand. Orders between 2008-2018 demonstrate a substantial shift in market requirements; residential properties have experienced a volume increase of circa 35% while both commercial and industrial properties have experienced volume decreases of circa 49% and 3% respectively (Ons.gov.uk, 2019b). This process of

gentrifying post-industrial land (Lees *et al.,* 2013) has also encouraged wider economic and occupational diversification within these cities and urban conurbations (Hamnett and Whitelegg, 2007).

The appraisal of commercial and industrial buildings to residential conversion projects comprises an analysis of various pertinent determinants, incorporating economic, social and environmental factors. Therefore, both project-specific and broader (statutory, macro-economic etc.) catalysts affect the risk and return associated with each project (Wilkinson *et al.,* 2014). Figure 4 demonstrates key points which developers consider throughout the appraisal of potential development opportunities. Yet despite the complexity involved in making decisions from multiple criteria, academic interest in this area is vastly underrepresented. Hitherto, relevant research has investigated: socio-economic drivers stimulating the uptake in the conversion of commercial and industrial property into residential property (Hamnett and Whitelegg, 2007); sustainable adaptation of buildings (Wilkinson *et al.,* 2014); and opportunities, threats, risks and critical success factors regarding the conversion of commercial properties into residential properties (Remøy and van der Voordt, 2014). However, no research is available regarding the salient commercial processes and key decision-making criteria needed to make an informed decision with regards to a building's change of use.

<Insert Figure 4 about here>

**Case Study One – Conversion of an Office Block, Coventry**

This case study involved a private developer's conversion of an existing six-storey retail/office facility into a seven-storey, 94-bed student accommodation block – providing a mixture of 5-bed cluster apartments and studio apartments. All apartments are located around a central courtyard area providing students with a range of on-site facilities including study area, gym areas, games rooms and laundry facilities. The development tranche obtained is £4,589,000.00, with an agreed contract sum of £3,587,389.00 (or cost of £38,163.72 per bed). Commencement on site began on the 13th September 2019 with practical completion of the works scheduled for the 22nd June 2020. The development tranche includes costs for the professional parties displayed within Table 3 – demonstrating the complexities and high level of consultants associated with the conversion of an existing commercial property into a residential property.

<Insert Table 3 here>

The contractual arrangements associated with the aforementioned scheme are: JCT Design and Build 2016 Edition with Amendments; 10% performance bond required *(to be released upon the completion of making good defects);* insurance option C; liquidated damages to be enforced *(exact values are redacted);* and method of payment alternative B.

**Case Study Two – New Build Multi-storey Development, Sheffield**

This case study involved a private developer's design and construction of a new-build, seven-storey, 128-bed student accommodation block, including the associated demolition of existing structures and hardstanding areas. Providing a mixture of studio apartments and two-bed apartments as well as a cinema room, games/common room, gym, study room and laundry facilities. This private developer has an investment portfolio of £3.95 billion which includes 6,905 homes and 341 hotel suites. The contract sum for the project is £6,014,136.64 (or cost of £46,985.44 per bed), with a commencement date of the 21st September 2015 with practical completion of the works certified on the 8th August 2016.

The contractual arrangements associated with the aforementioned scheme are: JCT Design and Build 2011 Edition with Amendments; parent company guarantee; insurance option A; liquidated damages to be enforced *(exact values are redacted);* and method of payment alternative B.

## CROSS COMPARATIVE ELEMENTAL COST ANALYSIS

A cross comparative elemental cost analysis served to illustrate the prominent commercial divergences between the new-build residential property and converted commercial to residential property (refer to Figure 5).

<Insert Figure 5 here>

Substructure, superstructure and preliminary costs illustrated the largest variances, exemplifying cumulative cost differentials of +£2,311,481.19. Substructure and superstructure cost variances are related directly to the reuse of the primary structural elements regarding the *conversion case study* project – subsequently, circumventing the cost impacts associated with the *new build case study*. Preliminary cost differentials vary based on the contractor's assessment of required, plant, labour, accommodations etc. However, the preceding

circumvention of substructure and superstructure works decrease the required labour and plant to almost minimal. Circumvention of substructure and superstructure works also impacted directly on the required programme duration of works. The *conversion case study project* programme durations required exactly 40 weeks, whilst the *new build case study* programme duration required exactly 46 weeks. Subsequently, reducing the *conversion case study project* preliminary costs associated with general labour, accommodation and buildings, general plant and temporary works is concomitant to the 6-week reduction in programme duration.

## PHASE TWO - DEVELOPMENT OF THE APPRAISAL TOOL: A PROOF OF CONCEPT

The aforementioned case studies allowed key criteria and commercial processes to be identified during the projects' feasibility stage – achieved, through a manual content analysis of largely qualitative secondary data sets found in company documents. Specifically, documents used included construction cost reports, development budgets/reports and engagement in project team meetings. Throughout the collection of this secondary data, the criteria illustrated in Table 4 were identified as salient (indeed, recurrent) determinants which affect the developer's proclivity to undertake the property conversion works.

<Insert Table 4 here>

A focus group of ten experienced developers, each with a minimum of 25 years' experience in senior management roles (e.g. Directors and Associate Directors) was convened using Microsoft Teams video conferencing facilities – and given their informed consent (cf. Fisher *et al.,* 2018), the prevailing discourse was recorded. Focus groups can typically consist of anywhere from four or five participants to as many as a dozen (cf. Krueger and Casey, 2015) – however, ten was deemed manageable for this current study as saturation point was achieved (Hennink and Kaiser, 2022) i.e., using ten participants ensured that no new materials or insights transpired from the ensuing discourse. Therefore, an additional focus group or additional member of the group was not required - the ensuing discourse was then analysed via a manual content analysis.

First, the criteria in Table 4 were presented to confirm their validity. Participant A reflected the general consensus of opinion that broadly concurred with the determinants presented. He said:

*"The determinants included are broad development considerations and will be utilised during any developer's feasibility, construction and occupation appraisals."*

Only minor areas of improvement were required and these related to grammatical and syntax errors contained within the table itself. The discussion then moved to structuring the overall format of the appraisal tool and specifically, focus group members expressed a keen desire for RIBA stages 0-7 to be included along with associated appraisal elements at each stage (i.e., 0 = strategic definition; 1 = preparation and brief; 2 = concept design; 3 = develop design; 4 = technical design; 5 = construction; 6 = handover and close out; and 7 = in use). Participants felt that these stages provided an industry recognised 'cornerstone' framework within which appraisal elements (sourced from literature and internal documents) could reside for consideration and assessment. For example, within the first stage (0 – strategic definition), there are two important sub-factors for consideration, namely: i) 'business case'; and ii) 'strategic brief'. Within these two dichotomous groupings there are a further four variables within each sub-factor that require assessment (as assessment criteria).

Discussions then focused upon how each assessment criteria could be rated for comparability purposes between competing development opportunities. Participants agreed that the rating exercise should contain two parts – first the 'element weighting' which reports how important a group within an RIBA stage is and similarly, how important each appraisal element is within a group. For stage 0, it was decided that both '*business case*' and '*strategic brief*' should be equally weighted at 50% each – where the four appraisal elements within each group are also weighted. For example, '*Appraised costs for, land, construction, project team fees, agents, legals, stamp duty, financing, surveys, etc.*' is weighted at 20% (refer to Figure 6). These weightings are therefore fixed based upon participating practitioner expert opinion sourced from the focus group responses. Individual users then added an 'element score' (based on their knowledge and experience) on a scale of 0-100% as a barometer of appraisal risk, where 0% = high risk and 100% = low risk. These element scores are then multiplied with the element weighting to derive a total score. These scores were then totalled across each RIBA stage and cumulatively over all stages to enable developers to make an informed judgement of the risks posed per development and importantly, whether such risks are at an acceptable level to progress the development.

However, participant C raised the question that percentage boundaries should be established to define and delineate clusters of risk, namely low, medium and high risk for each RIBA stage (and assessment criteria within). Their opinion was that having a percentage rating *per se* does not allow a user to generate an informed decision. After deliberation with all the focus group members, it was agreed to categorise the overall risk posed (for each stage or for all stages collectively) as: 0-50% = high risk; 51-80% = medium risk; and 81-100% = low risk. Using this risk classification it was acknowledged that this categorisation should be periodically reviewed and revised as the appraisal tool is used over time to refine its accuracy and modify categories within. Participant G said:

> *"Projects can be fluid, starting as a speculative development and ending with an occupier. The developer should review the development periodically and alter the elemental weightings as to whether the project is developer or end-user driven"*

Further refinement was also discussed, particularly around attributing automatic weightings for each of the RIBA stages of work activity within MS Excel fields that were locked to prevent user error. To accommodate this finer nuance, and present the work within a user-friendly framework, it was decided to enter the appraisal criteria into an MS Excel worksheet that contained non-editable formulas so that users could simply add in their assessment of risk to generate a risk category (low, medium or high). Using MS Excel also ensures that the widest possible audience of practitioners can utilise the tool as MS Office is installed on all IT machines used (refer to Figure 6).

Participant J said:

> *"Developers can refine this tool further – Excel risk analysis/appraisal sheets which assess the risk profile of each appraisal element and RIBA stage individually can be utilised to ensure that risk values entered have been assessed effectively. In turn, this creates a holistic and element specific appraisal tool."*

Given the nascent development of this tool, it was decided to trial it besides the existing methods of assessing risk to determine its validity in practice (now that the theoretical proof of concept had been confirmed). The tool may yield useful results, given its basis in operational practice and weighting of risks founded on professional experience. A similar approach, using

a combination of objective data and subjective risk data from an expert group was used as the basis for a predictive model intended to drive decision-making regarding operational risk in road construction (Fowler *et al.*, 2011). This model was found to perform to good effect, providing the basis to identify favourable and unfavourable methods of working to deliver safety benefit (Reeves and Manning, 2015); this enabled a change in national working practices (DfT, 2020) which were accepted as good practice by practitioners.

