

ACTANTS INFLUENCING THE SUCCESSFUL COMPILATION OF ECONOMIC FEASIBILITY STUDIES: THE QUANTITY SURVEYORS' PERSPECTIVE

Rolien Terblanche¹, David Root² and Ria Vosloo³

^{1&2} *School of Construction Economics and Management, University of the Witwatersrand, 1 Jan Smuts Avenue, Johannesburg, South Africa 2050*

³ *Post Graduate Centre, University of Johannesburg, 5 Kingsway Avenue, Johannesburg, South Africa 2006*

An economic feasibility study is a document that provides financial information, which supports informed investment decision-making for property development projects. These feasibilities, however, are inconsistent in content, neglected, lack standards, and creates confusion in practice, leading to undesired investment decisions. It is thus imperative to understand where the issues manifest, what they are and how it can be eliminated to ensure quality and successful feasibilities that provide the correct advice in terms of the economic feasibility of a proposed construction project. By employing the Actor-Network Theory (ANT), these objectives and aim were met through the identification of actants in the feasibility network, understanding the relationships between these actants, understanding and mapping the actor-network, and finally identifying where the issues manifest within this network. A literature review was conducted in addition to 23 interviews with quantity surveyors in South Africa. Through the literature review and semi-structured interviews, several actants were identified. The feasibility is a complex process that involves a substantial amount of actants that influence the success of the advice, investment decision and construction project. Descriptions of the relationships of these actants were noted and graphically depicted, while actions that destabilise the network were identified. With a deepening understanding of the feasibility network, the compilation and usage of feasibility studies could be enhanced by improved understanding, careful compilation, and successful investment decision-making.

Keywords: ANT; projects; information management; investment decisions

INTRODUCTION

Quantity surveyors (Qs), also known as cost engineers (Cruywagen and Llale 2017), are consultants that primarily estimate and manage costs of construction projects. Additionally, they advise property developers on the optimum use of capital (Ismail, Drogemuller, Beazley and Owen 2016; Cruywagen and Llale 2017). This advice is dependent on and supported by an economic feasibility study report (from herein referred to as feasibility/s), a 'tool' often compiled by the QS as part of their responsibility. The feasibility is a document that provides financial information,

¹ rolien072@gmail.com

which supports informed investment decision-making for property development projects (Basak 2006; ASAQS 2016). Therefore, the key stakeholders surrounding the compilation and usage of a feasibility is the QS and the developer, however only the QSs' perspective will be investigated.

Private developers are concerned with commercial success and aim for economic feasibility and benefits, whereas the public sector is concerned with developmental success and aims for social benefits (Rwelamila and Ogunlana 2015). Consequently, the focus will be on the private sector that utilizes feasibilities for private investments in building projects (commercial, retail, industrial and residential sector).

The quality and successfulness of feasibilities are in question, motivated by findings of previous studies. These studies found that feasibilities are inconsistent in content (Shen, Tam, Tam and Ji 2010), often incorrect (Huxham 2010; Kwaku Osei 2016; Kgaka 2018), inadequate (Oso Sunday 2020), neglected and problematic (Mohammed, Naji and Ali 2019). The feasibility is a professional output of a QS and a sub-quality report is neither good for the profession nor the investment decision that it supports (Terblanche, Ozumba and Root 2019). It is thus imperative to understand where the issues manifest, what they are and how it can be eliminated to ensure quality and successful feasibilities that provide the correct advice in terms of the economic feasibility of a proposed construction project.

By employing the Actor-Network Theory (ANT), these objectives and aim can be met through the identification of actants in the feasibility network, understanding the relationships between these actants, understanding and mapping the actor-network, and finally identifying where the issues manifest within this network. This could provide a basis for recommendations that assist the compilation of a quality and successful feasibility. ANT and the corresponding concepts are discussed in the next section.

Actor-Network Theory

ANT was developed by Michael Callon, Bruno Latour and John Law, three Science and Technology studies scholars, in the early 1980's with the aim of explaining complex networks in the scientific research environment (Williams-Jones and Graham 2003). With ANT, certain concepts and terminology are used which will be introduced and briefly explained in this section. These include actor; actant; actor-network; agency; translation; problematisation; interessement; enrolment; mobilisation; black box; focal actant; source actant; target actant; and translating actant.