It was agreed that, when the tool yields results, fine tuning could be conducted and the next stage of development (to a full cloud-based software solution) could commence. It is essential to base such a development of model parameters on real-world data obtained from experienced practitioners, which is subsequently benchmarked against established methods. This enables bridging of the gap between those with academic understanding of work *as imagined* and those with direct knowledge of work *as done*. The risk of basing processes or requirements on work as imagined (rather than on work as done) exists in all work environments; such gaps can significantly influence perceptions of risk (Borys, 2009), resulting in poor risk awareness around issues of importance and overweighting of minor risks. Experienced and objective practitioner assessment of effectiveness, ideally benchmarked against established methods where these exist, are vital to ensure risk is managed proportionately such that acceptable and safe outcomes are achieved.



<Insert Figure 6 here>

## DISCUSSION

Property conversion of formerly commercial and industrial property into rented residential accommodation provides a viable solution to the UK's housing crisis and moreover, offers a more inherently sustainable solution than demolition – perhaps when most of the components of the building are structurally sound. Specifically, the development of the appraisal tool as a proof of concept offers practitioners a novel method of assessing the determinants which affect the developer's proclivity to undertake the property conversion works. This novel tool therefore advances previous research conducted by Remøy and van der Voordt (2007) who used case studies to consider the conversion of vacant office buildings into housing but failed to produce a decision support tool. It also extends the later published work of Remøy and van der Voordt (2014) who used a similar methodology to their previously published work (cf. Remøy and van der Voordt, 2007) to reveal the legal, financial, technical and functional factors

that impact upon the opportunities and risks of building conversions. In other more recent work, Tam *et al.,* (2018) reviewed the critical success factors (CSFs) for the adaptive reuse of industrial buildings in Hong Kong; whereas, Glumac and Islam (2020) examined housing preferences for adaptive re-use of office and industrial buildings using a perceptual type survey. Cumulatively, this body of knowledge illustrates that there is a relatively low level of academic interest in industrial building conversion into domestic property but also underscores the novelty of the present study and the decision support tool developed.

The practical implications of this current work offers invaluable insight into: the decision support criteria used to make an assessment of whether to convert a building or not; and enable a more accurate assessment (premised upon past experience) to be made. This work therefore offers: environmental impact by increasing the reuse and adaptation of existing buildings; societal impact by creating more affordable homes for the public; and economic impact via the gentrification of inner city urban areas to revitalise the economy of that region. As a theoretical contribution, the work constitutes the first attempt to conceptualise a decision support tool for rented residential property development. This tool should now: be tested and validated in practice with its predicted results compared against actual performance; and incorporate further revisions and refinements to ensure accuracy.



## Limitations and Future Work

Several limitations are however apparent. For example, the work is based upon a case study of one developer in the UK and so generalisation of the findings is not applicable to the population of developers globally. That said, this ground-breaking work does establish a clear benchmark guidance that provides a useful template for other researchers or developers to adopt, adapt and develop further. In this context, a considerable advancement has been made. Three other important areas of future work include: 1. The elemental weighting (as a percentage) assigned to each criterion should be tested in practice to confirm or adjust in line with factual evidence accrued from longitudinal case studies in practice; 2. To facilitate this process of finer adjustment, a reflective analysis should be developed as a feedback loop not only to compare differences between the predicted and actual performance of a project but also determine why these differences occurred. Hence, although the tool's functionality and criteria have been validated in this present study, the tool's accuracy will require further fine tuning and adjustment over time and in usage; and 3. The MS Excel spreadsheet is utilitarian in functionality and further work is required to create a more interactive graphical user front-end

environment supported by back-end relational databases. Such databases could store case study histories of primary data accrued and use such to generate reports and trends that guide future practice. So rather than being a panacea to a problem, this research represents a promising first step towards developing a final software solution that could yield significant value and impact within the housing sector and wider society.

## CONCLUSION

The UK's housing crisis continues unabated and is fueled by a complex array of socio-political factors such as: shortages of new homes being built; a lack of social (formerly council) housing; an expanding population; and pay increases falling behind house price increases. In turn, this has created social inequality as purchasing a new home is beyond the reach of average first-time buyers or those in need social accommodation for rent (such as single parents, the unemployed or severely disabled). Successive government public policy plans and legislation/regulation have aspired to narrow the gap and whilst these are to be encouraged as positive steps forward, other private funded innovative interventions are needed to complement a portfolio of existing solutions and strategies on offer. Simultaneously, the globe is facing an unprecedented environmental challenge. The modern built environment must be developed in harmony with the natural environment if anthropogenic emissions are to be controlled to reduce the present rate of global climate change. Re-use (or change of use) of existing buildings (particularly unoccupied buildings) offers this opportunity to re-use sound structural components and lower the environmental impact of residential development. Moreover, this strategy offers tangible economic benefits associated with gentrification of the formerly industrialised urban environment through a process of regeneration – thus, breathing new life and prosperity into these former commercial/industrial conurbations.

The work undertaken above found that the conversion of commercial and industrial property into residential property for rent represents a viable, yet much overlooked, solution to the affordable housing crisis. Financial and technical data presented in this case study provides evidence to support this conclusion. The framework and approach used to create the decision support tool presented in this current paper provides a useful blueprint for other researchers to follow, adopt, amend and/or improve. For practice, the appraisal support tool developed provides a useful 'proof of concept' that developers can utilise to make more informed and consistent building conversion decisions. At this juncture, the approach combines extant literature and professional knowledge to define and delineate decision support criteria. The

approach is based on *work as done*, with knowledge captured from a focus group of experienced practitioners which maximized the likelihood that the model provides valid results. In so doing the work reflects current wisdom and knowledge of practicing developers whilst leaving ample opportunities for further academic development and refinement.

## REFERENCES

Abbasi, K.R., Hussain, K., Redulescu, M., and Ozturk, I. (2021) Does natural resources depletion and economic growth achieve the carbon neutrality target of the UK? A way forward towards sustainable development, Resources Policy, 74, DOI: https://doi.org/10.1016/j.resourpol.2021.102341

Al-Saeed, Y., Edwards, D. and Scaysbrook, S. (2020). Automating construction manufacturing procedures using BIM digital objects (BDOs): Case study of knowledge transfer partnership project in UK, Construction Innovation, Vol. ahead-of-print No. ahead-of-print. DOI: https://doi.org/10.1108/CI-12-2019-0141

Assets.publishing.service.gov.uk. (2002). *Horizontal Guidance for Noise Part 2 – Noise Assessment and Control*. [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/298126/LIT_8291_337647.pdf [Accessed 11 Oct. 2019].

Assets.publishing.service.gov.uk. (2010). *Guidelines for Managing Projects*. [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/31979/10-1257-guidelines-for-managing-projects.pdf [Accessed 11 Oct. 2019].

Assets.publishing.service.gov.uk. (2019). Government response to consultation on Planning Reform: Supporting the high street and increasing the delivery of new homes. [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/799220/Government_Response_to_Planning_Reform_Consultation.pdf [Accessed 11 Oct. 2019].

Bayramova, A., Edwards, D.J. and Roberts, C. (2021) The role of blockchain technology in augmenting supply chain resilience to cybercrime, Buildings, 11(7). DOI: https://doi.org/10.3390/buildings11070283

Beck, T. and Levine, R. (2018). Handbook of finance and development. Edward Elgar Publishing Limited, pp.1-616.

Borys, D. (2009) Exploring risk-awareness as a cultural approach to safety: exposing the gap between work as imagined and work as actually performed, Safety Science Monitor, 13(2), 3

Brazg, G. (2019). The Cost of Selling a House (2019 update) – TheAdvisory. [online] The Advisory. Available at: https://www.theadvisory.co.uk/house-selling/cost-of-selling-a-house/ [Accessed 15 Sep. 2019].

Burton, E., Edwards, D.J., Roberts, C., Chileshe, N. and Lai, J.H.K. (2021) Delineating the implications of dispersing teams and teleworking in an Agile UK construction sector, Sustainability, 13(17), DOI: https://doi.org/10.3390/su13179981

Chen, J. (2019). Yield. [online] Investopedia. Available at: https://www.investopedia.com/terms/y/yield.asp [Accessed 15 Sep. 2019].

Contamination, the environment and sustainability. (2010). 3rd ed. [ebook] Royal institute of chartered surveyors, pp.1-77. Available at: https://www.rics.org/globalassets/rics-website/media/upholding-professional-standards/sector-standards/land/contamination-environment-sustainability-3rd-edition-rics.pdf [Accessed 15 Sep. 2019].

DfT (2020) Traffic Signs Manual Chapter 8 Part 3: Update. Available online at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/875167/Traffic_Signs_Manual_-_chapter_8.3.pdf [Accessed 28 April 2020]

Donovan, P. (2015). The truth about inflation. London: Routledge, pp.1-214.

Edwards, M. (2016). *The housing crisis and London*. [ebook] Taylor & Francis Online, pp.222-237. Available at: https://www-tandfonline-com.ezproxy.bcu.ac.uk/doi/full/10.1080/13604813.2016.1145947 [Accessed 4 Jun. 2019].

Edwards, D. J., Holt, G. D. and Harris, F. C. (1998) Predictive maintenance techniques and their relevance to construction plant, Journal of Quality in Maintenance Engineering, 4(1), pp. 25-37. DOI:10.1108/13552519810369057

Edwards, D. J. and Love, P. E. D. (2016) A case study of machinery maintenance protocols and procedures within the UK utilities sector. Accident Analysis and Prevention, 93, pp. 319-329. DOI:10.1016/j.aap.2015.10.031

Edwards, D. J., Pärn, E. A., Love, P. E. D. and El-Gohary, H. (2017) Machinery, manumission and economic machinations. Journal of Business Research, 70, pp. 391-394. DOI:10.1016/j.jbusres.2016.08.012

Edwards, D.J., Akhtar, J., Rillie, I., Chileshe, N., Lai, J., Roberts, C. and Ejohwomu, O (2021) Systematic analysis of driverless technologies, Journal of Engineering Design and Technology. DOI: https://doi.org/10.1108/JEDT-02-2021-0101

Epple, D., Gordon, B. and Sieg, H. (2010). A New Approach to Estimating the Production Function for Housing. American Economic Review, [online] 100(3), pp.905-924.

Available at: https://search-proquest-com.ezproxy.bcu.ac.uk/docview/734366777?pq-origsite=summon [Accessed 11 Jun. 2019].

Fisher, L., Edwards, D. J., Pärn, E. A. and Aigbavboa, C. O. (2018) Building design for people with dementia: a case study of a UK care home. Facilities, 36(7/8), pp. 349-368. DOI:10.1108/F-06-2017-0062

Fixing our broken housing market. (2017). [ebook] London: Department for Communities and Local Government, p.9. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/590464/Fixing_our_broken_housing_market_-_print_ready_version.pdf [Accessed 29 May 2019].

Fowler, C., Clark, S., Rillie, I., Cuerden, R. and Smith, L. (2011) Development of the Measurement of Injury Risk (MIRi) Index, Client Project Report CPR1106. Wokingham: Transport Research Laboratory

Glumac, B. and Islam, N. (2020) Housing preferences for adaptive re-use of office and industrial buildings: Demand side, Sustainable Cities and Society, 62. DOI: https://doi.org/10.1016/j.scs.2020.102379.

GOV.UK. (2016). *Approved Documents*. [online] Available at: https://www.gov.uk/government/collections/approved-documents [Accessed 11 Oct. 2019].

GOV.UK. (2019a). *Ministry of Housing, Communities and Local Government single departmental plan*. [online] Available at: https://www.gov.uk/government/publications/department-for-communities-and-local-government-single-departmental-plan/ministry-of-housing-communities-and-local-government-single-departmental-plan–2 [Accessed 1 Dec. 2019].

GOV.UK. (2019b). Building regulations approval. [online] Available at: https://www.gov.uk/building-regulations-approval/how-to-apply [Accessed 15 Sep. 2019].

GOV.UK. (2019c). Housing and economic land availability assessment. [online] Available at: https://www.gov.uk/guidance/housing-and-economic-land-availability-assessment#sitebroad-location-assessment [Accessed 15 Sep. 2019].

Hamnett, C. and Whitelegg, D. (2007). Loft Conversion and Gentrification in London: From Industrial to Postindustrial Land Use. Environment and Planning A: Economy and Space, 39(1), pp.106-124.

Handbook.fca.org.uk. (2019). Insurance: Conduct of Business. [online] Available at: https://www.handbook.fca.org.uk/handbook/ICOBS.pdf [Accessed 11 Oct. 2019].

Hennink, M. and Kaiser, B.N. (2022) Sample sizes for saturation in qualitative research: A systematic review of empirical tests, Social Science & Medicine, 292, DOI: https://doi.org/10.1016/j.socscimed.2021.114523

HM Treasury (2017). AUTUMN BUDGET 2017. London: HM Treasury, p.24.

HM Treasury (2018). 2018 BUDGET. London: HM Treasury, p.23.

House of Commons Library (2018). Tackling the under-supply of housing in England. House of Commons Library, p.3.

House of Commons (2019). Permitted Development Rights. House of Commons Library, pp.3-19.

Hoxley, M. (2016). Building condition surveys. 3rd ed. RIBA Publishing, pp.1-160.

HSE (2006a) Health and Safety in Construction, Third Edition, HSG 150, Sudbury: HSE Books or online at https://www.hse.gov.uk/pubns/priced/hsg150.pdf

HSE (2006b). *The safe isolation of plant and equipment*. [online] Available at: http://www.hse.gov.uk/pUbns/priced/hsg253.pdf [Accessed 11 Oct. 2019].

HSE (2008) The Absolutely Essential Health and Safety Toolkit for the Smaller Construction Contractor, INDG344 Revision 2, Sudbury: HSE Books or online at https://www.hse.gov.uk/pubns/indg344.pdf

HSE (2012). *Asbestos: The survey guide*. [online] Available at: http://www.hse.gov.uk/pUbns/priced/hsg264.pdf [Accessed 11 Oct. 2019].

Hughes, B., Edwards, D.J. Martek, I., Chileshe, N. and Thwala, W. D. (2021) Assessing the 'clerk of works' role in delivering quality affordable housing: a UK case study, Smart and Sustainable Built Environment. Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/SASBE-01-2021-0015

Jones, B., Norton, P. and Daddow, O. (2018). Politics UK. 9th ed. London: Taylor and Francis Group.

Jones, C. and W. Richardson, H. (2014). Housing markets and policy in the UK and the USA. International Journal of Housing Markets and Analysis, [online] 7(1), pp.129-144. Available at: https://search-proquest-com.ezproxy.bcu.ac.uk/docview/1508425858/fulltextPDF/42275104670744D8PQ/1?accountid=10749 [Accessed 11 Jun. 2019].

Krueger, R.A. and Casey, M.A. (2015) Focus group interviewing. Handbook of practical program evaluation, 5th E. pp.506-534, Sage Publishing. ISBN: 978-1-4833-6524-4.

Lees, L., Slater, T. and Wyly, E. (2013). Gentrification. Florence: Taylor and Francis, pp.3-276.

Liu, M., Luong, L., Lachaud, J., Edalati, H., Reeves, A. and Hwang, S.W. (2021) Adverse childhood experiences and related outcomes among adults experiencing homelessness: a systematic review and meta-analysis, The Lancet Public Health, 6(11), e836-e847. DOI: https://doi.org/10.1016/S2468-2667(21)00189-4

Marsh, R., Chang, M. and Wood, J. (2020) The relationship between housing created through Permitted Development Rights and health: a systematic review, Cities & Health, DOI: 10.1080/23748834.2020.1833281

Measured surveys of land, buildings and utilities. (n.d.). 3rd ed. [ebook] Royal institute of chartered surveyors, pp.1-50. Available at: https://www.rics.org/globalassets/rics-website/media/upholding-professional-standards/sector-standards/land/measured-surveys-of-land-buildings-and-utilities-3rd-edition-rics.pdf [Accessed 15 Sep. 2019].

Metje, N., Beck, A., Hojjati, A. and Rogers, C. (2019). Improved underground utilities asset management – assessing the impact of the UK utility survey standard (PAS128). Proceedings of the Institution of Civil Engineers – Municipal Engineer, pp.1-19.

Ministry of Housing, Communities & Local Government (2019). Table 118: Annual net additional dwellings and components, England and the Regions, 2000-01 to 2018-19. Ministry of Housing, Communities & Local Government.

Molloy, R. (2018). The effect of housing supply regulation on housing affordability: A review. [ebook] ScienceDirect. Available at: https://www-sciencedirect-com.ezproxy.bcu.ac.uk/science/article/pii/S016604621730248X [Accessed 4 Jun. 2019].

Moskowitz, D. (2019). How Real Estate Agent and Broker Fees Work. [online] Investopedia. Available at: https://www.investopedia.com/articles/active-trading/031215/how-real-estate-agent-and-broker-fees-work.asp [Accessed 15 Sep. 2019].

Nazir, F., Edwards, D.J., Shelbourn, M., Martek, I., Thwala, W.D. and El-Gohary, H. (2020) Comparison of modular and traditional UK housing construction: a bibliometric analysis, Journal of Engineering Design and Technology, 19(1), pp. 164-186. DOI: https://doi.org/10.1108/JEDT-05-2020-0193

Newman, C., Edwards, D.J., Martek, I., Lai, J. and Thwala, W.D. (2020) Industry 4.0 Deployment in the Construction Industry: A Bibliometric Literature Review and UK-

based Case Study, Smart and Sustainable Built Environment DOI: https://doi.org/10.1108/SASBE-02-2020-0016

Ons.gov.uk. (2018a). *Household projections for England – household type projections – Office for National Statistics*. [online] Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/2016basedhouseholdprojectionsinengland/2016based [Accessed 9 Nov. 2019].

Ons.gov.uk. (2018b). Average household income, UK – Office for National Statistics. [online] Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/bulletins/householddisposableincomeandinequality/yearending2018 [Accessed 6 Jul. 2019].

–

–Ons.gov.uk. (2019a). Overview of the UK population – Office for National Statistics. [online] Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/articles/overviewoftheukpopulation/august2019 [Accessed 11 Oct. 2019].

Ons.gov.uk. (2019b). House price data: quarterly tables – Office for National Statistics. [online] Available at: https://www.ons.gov.uk/economy/inflationandpriceindices/datasets/housepriceindexmonthlyquarterlytables1to19 [Accessed 4 Jun. 2019].

Ons.gov.uk. (2019c). New orders in the construction industry – Office for National Statistics. [online] Available at: https://www.ons.gov.uk/businessindustryandtrade/constructionindustry/datasets/neworderintheconstructionindustry [Accessed 11 Aug. 2019].

Ons.gov.uk. (2019d). CPIH ANNUAL RATE 00: ALL ITEMS 2015=100 – Office for National Statistics. [online] Available at: https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/l55o/mm23 [Accessed 6 Jul. 2019].

Pärn, E. A. and Edwards, D. J. (2017) Conceptualising the FINDD API plug-in: a study of BIM-FM integration. Automation in Construction, 80, pp. 11-21. DOI:10.1016/j.autcon.2017.03.015

Party wall legislation and procedure. (2019). 7th ed. [ebook] Royal institute of chartered surveyors, pp.1-57. Available at: https://www.rics.org/globalassets/rics-website/media/upholding-professional-standards/sector-standards/building-surveying/party-wall-legislation-and-procedure-rics.pdf [Accessed 15 Sep. 2019].

Portal, P. (2019). What it costs | How to apply | Planning Portal. [online] Planningportal.co.uk. Available at: https://www.planningportal.co.uk/info/200232/planning_applications/59/how_to_apply/7 [Accessed 15 Sep. 2019].

Posillico, J., Edwards, D.J., Roberts, C. and Shelbourn, M. (2021) Curriculum development in the higher education literature: A synthesis focusing on construction management programmes, Industry and Higher Education. DOI: https://doi.org/10.1177/09504222211044894

Pray, R. (2019). National construction estimator. 67th ed. Craftsman Book Company, pp.1-672.