In essence, ANT recognise that complex relationships exist between actors, where actors are not only humans, but also inanimate objects, processes and concepts, allowing an actor-network to form (Latour 2005). Actors are often referred to as actants within ANT, since an actant is that which either accomplishes or undergoes an act (have agency) (Latour 1996). By using the word actant, the focus is shifted slightly towards the actions of the entity rather than the source of this action. Therefore, the term actant is deemed more appropriate, and will be referred to as such in the following discussions. Furthermore, ANT sees human and non-human actants as equally important and therefore assign agency to both (Callon 1984; Silvis and Alexander 2014). "An actant can literally be anything provided it is granted to be the source of an action." (Latour 1996).

Translation is the concept that explains the gap between the heterogeneous actants that form part of the same network and is the mechanism by which the network takes form (Callon 1984). Callon (1984) further explains that there are four stages to translation termed 'problematization', 'interessement', 'enrolment', and 'mobilisation'. These four stages are interwoven and overlaps and not isolated events that occur sequentially. Problematization occurs when initiating actants, also known as focal actants, identify an issue and propose a solution. In this stage, the initial actants are determined (Pak, Alwi and Ismail 2020). In the second stage, which is interessement, additional actants are recruited to become part of this solution. When the recruitment is successful, enrolment (stage three) takes place. Additionally, during the enrolment stage, the focal actants attempt to define roles in the network. Finally, mobilisation is in play when the network is stable, although temporarily, and the solution is widely accepted. Furthermore, complete translation does not necessarily have to occur, it could fail or stop at any stage (Callon 1984).

Black boxes are used in ANT as a means to simplify the actor-network by condensing parts of the network into a single actant. In these black boxes, it is assumed that the network within is stable (Silvis and Alexander 2014). Simultaneously, it is recognised that the black box can be "opened" at any time to reveal a complex network. Venturini (2012) emphasised the significance of the black box concept, "The basic tenet of ANT is that every actor can be decomposed into a network and that every network can be connected tightly enough to become a single actor."

ANT has been used to map the adoption process of standardisation (Troshani and Lymer 2009), understand development project implementation (Heeks and Stanforth 2014), theorise IT programmes in healthcare (Greenhalgh and Stones 2010), explore the accountability structure in construction projects (Burga and Rezania 2017), and study the privatisation of solid waste management while all applicable parties' interests are aligned (Pak *et al.*, 2020). ANT is thus widely adopted and used across many industries. Most of these studies, however, included only concrete actants in the network, for example: a company, cell phone, learning material, operating manual, etc. Granted that actants can be anything, provided that it is a source of an action, a study does not exploit the full potential of the theory if only concrete entities are given agency. Silvis and Alexander (2014) on the other hand, demonstrated the use of more abstract actants, for example: knowledge, an idea, objectives, perceptions, challenges, etc.

A prominent use of ANT is to examine a network of actants in order to address issues in the system, where the stability of the network directs the capability of the "solution" (Silvis and Alexander 2014). The rationale of using ANT as an analytical tool is twofold. Firstly, to understand the network revolving around the feasibility process and secondly, to identify issues in the network that destabilise the network.

In addition to ANT, Silvis and Alexander (2014) created a graphical syntax for ANT to provide a mechanism for visualising the actor-network. This graphical syntax is useful to identify actants and translations within the actor-network. There are three different roles that actants can take during the translation process (Silvis and Alexander 2014): (i) A source actant: an actant that is being translated (abbreviated as source); (ii) A target actant: an actant that is being translated for another actant (abbreviated as target); (iii) A translating actant: the actant that translates the source actant for the target actant (abbreviated as translator).

LITERATURE REVIEW

Components of a Feasibility

In summary, the main components of a feasibility are: duration and mile stones (Willemse, 2019), total capital outlay, total project income, cash flow projection (Lock, 2020), profitability indicators (Stefánsdóttir, 2015), sensitivity analysis (Karas, 2017), and recommendations towards the investment decision (Stefánsdóttir, 2015).

Total capital outlay includes land costs, construction costs escalated, professional fees, finance costs, and other development costs (Cloete 2006). The total project income requires the calculation of the gross income, net income, and interim income (income prior to opening date) (Huxham 2010). The net income is calculated by deducting the operational costs (Stefánsdóttir 2015). Furthermore, there are various profitability indicators, however most indicators require the total capital outlay and the net income to calculate the profitability (Cloete 2006). Hence, to provide an accurate profitability indicator, all projects' costs need to be accounted for in the total capital outlay, as well as the operational costs in the net income calculation.