Reed, R. and Sims, S. (2015). Property Development. 6th ed. New York: Routledge, pp.77-110.

Remøy, H. and van der Voordt, T. (2007). A new life: conversion of vacant office buildings into housing. Facilities, [online] 25(3/4), pp.88-103. Available at: https://search-proquest-com.ezproxy.bcu.ac.uk/docview/219657158/fulltextPDF/C68F38C8AC114027PQ/1?accountid=10749 [Accessed 14 Sep. 2019].

Remøy, H. and van der Voordt, T. (2014). Adaptive reuse of office buildings into housing: opportunities and risks. Building Research & Information, [online] 42(3), pp.381-390. Available at: https://www-tandfonline-com.ezproxy.bcu.ac.uk/doi/full/10.1080/09613218.2014.865922 [Accessed 14 Sep. 2019].

Reeves, C. and Manning J. (2015) IPV Guidance Supporting Documentation, Project Report PPR701. Wokingham: Transport Research Laboratory

Rics.org. (2014). *Measured surveys of land, buildings and utilities*. [online] Available at: https://www.rics.org/globalassets/rics-website/media/upholding-professional-standards/sector-standards/land/measured-surveys-of-land-buildings-and-utilities-3rd-edition-rics.pdf [Accessed 11 Oct. 2019].

Rics.org. (2019). *Black Book*. [online] Available at: https://www.rics.org/uk/upholding-professional-standards/sector-standards/construction/black-book/ [Accessed 11 Oct. 2019].

Rics.org. (n.d.). Lender's independent monitoring surveyor. [online] Available at: https://www.rics.org/globalassets/rics-website/media/upholding-professional-standards/sector-standards/construction/black-book/lenders-independent-monitoring-surveyor-1st-edition-rics.pdf [Accessed 11 Oct. 2019].

Rights of light. (2016). 2nd ed. [ebook] Royal institute of chartered surveyors, pp.1-37. Available at: https://www.rics.org/globalassets/rics-website/media/upholding-professional-standards/sector-standards/building-surveying/rights-of-light-2nd-edition-rics.pdf [Accessed 15 Sep. 2019].

Roberts, C. J., Edwards, D. J., Hosseini, M. Reza., Matzeo-Garcia, M. and Owusu-Man, D. (2019) Post occupancy evaluation: a critical review of literature. Engineering, Construction and Architectural Management. 26(9), pp. 2084-2106. DOI: https://doi.org/10.1108/ECAM-09-2018-0390

Scopus.com. (2019). *Conversion of Commercial and Industrial Property to Residential Property – Search Results.* [online] Available at: https://www.scopus.com/term/analyzer.uri?sid=85b1a712d7636ee61cb9fe4998143bf6&origin=resultslist&src=s&s=TITLE-ABS-KEY%28the+conversion+of+commercial+and+industrial+property+into+residential+proporty%29&sort=plf-f&sdt=b&sot=b&sl=93&count=12&analyzeResults=Analyze+results&txGid=9fdd59f19e06b0a3c48982b153536c47 [Accessed 3 Nov. 2019].

Smith, P. (2016). Structural design of buildings. Chichester, West Sussex, United Kingdom: Wiley Blackwell, pp.1-256.

Smith, J., Edwards, D.J., Martek, I., Chileshe, N., Roberts, C. and Hayhow, S. (2021) The antecedents of construction project change: an analysis of design and build procurement application, Journal of Engineering Design and Technology. DOI: https://doi.org/10.1108/JEDT-12-2020-0507

Stephens, M., Wilcox, S., Williams, P. and Young, G. (2018). 2018 UK Housing Review. [ebook] Online: Chartered Institute of Housing. Available at: http://www.cih.org/resources/PDF/Policy%20free%20download%20pdfs/UK%20Housing%20Review%202018%20Autumn%20briefing%20paper%20final.pdf [Accessed 11 Jun. 2019].

Stwater.co.uk. (2019). *Sewerage supply connections guidance notes*. [online] Available at: https://www.stwater.co.uk/content/dam/stw/stw_buildinganddeveloping/Sewerage-supply_connections_guidance.pdf [Accessed 11 Oct. 2019].

Tan, Y., Shuai, C. and Wang, T. (2018) Critical Success Factors (CSFs) for the Adaptive Reuse of Industrial Buildings in Hong Kong. International Journal of Environmental Research and Public Health, 15(7). DOI: https://doi.org/10.3390/ijerph15071546

Understanding the Archaeology of Landscapes. (2017). 2nd ed. [ebook] Historic England, pp.1-67. Available at: https://historicengland.org.uk/images-books/publications/understanding-archaeology-of-landscapes/heag142-understanding-archaeology-of-landscapes/ [Accessed 15 Sep. 2019].

Van der Meij, R.J.B., Edwards, D.J., Roberts, C., El-Gohary, H. and Posillico, J. (2021) Performance management within the Dutch steel processing industry, Journal of Engineering Design and Technology. Vol. ahead-of-print No. ahead-of-print. DOI: https://doi.org/10.1108/JEDT-04-2021-0201

Water.org.uk. (2019). *Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code")*. [online] Available at: https://www.water.org.uk/wp-content/uploads/2019/03/Appendix-C-to-draft-sewerage-Sector-Guidance-Design-and-Construction-Guidance.pdf [Accessed 11 Oct. 2019].

Whitehead, C. (2011). Causes and Consequences? Exploring the Shape and Direction of the Housing System in the UK Post the Financial Crisis. [ebook] Online: Taylor & Francis Online, pp.1157-1169. Available at: https://www-tandfonline-com.ezproxy.bcu.ac.uk/doi/full/10.1080/02673037.2011.618974 [Accessed 11 Jun. 2019].

Wilcox, S., Williams, P. and Perry, J. (2015). UK Housing Review. [ebook] Coventry: Chartered Institute of Housing, p.3. Available at: http://www.cih.org/resources/PDF/Policy%20free%20download%20pdfs/UKHR%20Briefing%202015.pdf [Accessed 29 May 2019].

Wilkinson, S., Remøy, H. and Langston, C. (2014). Sustainable building adaptation: innovations in decision-making. Chichester: Wiley-Blackwell.

Williams, M. (2000). Interpretivism and Generalisation. 34th ed. [ebook] Online: BSA Publications Limited, pp.209-224. Available at: https://journals-sagepub-com.ezproxy.bcu.ac.uk/doi/pdf/10.1177/S0038038500000146 [Accessed 11 Jun. 2019].

Williamson, G. and Prosser, S. (2002). Action research: politics, ethics and participation. 40th ed. [ebook] Online: Wiley online library. Available at: https://onlinelibrary-wiley-com.ezproxy.bcu.ac.uk/doi/full/10.1046/j.1365-2648.2002.02416.x [Accessed 11 Jun. 2019].

Woodside, A. (2010). Case study research. Bingley: Emerald Group Pub., pp.1-17, 189-206, 241-320, 343-358, 397-435.

**Figure 1** – Supply, Demand and Price Statistics (Authors Own Construct)

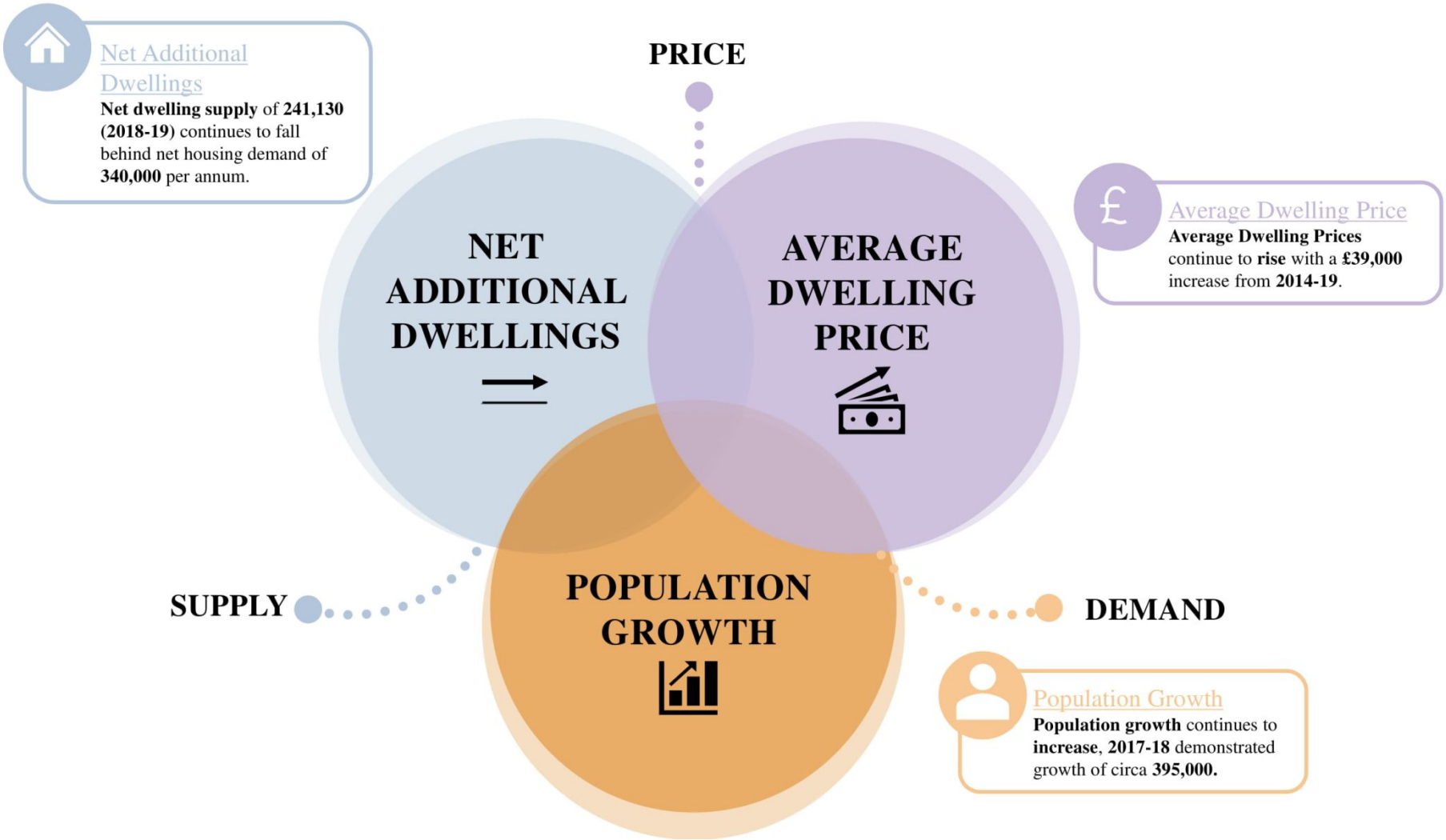


**Figure 2 –** The Single Department Plan Policies (Authors Own Construct)

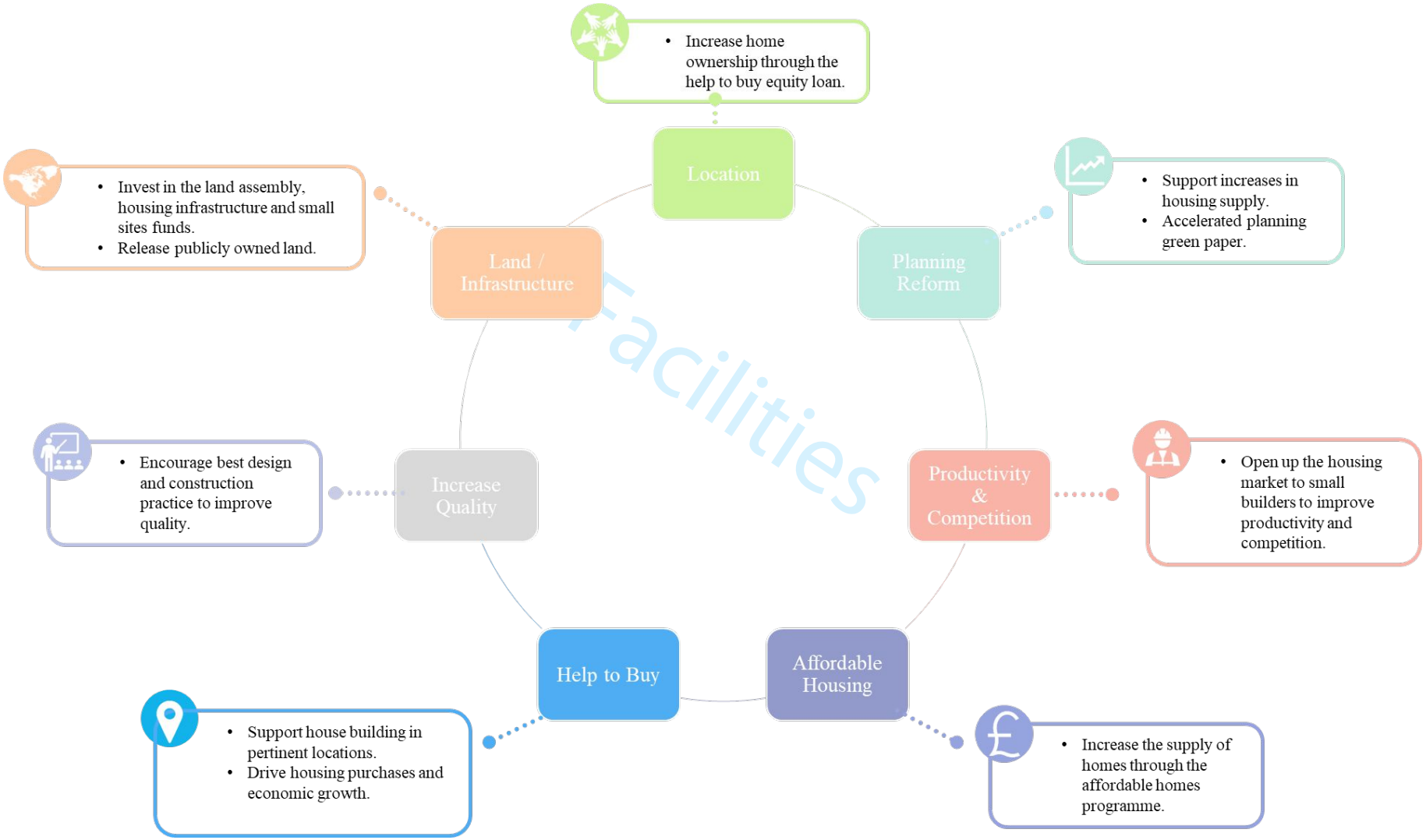


**Figure 3** – Research Process (Authors Own Construct)

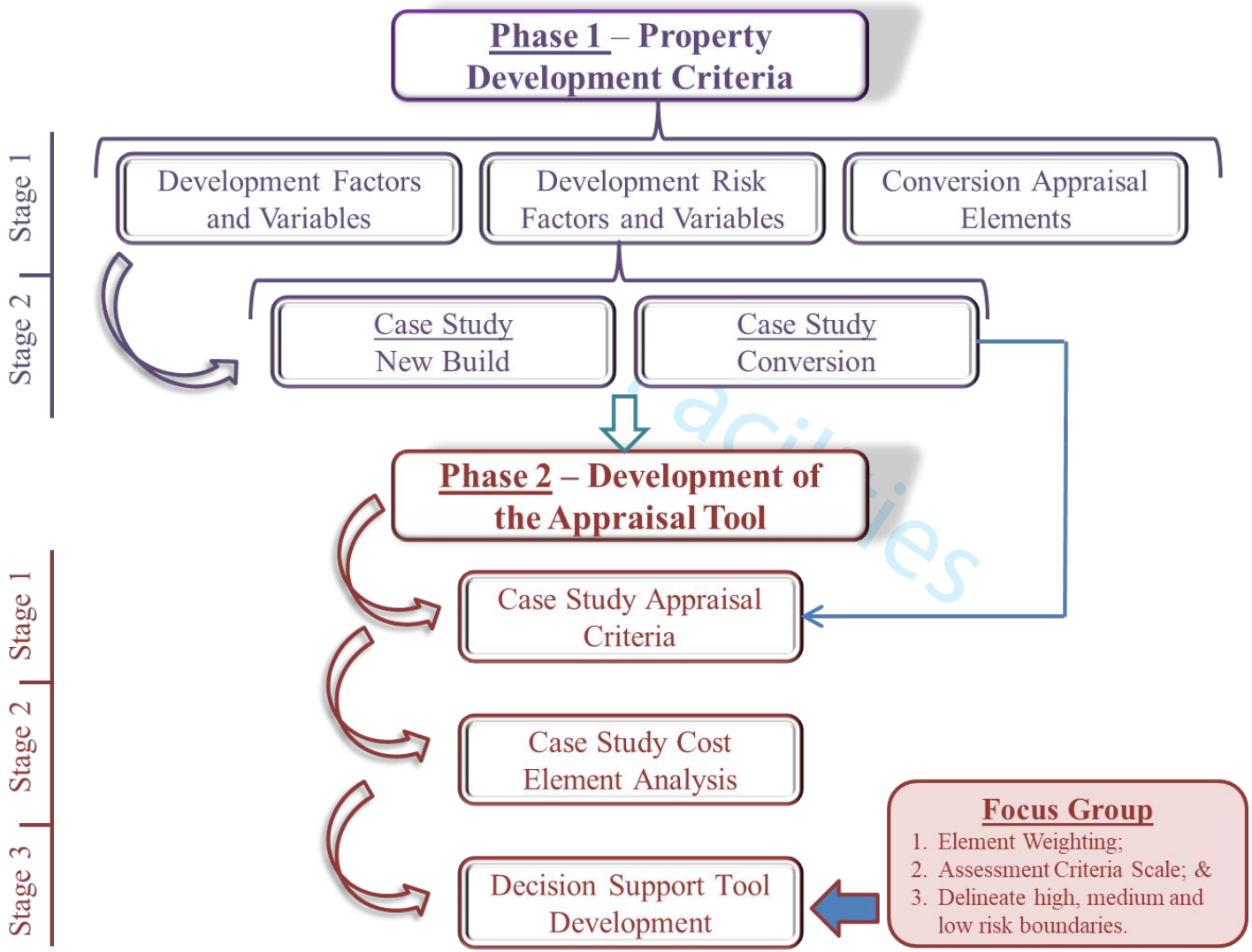