Actants in the Feasibility Network

The QS, being central to the compilation of the feasibility, needs to have the required expertise to provide a successful report (Lim, Nepal, Skitmore and Xiong 2016). Irrespective of the experience level, the estimation method used for the construction cost can be detrimental to the success since some estimation methods are too simplified in a complex calculation (Bettini, Longo, Alcoforado and Maia 2016). Furthermore, the QS's volume of work and time allowed/available for the compilation of the feasibility (Dandan, Sweis, Sukkari and Sweis 2019) impose on the amount of research done (Syed Alwee, Salehudin, Mohamed Sabli, Isnaini Janipha and Maisham 2019), compilation approach and estimation method. Finally, the over allowance of a contingency can overthrow the feasibility (Lim *et al.*, 2016).

In addition to the QS's experience, the developer's level of knowledge also influences the approach to a successful feasibility (Al-Hawsah 2020). While the QS compiles the feasibility, the QS requires certain information from the developer and the professional team (architects and engineers). Hence, the clarity of the developer's brief is essential to successful compilation (Dandan *et al.*, 2019), as well as the completeness of the information received from the team (Syed Alwee *et al.*, 2019). The completeness, however, is not the only concern, the level of experience of the team (Dandan *et al.*, 2019) along with a cost conscious approach (Bettini *et al.*, 2016) impact the feasibility. Furthermore, QSs sometimes make use of information from historical databases without questioning the applicability to the new feasibility (Lim *et al.*, 2016).

When a rental scheme is at play, the success of the feasibility is highly dependent on the availability of tenants (Karas 2017). Furthermore, external influences like change in exchange rates and inflation (Dandan *et al.*, 2019) and the volatility of the market (Kgaka 2018) impose on the overall validity of the outcome of a feasibility.

METHODOLOGY

A fundamental principle of research based around ANT is that it should be able to tell a rich story of a particular network (Heeks and Stanforth 2014). Therefore, qualitative data was gathered by means of in-depth, semi-structured interviews with QSs in South Africa as the target population. The criteria for the QSs to be deemed adequate,

included Qs with more than five years of experience in the private commercial sector (commercial, retail, industrial, hospitality and bulk residential). After 43 adequate quantity surveyors were approached, a total of 23 agreed to be interviewed, resulting in a 53.49% success rate. The participants were identified by using a combination of the purposive sampling method and snowballing.

The interviews were recorded, then transcribed verbatim using Otter.ai. In the interviews, no personal identification questions were asked, and the recorded files were saved under a pseudonym. The uploaded file to Otter.ai had thus no personal information, while the login details to Otter.ai remained confidential, ensuring the protection of the participants' identity. A reflexive thematic analysis followed via the NVivo software program. Using ANT as an analytical framework, actants influencing the successful compilation of feasibilities were identified through arising themes.

Through the reflexive thematic analysis of the qualitative data, themes developed at a later stage from the codes while the theme development required considerable interpretive work from the researcher (Braun and Clarke 2021). Furthermore, coding in the reflexive thematic analysis approach is recognised as an inherently subjective process (Braun and Clarke 2021). In addition to this, an interpretation of actants within a system is required to map the network, motivating the adoption of the interpretivist philosophical view. The analysis is conducted with the ANT framework and the graphical syntax is used to interpret and demonstrate the actor-network. The syntax uses symbols to present an actants' state as well as the relationships within the network. Descriptions of these relationships were noted and graphically depicted.

Interpretation and Graphical Presentation of the Actor-Network

The graphical presentation of the network can be seen in Fig 1 and the interpretation of the actants, and the corresponding relationships are discussed hereunder.

With the objectives of giving and receiving correct advice in terms of economic feasibility of a proposed construction project (abbreviated as objective), the QS and developer form key actants of the network along with the economic feasibility study report. The empirical data gathered is from the perspective of the QS, a key actant. The literature review in combination with the interviews presented actants that form part of the actor-network. The two data sources are deemed complimentary in the mapping and interpretation of the feasibility actor-network.