**Figure 4** – Conversion Appraisal Elements (Authors Own Construct)

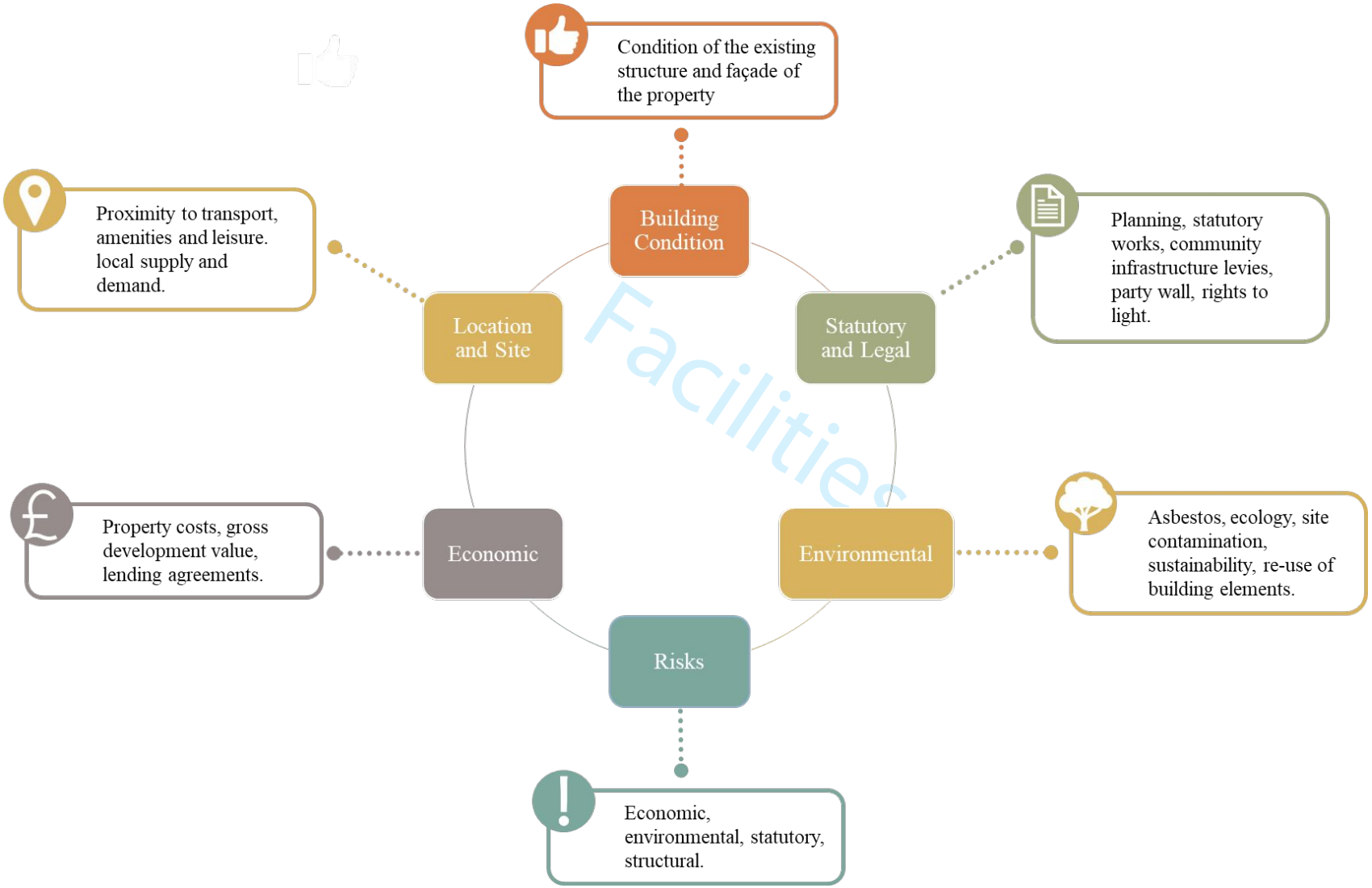


**Figure 5 –** Case Study Elemental Cost Analysis (Authors Own Construct)

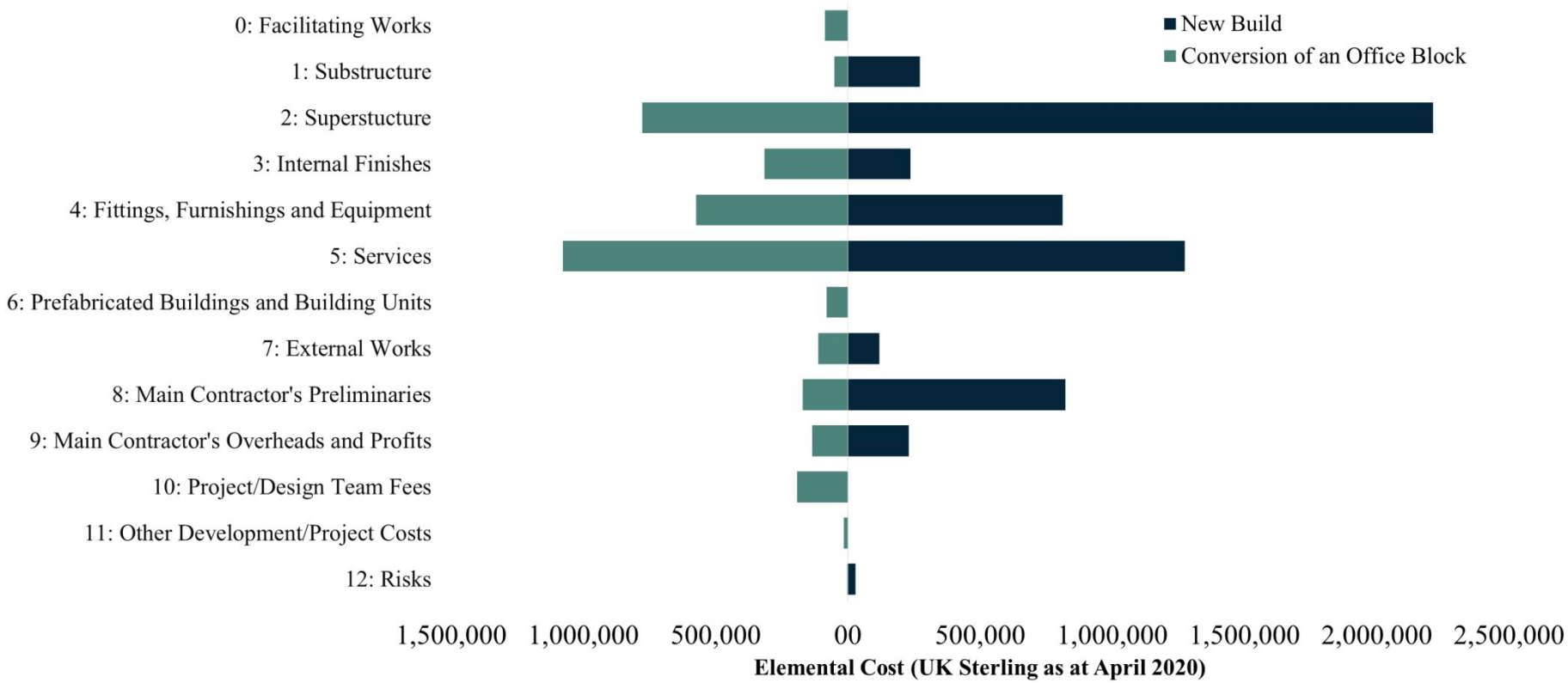
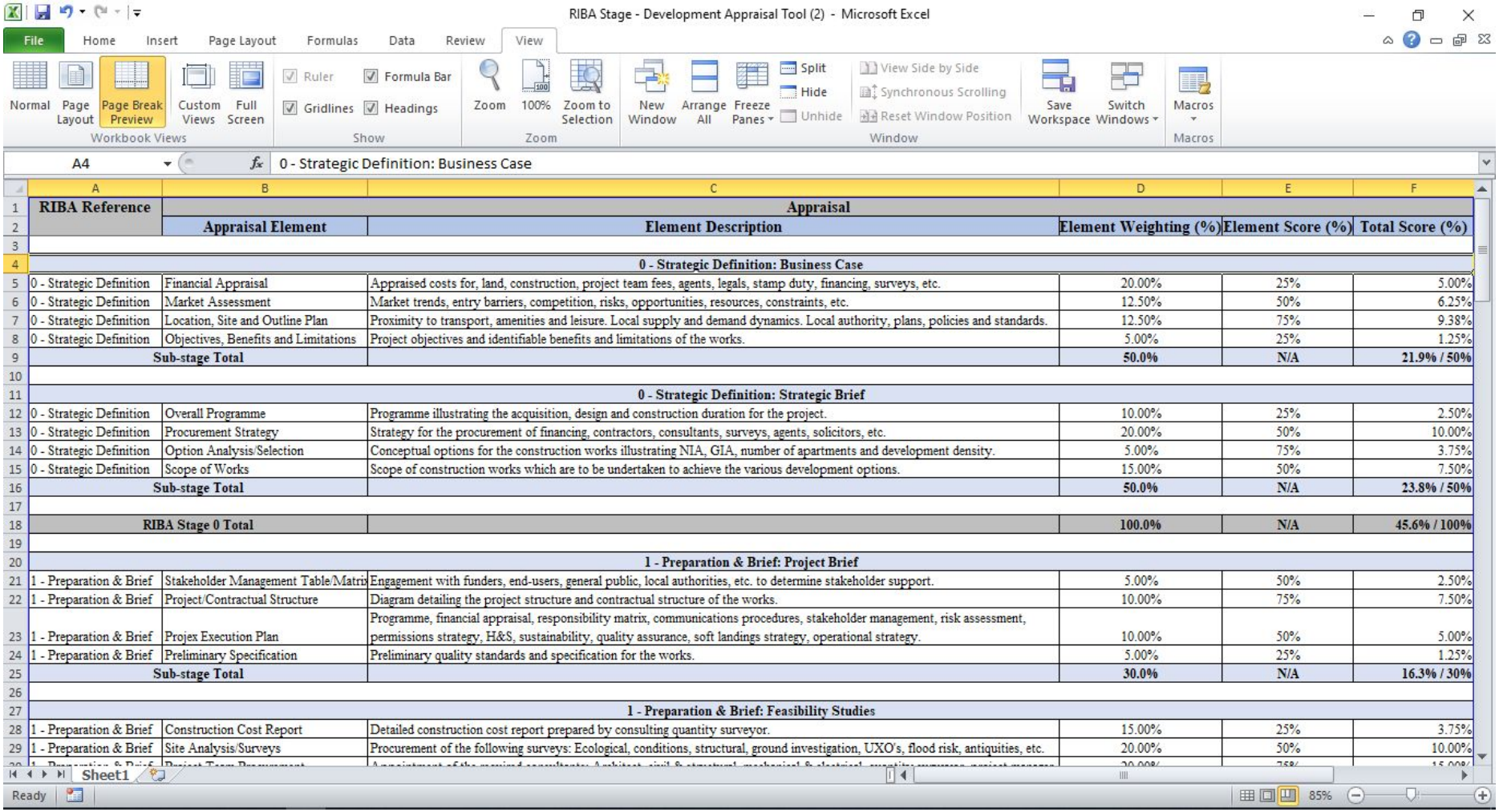