The QS as the source actant impose on the objective (target) by their perception of a successful feasibility (translator) which should be aligned with the developers' view of a successful feasibility. Some Qs do recognise that the success of the study is dependent on the parameters set by the developer: "A successful feasibility study depends on what the client wants at the end of the day." Another perspective of a successful feasibility is that it is only deemed successful once the project is completed within the constraints of the study. Some argue that the success is directly related to the return presented by the study. An additional perspective is that the feasibility should be accurate and honest, irrespective of the predicted return. A final perspective is that the study is deemed successful once the project has been approved: "It's successful when we get to a point that we can turn a paper exercise into a real project." If the perception of the QS do not align with the developer the following happens: "And I think it's one of the biggest problems in the market generally, is that we as Qs are trying to, try and convince our clients that they must do this development. Every scheme is a good scheme, and it's not always the case." Or the

expected income is manipulated by the QS to make the project seem feasible to get the project approved (Kgaka 2018).

Given that various perspectives exist in the QS profession regarding what constitutes a successful feasibility, it is imperative that the QS's perspective is aligned with the developer's perspective to work towards the same goal. Further to the QS being the source actant, the QS is responsible for compiling the report and requests input (translator) from the professional team (architect and engineers) (target), from financiers (target) as well as the municipality (target). In turn, the input from the professional team (source), enact on the objective (target) by the level of completeness of the input and being cost conscious (translator): "In the end the feasibility is only as accurate as the information that you get." "Good architects, in my opinion are very good at design, but also have a sense of cost." "...makes a huge impact, you have consultants that is cost conscious, and you have ones that really doesn't care." If the team is not cost conscious, often tension would arise between the QS and the design team: "Tension builds, we fight with everyone because I need to protect the feasibility and protect the estimate."

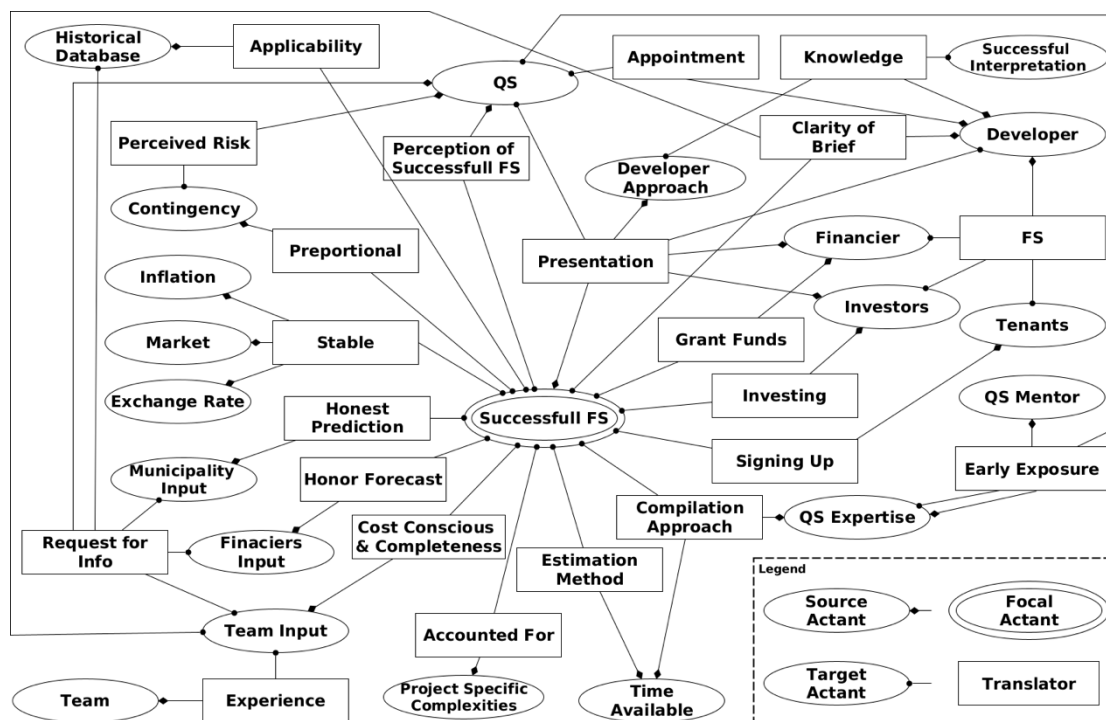


Fig 1: Feasibility Actor-Network

Similarly, the input from the municipality (source) effects the objective by giving an honest and trustworthy estimate (translator) of the expected rates and taxes. Unfortunately however, municipalities in South Africa seem to change their rates and taxes once the building is in use, causing a significant decrease in return: "There is things like increases in rates that can have a major effect on the feasibility, when the council ups his rates by 100% for no real reason." Additionally, the input from the financiers (source) influence the objective by honouring the forecasted interest rate (translator) when they were initially approached.

The QS (source) decide on the contingency (target) based on their perceived risk (translator) in the project. The contingency (source) however, needs to remain proportional (translator) to the total project cost to avoid overthrowing the potential

investment: "But we also find that contingency can kill a job and you got to be realistic with the contingency."

The QS level of expertise (source) change the QS (target) by early exposure of the required knowledge (translator). The QS level of expertise is deemed the source actant due to the knowledge reaching the QS instead of the QS finding the knowledge. However, the expertise level (target) is imposed by the mentor (source) of the QS by allowing the inexperienced QS to get exposure (translator) to feasibilities.

Nonetheless, in the industry it is often seen that there is a delayed exposure to feasibilities and a reluctance of knowledge sharing: "Specifically the younger QSs don't get exposed to it." Furthermore, the QS level of expertise (source) contribute to the objective (target) by means of the compilation process (translator). Some participants referred to having "a feel for the feasibility". Kahneman (2011) explains that this 'knowing-without-knowing' is knowledge gained over time and stored in memory and this intuition is merely an experience of memory. Therefore, the "feel" occurs when a QS has a certain level of experience, which is a required actant to contribute to the stability of the network.

Irrespective of the expertise level of the QS, the time available (source) to compile the feasibility infringe on the objective (target) by means of the compilation approach (translator) and estimation method (translator): "We would go into as much detail as we've got time available, to be honest, because the more detail you can put into it, it's all the better for decision making". "Sometimes you do it in square meters, because the client wants it the next morning." Other participants expressed their concerns about the rate per square method of estimating: "They put a rate per square which is extremely dangerous, we don't ever do that, we do not recommend that."

While the QS is compiling the feasibility, project specific complexities (source) need to be accounted for (translator) to contribute to the objective (target). The complexities that manifest in a feasibility are the type of income stream, operational costs and projects done in phases and was expressed by various participants: "So the income side is always this sort of uncertain and operational costs as well." "And it's not only just the income, it is also the operational costs and we find ourselves getting more and more involved in." "And then the hard part comes which is operational costs." "If it is phased, it is more complicated."

External actants that impose on the success of a feasibility (target) is the exchange rate, inflation rate and market (sources). If the exchange rate, inflation and market remain stable (translator), the negative impact is mitigated: "60% of the building is reliant on import duties, and an exchange rate." "You need to actually have a look, is the project mechanically intensive, are there lots of lifts are there lots of important air conditioning equipment or whatever that might affect the Rand Dollar, that might affect your escalation."

Moving to the developer (source) - QS (target) relationship, the developer approaches the QS with the objective to get correct advice in terms of the economic feasibility of a proposed construction project. The relationship is translated through an appointment or an agreement with the QS. However, in South Africa, the compilation stage of the feasibility is often done as risk work: "Especially in South Africa, a lot of private sector commercial projects are done on a risk basis." Furthermore, the professional fees have been decreasing lately: "...the professional fees, and that's just getting less and less every year." Both the aforementioned factors motivate the limited time that

the QS profession is willing to spend on the compilation of a feasibility, which in turn negatively affect the quality of feasibilities.

As part of the feasibility process, financing needs to be sourced (if required), investors need to be attracted (if required) and tenants need to be signed up if it is rental scheme. The developer (source) approaches financiers (target) and investors (target) with a preliminary feasibility (translation) with the aim to source funding. The financier (source) acts on the success of a feasibility (target) by granting funds (translator). The investor (source) contributes to the success of a feasibility (target) by investing (translator). Additionally, the investors (source) and financiers (source) have requirements in terms of the presentation (translator) of the feasibility: "We've had a couple of specifications or criteria from financiers, how they want to see it, they would want to see specific calculations for financing purposes as well on the capex, which we have incorporated." "Does he plan to get partners involved, because that all kind of stipulates how you would present this feasibility." In a rental scheme, the developer (source) needs to sign tenants up (targets) and usually use the preliminary feasibility study (translator) as a negotiation medium. The tenants (source) impose on the success of the feasibility (target) by signing the tenant contract (translator): "Especially with retail, one day you've got 70% let scheme, the next day 30% of them is pulled out."