**Figure 6** – Decision Support Tool (Authors Own Construct)



RIBA Stage - Development Appraisal Tool (2) - Microsoft Excel

| RIBA Reference | Appraisal | | | | |
|---|---|---|---|---|---|
| | Appraisal Element | Element Description | Element Weighting (%) | Element Score (%) | Total Score (%) |
| | | **0 - Strategic Definition: Business Case** | | | |
| 0 - Strategic Definition | Financial Appraisal | Appraised costs for, land, construction, project team fees, agents, legals, stamp duty, financing, surveys, etc. | 20.00% | 25% | 5.00% |
| 0 - Strategic Definition | Market Assessment | Market trends, entry barriers, competition, risks, opportunities, resources, constraints, etc. | 12.50% | 50% | 6.25% |
| 0 - Strategic Definition | Location, Site and Outline Plan | Proximity to transport, amenities and leisure. Local supply and demand dynamics. Local authority, plans, policies and standards. | 12.50% | 75% | 9.38% |
| 0 - Strategic Definition | Objectives, Benefits and Limitations | Project objectives and identifiable benefits and limitations of the works. | 5.00% | 25% | 1.25% |
| **Sub-stage Total** | | | **50.0%** | **N/A** | **21.9% / 50%** |
| | | **0 - Strategic Definition: Strategic Brief** | | | |
| 0 - Strategic Definition | Overall Programme | Programme illustrating the acquisition, design and construction duration for the project. | 10.00% | 25% | 2.50% |
| 0 - Strategic Definition | Procurement Strategy | Strategy for the procurement of financing, contractors, consultants, surveys, agents, solicitors, etc. | 20.00% | 50% | 10.00% |
| 0 - Strategic Definition | Option Analysis/Selection | Conceptual options for the construction works illustrating NIA, GIA, number of apartments and development density. | 5.00% | 75% | 3.75% |
| 0 - Strategic Definition | Scope of Works | Scope of construction works which are to be undertaken to achieve the various development options. | 15.00% | 50% | 7.50% |
| **Sub-stage Total** | | | **50.0%** | **N/A** | **23.8% / 50%** |
| **RIBA Stage 0 Total** | | | **100.0%** | **N/A** | **45.6% / 100%** |
| | | **1 - Preparation & Brief: Project Brief** | | | |
| 1 - Preparation & Brief | Stakeholder Management Table/Matrix | Engagement with funders, end-users, general public, local authorities, etc. to determine stakeholder support. | 5.00% | 50% | 2.50% |
| 1 - Preparation & Brief | Project/Contractual Structure | Diagram detailing the project structure and contractual structure of the works. | 10.00% | 75% | 7.50% |
| 1 - Preparation & Brief | Projex Execution Plan | Programme, financial appraisal, responsibility matrix, communications procedures, stakeholder management, risk assessment, permissions strategy, H&S, sustainability, quality assurance, soft landings strategy, operational strategy. | 10.00% | 50% | 5.00% |
| 1 - Preparation & Brief | Preliminary Specification | Preliminary quality standards and specification for the works. | 5.00% | 25% | 1.25% |
| **Sub-stage Total** | | | **30.0%** | **N/A** | **16.3% / 30%** |
| | | **1 - Preparation & Brief: Feasibility Studies** | | | |
| 1 - Preparation & Brief | Construction Cost Report | Detailed construction cost report prepared by consulting quantity surveyor. | 15.00% | 25% | 3.75% |
| 1 - Preparation & Brief | Site Analysis/Surveys | Procurement of the following surveys: Ecological, conditions, structural, ground investigation, UXO's, flood risk, antiquities, etc. | 20.00% | 50% | 10.00% |

**Table 1** – Development Factors and Variables (Authors Own Construct)

| Development Factors | Variable | Description | References |
|---|---|---|---|
| Gross Development Value (GDV) | Rent/sale price. | GDV is the projected value of a development once complete and is central to determining the economic viability of a development project. Lending appraisals are based on a percentage of the GDV and allow the developer to determine whether development costs are viable given their current lending capabilities. | (Reed and Sims, 2015; Rights of light, 2016; Beck and Levine, 2018; Chen, 2019; Pray, 2019; Portal, 2019; GOV.UK, 2019b; Moskowitz, 2019; Brazg, 2019; Party wall legislation and procedure, 2019). |
| | Investment yield. | Investment yield is the income returned on an investment and is commonly expressed as a percentage or as a gross value gain. | |
| Development costs | Land/property costs (private developer only). | Land/property costs are the gross costs of obtaining land and/or property. Including the costs associated with using the land/property such as taxes, permits etc. | |
| | construction costs. | Construction costs are the overall cost of constructing the property and include: preliminaries, overheads and profits and contingencies imposed by the main contractor. | |
| | Professional fees. | Professional fees include the costs associated with the project/design team (e.g. Architect, Project Manager, Quantity Surveyor/Employers Agent etc. | |
| | Site investigation fees. | Site investigation fees include obtaining a site investigation survey/report (e.g., ground investigations and geological) survey that identifies any potential hazards. | |
| | Planning fees. | Planning fees are costs associated with obtaining planning permission for a development project. | |
| | Building regulation fees. | Building regulation fees are costs associated with obtaining building control certificates; where a building control officer monitors and advises throughout the design and construction phases to ensure the development adheres to current building regulations. | |
| | Funding fees (private developer only). | Funding fees are costs associated with obtaining funding for a development this includes arrangement fees, exit fees, broker fees, valuation fees etc. | |
| | Finance costs (private developer only)/interest. | Finance costs pertain to the interest rates offered by lenders throughout the duration of either a short-term or long-term development loan. | |
| | real estate agent fees. | Real estate agents' fees consist of commission, auctioneer fees etc. | |
| | Promotion costs. | Promotion costs are fees associated with the development's marketing and advertising. | |
| | Sale costs. | Sale costs are fees associated with the property's sale e.g., solicitor fees, property taxes etc. | |
| | Other costs (party wall, right to light etc.). | Other costs which must be considered are party wall costs, right to light costs, oversailing costs etc. Architects will commonly determine whether these costs may be incurred - the developer must then seek advice from a specialist in each field, to determine the remedial efforts required. | |
| | Risk allowance. | Risk allowances are a contingency which is implemented by both the developer and lender to ensure that the developer has funds which are reserved and discharged when unforeseen costs are incurred. | |
| | Overheads and profit allowance. | Overheads are the developer's costs relating to business expenses such as rent, utilities, staff, insurance etc. Profit is a gross amount allowance that the developer will make when the property is sold and is usually expressed as a percentage value of the overall development costs. | |

**Table 2** – Development Risk Factors and Variables (Authors Own Construct)

| Risk Factors | Variable | Description | References |
|---|---|---|---|
| Systematic (Market Fluctuations) | Fluctuations of finance costs. | The fluctuation of finance costs can increase project costs albeit, many lenders offer fixed interest rates and service charges. | (Measured surveys of land, buildings and utilities, n.d.; HSE, 2006a; HSE, 2008; Contamination, the environment and sustainability, 2010; Donovan, 2015; Reed and Sims, 2015; Rights of light, 2016; Understanding the Archaeology of Landscapes, 2017; Ons.gov.uk, 2019c; Pray, 2019; Party wall legislation and procedure, 2019; Metje *et al.,* 2019). |
| | Fluctuations of residential property values. | The fluctuation of residential property values pertains to the cyclical nature of the property market and the momentum or reversion of property sale values. | |
| | Increasing/decreasing costs in labour and materials. | Increasing/decreasing costs in labour and materials are due to fluctuations associated with material and labour shortages or oversupply. | |
| Unsystematic (Property/Land Specific) | Site conditions/off-site upgrades. | Site conditions/off-site upgrades are site-specific items such as S278/106 fees, community infrastructure levies etc. | |
| | Ground conditions. | Ground conditions are items associated with the geology, hydrology and soil conditions on site. | |
| | Contaminated materials. | Contaminated materials include items such as asbestos, industrial waste and agricultural waste. | |
| | Safety compliance | Specific safety activity required within initial survey activities and/or construction operations, for example working at height for access to parts of the building. | |
| | Party wall, rights to light, oversailing disputes. | For party wall, right to light, oversailing disputes etc. Architects will commonly determine whether these costs may be incurred and the developer must then seek advice from a specialist in each field, to determine the remedial efforts required. | |
| | Primary network upgrades. | Primary network upgrades are items associated with the upgrade of primary local utility supplies such as gas, electric etc. | |
| | Service diversions. | Service diversions are items associated with the diversion of key utility services to the development site. | |
| | Archaeological requirements. | Archaeological requirements include sites in which archaeological evidence is observed and investigated. | |

**Table 3** – Conversion of an Office Block, Coventry – Consultants and Surveys Procured (Authors Own Construct)

| Development Phase | Party | Reason for Procurement | |
|---|---|---|---|
| Pre-Contract | Asbestos Surveyor (AS) | An AS was employed to survey the building for asbestos and produce an asbestos report, advising regarding the location and quantity of asbestos within the building. | (Rics.org, n.d.; Assets.publishing.service.gov.uk, 2002; HSE, 2006b; Assets.publishing.service.gov.uk, 2010; HSE, 2012; Rics.org, 2014; Rics.org, 2019; GOV.UK, 2016; Stwater.co.uk, 2019; Water.org.uk, 2019; Handbook.fca.org.uk, 2019; Rics.org, 2019). |
| | Site Investigation (SI) Engineer | An SI Engineer was employed to assess the contaminants, substrata etc. located to the site and surrounding areas and to produce a risk assessment regarding the removal of said contaminants. | |
| | Measured Surveyor (MS) | A MS was employed to produce a measured survey of the existing building, thus allowing the Architect to produce GA plans etc. incorporating areas of the existing structure which are to be retained. | |
| | CCTV Surveyor | A CCTV Surveyor was employed to survey the existing below ground drainage and determine whether said drainage was suitable for retaining and/or adaptation of use. | |
| | Transport Engineer | A Transport Engineer was employed to determine the impact of the site upon local infrastructure, in turn prescribing several areas of S106 works which were required to develop the project. | |
| | Air tests | Air tests were undertaken to determine air quality of the existing building prior to the soft strip and asbestos removal works. | |
| | Acoustic surveys | Acoustic surveys were undertaken to determine the acoustic levels surrounding the site, due to the site being located adjacent to a highway. The acoustician then specified the level of acoustic improvements required in order to achieve compliance with the planning conditions/building regulations. | |
| | Manhole/invert level surveys | Manhole/invert level surveys were undertaken to determine the location and quality of existing manholes for drainage connections. | |
| | Enabling/Demolitions Contractor | This site was procured from a previous occupant/owner, meaning partitions, finishes, MEP installations etc. had to be removed before construction works began. | |
| | Asbestos Removals Contractor | Due to this building being constructed and fitted-out in the 1970's, asbestos surveys were undertaken prior to the commencement of enabling/demolition works. | |
| | Isolation/decommissioning of air conditioning units | The building's conditions survey identified several of the air-conditioning units contained banned refrigerants which required isolation and decommissioning before works could commence. | |
| | Architect | An Architect was employed to develop and manage the building's design. The Pre-Tender design was developed to RIBA stage 4, to allow the client to maintain control over the quality of the project. | |
| | Mechanical, Electrical and Plumbing Engineer (MEP Engineer) | A MEP Engineer was employed to develop the building's MEP design. The Pre-Tender design was developed to RIBA stage 4, to allow the client to maintain control over the quality of the MEP works. | |
| | Civil and Structural Engineer (C&S Engineer) | A C&S Engineer was employed to develop the building's C&S design. The Pre-Tender design was developed to RIBA stage 4, to allow the client to maintain control over the quality of the MEP works. | |
| | Principal Designer (PD) | A PD was employed to advise regarding the Health and Safety factors and CDM compliance. | |
| | Building Control Officer (BCO) | A BCO was employed to advise regarding the regulatory standards of safety, sustainability, and accessibility associated with the project's design. | |