Once the feasibility is compiled, with the objective (source) to give correct advice in terms of the economic feasibility of a proposed construction project, the QS (source) presents the feasibility to the developer (target). The developer (source), with the right knowledge level (translator), interprets the feasibility and advice presented successfully. In the industry however, developers have various levels of knowledge when it comes to the feasibility: "All of the clients aren't educated in the built environment. So that is why you actually have to lecture them through your feasibility study." Additionally, the developer's (source) level of knowledge (translator) impacts the approach (target) the developer take in the feasibility process. This approach becomes a source actant and influence the presentation (translator) of the QS (target): "The one developer said to me now, I don't want to see all this, I want to see how much it costs. The other developer, he wants to see the nitty gritty."

CONCLUSIONS

The economic feasibility study is a complex process that involves a substantial amount of actants that influence the success of the advice, investment decision and construction project. The actants are not limited to the stakeholders involved but includes abstract influencers such as what a QS deem a successful feasibility to be. The feasibility is faulty with various problems in practice. This can be seen in the fragile and often unstable feasibility actor-network. With a deepening understanding of the actants in the feasibility process, the compilation and usage of economic feasibility studies, for private commercial developments where profitability is key, could be enhanced globally by improved understanding, careful compilation and successful investment decision-making.

The methodology limits the findings to the perceptions of a small sample of South African Qs. Therefore, further studies including the developers' perspective and the feasibility document as an artefact could be further explored, as well as including international perspectives and/or larger sample sizes by means of quantitative data. The identified actants could be further explored and unboxed.

REFERENCES

- Al-Hawsah, M (2020) *The Impact of Project Sponsors' Decisions on the Success of Projects: An Action Research Study*, DBA Thesis, Management School, University of Liverpool.
- Basak, B (2006) Cost management in an imperfect world: Bridging the gap between theory and practice, *ICEC Cost Management Journal*, 1-8.
- Bettini, C R, Longo, O C, Alcoforado, L F and Maia, A C G (2016) Method for estimating of construction cost of a building based on previous experiences, *Open Journal of Civil Engineering*, **6**(5), 749-63.
- Braun, V and Clarke, V (2021) Can I use TA? Should I use TA? Should I not use TA? comparing reflexive thematic analysis and other pattern-based qualitative analytic approaches, *Counselling and Psychotherapy Research*, **21**(1), 37-47.
- Burga, R and Rezanian D (2017) Project accountability: An exploratory case study using Actor-Network Theory, *International Journal of Project Management*, **35**(6), 1024-36.
- Callon, M (1984) Some elements of a sociology of translation: Domestication of the scallops and the fishermen of St Brieuc Bay, *The Sociological Review*, **32**(1), 196-233.
- Cloete, C (2006) *Feasibility Studies: Principles and Practice*, South Africa: The South African Property Education Trust.
- Cruywagen, H and Llale, J (2017) The Role of Quantity Surveyors in Public-Private Partnerships in South Africa, *South African Journal of Economic and Management Sciences*, **20**(1), 1-7.
- Dandan, T H, Sweis, G, Sukkari, L S and Sweis, R J (2019) Factors affecting the accuracy of cost estimate during various design stages, *Journal of Engineering, Design and Technology*, **18**(4), 787-819.
- Greenhalgh, T and Stones, R (2010) theorising big it programmes in healthcare: Strong structuration theory meets Actor-Network Theory, *Social Science and Medicine*, **70**(9), 1285-94.
- Heeks, R and Stanforth, C (2014) Understanding development project implementation: An actor-network perspective, *Public Administration and Development*, **34**(1), 14-31.
- Huxham, A (2010) *Property Development: Feasibility and Impact Parameters in the Vaal Triangle*, MBA Thesis, Business School, North-West University.
- Ismail, N A A, Drogemuller, R, Beazley, S and Owen, R (2016) A review of BIM capabilities for quantity surveying practice, In: A S B Ali, N F B Azmi, S J L Chua and S N B Kamaruzzaman (Eds.) *4th International Building Control Conference*, 7-8 March, Kuala Lumpur EDP Sciences, **66**, 1-7.
- Kahneman, D (2011) *Thinking, Fast and Slow*, UK: Penguin Books.
- Karas, J (2017) *Formulation and Analysis of Possible Strategies for Project Horova*, Diploma Thesis, Department of Economics and Management in Construction, Czech Technical University in Prague.
- Kgaka, L (2018) *Challenges Faced by Small Real Estate Entrepreneurs in the Johannesburg Central Business District*, MSc Dissertation, Department of Construction Economics and Management, University of Cape Town.
- Kwaku Osei, E (2016) *An Evaluation of Project Cost Management in the Mining Industry: A Case Study of AngloGold Ashanti (Gh) Limited-Obuasi Mine*, MBA Thesis, School of Business, Kwame Nkrumah University of Science and Technology.

- Latour, B (1996) On Actor-Network Theory: A few clarifications, *Soziale Welt*, **47**(4), 369-81.
- Latour, B (2005) *Reassembling the Social: An Introduction to Actor-Network-Theory*, Oxford: Oxford University Press.
- Lim, B, Nepal, M P, Skitmore, M and Xiong, B (2016) Drivers of the accuracy of developers' early-stage cost estimates in residential construction, *Journal of Financial Management of Property and Construction*, **21**(1), 4-20.
- Lock, D (2020) *The Practitioner Handbook of Project Controls*, UK: Routledge.
- Mohammed, S R, Naji, H I and Ali, R H (2019) Impact of the feasibility study on the construction projects, *In: 2nd International Conference on Sustainable Engineering Techniques*, 6-7 March, Baghdad IOP Publishing, **518**, 1-7.
- Oso Sunday, B (2020) Management of time overrun in a selected building projects in Auchi Polytechnic, Auchi, Edo State, *International Journal of Innovative Research and Advanced Studies*, **7**(5), 246-53.
- Pak, N A H C, Alwi, N M and Ismail, S (2020) Translation of management control system in solid waste management network, *In: Proceedings of the 4th UUM International Qualitative Research Conference (QRC 2020)*, 1-3 December 2020, Virtual Conference, 198-207.
- Rwelamila, P and Ogunlana, S (2015) *WI07-Construction in Developing Countries Research Roadmap- Report for Consultation*, South Africa: International Council for Research and Innovation in Building and Construction.
- Shen, L, Tam, V W, Tam, L and Ji, Y (2010) Project Feasibility study: The key to successful implementation of sustainable and socially responsible construction management practice, *Journal of Cleaner Production*, **18**(3), 254-9.
- Silvis, E, Alexander, P M (2014) A study using a graphical syntax for actor-network theory, *Information Technology and People*, **27**(2), 110-28.
- Stefánsdóttir, Á Ó (2015) *Feasibility Studies in Construction Projects in Iceland*, MSc Thesis, School of Science and Engineering, Reykjavik University.
- Syed Alwee, S N A, Salehudin, N, Mohamed Sabli, N A, Isnaini Janipha, N A and Maisham, M (2019) The importance of information in the preparation of feasibility study for construction development, *Voice of Academia: Academic Series of Universiti Teknologi MARA, Kedah*, **14**(1), 64-73.
- Terblanche, R, Ozumba, O and Root, D (2019) Enhancing financial communication in quantity surveying practice, *In: C Aigbavboa and W Thwala (Eds.), The Construction Industry in the Fourth Industrial Revolution*, CIDB, 28-30 July 2019, University of Johannesburg, 276-86.
- Troshani, I and Lymer, A (2009) Translation in XBRL standardization: An Actor-Network view, *In: 20th Australasian Conference on Information Systems*, 2-4 December 2009, Melbourne 775-84.
- Venturini, T (2012) Building on faults: How to represent controversies with digital methods, *Public Understanding of Science*, **21**(7), 796-812.
- Willemse, H (2019) *An Assessment of the Relevance of Feasibility Studies in Public Projects in South Africa*, Master's Thesis, University of Johannesburg.
- Williams-Jones, B and Graham, J E (2003) Actor-network theory: A tool to support ethical analysis of commercial genetic testing, *New Genetics and Society*, **22**(3), 271-96.