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| | Project Manager (PM) | A PM was employed to manage the pre-contract, design development, planning execution, programme and tender process. |
| | Quantity Surveyor (QS) | A QS was employed to manage the pre-contract, feasibility cost planning, procurement of surveys and the design team members, management of the development tranche, advising regarding procurement routes, analysis of tender submissions and development of contract documents. |
| | Solicitor | A Solicitor was employed to produce the Schedule of Amendments (SOA) and Collateral Warranties (CW's) and execute the SOA, CW's and JCT Contract with all required parties. |
| | Energy Performance Advisor | An EP advisor was employed to produce SBEM calculations and advise the design team regarding the requirements to achieve an EP rating of C. |
| | Fire Engineer (FE) | An FE was employed to advise regarding the fire strategy and achieve compliance in terms of material specifications etc. |
| | Insurance Advisor (IA) | An IA was employed to advise the client regarding the insurance requirements for the scheme inclusive of Public Liability Insurance, Contractors All Risks Insurance, Employers Liability Insurance etc. |
| Post-Contract | Architect | An Architect was employed to inspect the construction works and RIBA stages 5 & 6 design produced by the Main Contractor to ensure that compliance with design and quality requirements. |
| | Mechanical, Electrical and Plumbing Engineer (MEP Engineer) | A MEP Engineer was employed to inspect the construction works and RIBA stage 5 & 6 design produced by the Main Contractor to ensure that compliance with design and quality requirements. |
| | Civil and Structural Engineer (C&S Engineer) | A C&S Engineer was employed to inspect the construction works and RIBA stages 5 & 6 design produced by the Main Contractor to ensure that compliance with design and quality requirements. |
| | Principal Designer (PD) | A PD was employed to advise regarding the Health and Safety factors associated with the project, including consulting regarding the CDM compliance. |
| | Building Control Officer (BCO) | A BCO was employed to inspect the works and ensure that the Contractor is meeting regulatory standards (e.g., safety) and issuing a Building Control Certification upon Practical Completion. |
| | Project Manager (PM) | A PM was employed to manage the post-contract, design development, planning condition discharge, programme, construction works and meeting. |
| | Quantity Surveyor (QS) | A QS was employed to manage the overall development tranche in terms of managing contract instruction, variation orders, consultant fees, the Contractor's payment applications, the issue of payment notices, and the negotiation of the Final Account. |
| | Fund Monitor (FM) | A FM was employed to monitor the overall development tranche in terms of monitoring contract instruction, variation orders, consultant fees, the Contractor's payment applications, the issue of payment notices, and the negotiation of the final account. Such was monitored on behalf of the beneficiaries of the scheme i.e., the lenders. |
| | Marketing Specialist | A Marketing Specialist was employed to market the show suites to potential tenants and manage the process of letting all units prior to completion of the works. |
| | Student Operator | A Student Operator was employed to advise regarding the operational requirements of the works, therefore ensuring that the Facilities Management is suitable prior to project completion. |

**Table 4 –** Case Study Appraisal Criteria (Authors Own Construct)

| Appraisal Element | Assessment Factor | Reason for Analysis | References |
|---|---|---|---|
| **Gross Development Value** | Rent/sale price. | Gross Development Value (GDV) is a salient valuation metric and allows the developer to determine the investment yield which will be attained. Lenders also base their project appraisals on this figure. | (Measured surveys of land, buildings and utilities, n.d.; Contamination, the environment and sustainability, 2010; Reed and Sims, 2015; Donovan, 2015; Rights of light, 2016; Understanding the Archaeology of Landscapes, 2017; Beck and Levine, 2018; Chen, 2019; Pray, 2019; Portal, 2019; GOV.UK, 2019c; Moskowitz, 2019; Brazg, 2019; Party wall legislation and procedure, 2019; Ons.gov.uk., 2019a). |
| | Investment yield. | An investment yield is an income returned on an investment, the yield is commonly expressed as a percentage or a gross value gain when undertaking a development. | |
| **Development Costs** | | Development costs are assessed to determine whether the project is viable from an economic standpoint. Development costs are analyzed based on the total capital available, the budget is then assessed through the deduction of costs (detailed below) from the total capital available to ensure that the project will achieve a pre-determined level of profitability. | |
| | Land/property costs (private developer only). | Land/property costs are the gross costs of obtaining land and/or property, including associated taxes, permits etc. | |
| | Construction costs. | Construction costs are the overall cost of constructing the property will include the preliminaries, overheads and profits and contingencies imposed by the main contractor. | |
| | Professional fees. | Professional fees include the costs associated with the project/design team such as the Architect, Project Manager, Quantity Surveyor/Employer's Agent etc. | |
| | Site investigation fees. | Site investigation fees are the costs associated with obtaining a site investigation survey/report, which is comprised of ground investigations, geological survey maps etc. This allows for potential hazards associated on site to be determined. | |
| | Planning fees. | Planning fees are costs associated with obtaining planning permission for a development project. | |
| | Building regulation fees. | Building regulation fees are costs associated with obtaining building control certificates. A Building Control Officer will monitor and advise throughout the design and construction phases and ensure the development adheres to current building regulations. | |
| | Funding fees (private developer only). | Funding fees are costs associated with obtaining funding for a development, this includes arrangement fees, exit fees, broker fees, valuation fees etc. | |
| | Finance costs (private developer only)/interest. | Finance costs pertain to the interest rates offered by lenders throughout the duration of a development loan. | |
| | Real Estate Agent fees. | Real estate agents' fees consist of commission, GST, auctioneer fees etc. | |
| | Promotion costs. | Promotion costs are fees associated with the marketing and advertising a development. | |
| | Sale costs. | Sale costs are fees associated with the property sale such as solicitor fees, mortgage discharge fees, property taxes etc. | |
| | Other Costs (Party wall, right to light etc.). | Other costs which must be considered are party wall costs, right to light costs, oversailing costs etc. Architects will commonly determine whether these costs may be incurred, the Developer must then seek advice from a specialist to determine the remedial efforts required. | |

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|---|---|---|
| | Risk Allowance. | Risk allowances are a contingency which is implemented by both the Developer and Lender to ensure that the Developer has funds which are reserved and expended when unforeseen costs are incurred. |
| | Overheads and Profit Allowance. | Overheads are the developer's costs relating to business expenses such as rent, utilities, staff, insurance etc. Profit is a gross amount allowance that the developer will make when the property is sold and is usually expressed as a percentage value of the overall development costs. |
| **Building Condition** | Conditions Survey | Survey of the existing condition of the building's structure and façade to determine suitability for conversion and construction works required. |
| **Statutory and Legal** | Statutory and legal elements associated with the site. | Analysis of the statutory and legal elements associated with the site, such as purchase contracts, planning, community infrastructure levies, party wall agreements etc. |
| **Environmental** | Asbestos surveys, site investigation reports, sustainability requirements. | Asbestos surveys, site investigation reports, sustainability requirements and levels of material re-use. |
| **Risks** | Fluctuations of finance costs i.e. Interest rates and service charges. | The fluctuation of finance costs is potential cost increases/decreases associated with oscillating interest rates and service charges. However, many lenders offer fixed interest rates and service charges. |
| | Fluctuations of residential property values. | The fluctuation of residential property values pertains to the cyclical nature of the property market relating to the momentum or reversion of property sale values. |
| | Increasing costs in labour and materials. | Increasing costs in labour and materials are fluctuations associated with material and labour shortages or oversupply which can cause a price increase/decrease. |
| | Site conditions/off-site upgrades. | Site conditions/off-site upgrades are site-specific items such as S278/106 fees, community infrastructure levies etc. |
| | Ground conditions. | Ground conditions are items associated with the geology, hydrology, and soil conditions of a site. |
| | Contaminated materials. | Contaminated materials include items such as asbestos, industrial waste, agricultural waste, site filling materials etc. |
| | Party wall, rights to light, oversailing disputes. | Party wall, right to light, oversailing disputes etc. Architects will commonly determine whether these costs may be incurred the developer must then seek advice from a specialist in each field, to determine the remedial efforts required. |
| | Primary network upgrades. | Primary network upgrades are items associated with the upgrade of primary local utility supplies. |
| | Service diversions. | Service diversions are items associated with the diversion of key services such as gas, water, electric and telecoms to the site in which the development is taking place. |
| | Archaeological requirements. | Archaeological requirements are sites in which archaeological evidence is observed and investigated. |
| **Location and Site** | Assessment of the location of the site. | Proximity to transport, amenities and leisure and local supply and demand factors. |