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Citation: Gledson, Barry and Downs, Maddy (2017) Examining vignettes in AEC research – how are they used, and what are they good for? In: 3rd International Sustainable Ecological Engineering Design for Society (SEEDS) Conference, 13th -14th September 2017, Leeds.

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Examining vignettes in AEC research – how are they used, and what are they good for?

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Keywords: Research Methods, Sustainability, Vignettes.

Abstract

Prominent concerns of the SEEDS research community revolve around the intentions, ethics, behaviours and standards of designers, constructors and users of our built assets. One way of examining such 'approaches' is through the application of well-considered vignette type questions embedded within appropriate research instruments. The vignette technique presents research participants with a credibly constructed 'hypothetical' scenario that facilitates reflection, and can potentially reveal normative behaviours, specifically 'how' participants would react in such circumstances. An appraisal of the typical research methods used in the Architecture, Engineering and Construction (AEC) literature reveals an apparent underuse of such a data collection technique, and a systematic type literature review reveals several other uses of the term. The aims of this work are to explore the use of vignettes across the wider AEC literature, introduce the usefulness of vignettes as a data collection tool, and consider their suitability for the purposes of the agenda of the SEEDS community. The work concludes with the inclusion of an exemplar 'ethical dilemma' vignette to demonstrate the technique and a call for greater use of more 'sustainability focused' vignettes, in future empirical research work.

INTRODUCTION

Research is undertaken to address specifically formulated research aims, questions or hypotheses (Smith, 2014), and Fellows and Liu (2008) refer to research as being a “*voyage of discovery*”. The research efforts of the Leeds Sustainability Institute (LSI), and its academic network, particularly the annual Sustainable Ecological Engineering Design for Society (SEEDS) conference, are aimed at discovering, constructing, and then disseminating knowledge around the environmental impacts of the built environment. The mission of these learned bodies is also largely aligned with the goals of several leading, peer-reviewed building and construction journals, whose key concerns are illustrated in Figure 1.



Figure 1: Word cloud created from the scope of selected, leading 2017 Building, Construction and Engineering journals.

The above word cloud was created after using a leading journal ranking website, to perform a search for leading journals listed as 'Building and Construction' category within 'Engineering' subject area. From these, a random selection of several journals from within the top 50 journals results was taken. The text advising of the journal scope, from all these publications were fed into a word cloud web tool. These journals included:

- Energy and Buildings
- Buildings and Environment
- Automation in Construction
- Building Research & Information
- Construction Innovation: Information, Process, Management
- Engineering, Construction and Architectural Management

The usual strategies of undertaking research include 'Action', 'Ethnography', 'Survey', 'Case Study' and 'Experimental' approaches (Fellows and Liu, 2008; Yin, 2009), with Saunders et al., (2009) also listing 'Archival', and 'Grounded Theory' research styles. Use of such strategies are very evident in these built environment research journals, but an

apparently overlooked and underused research tool in the Architecture, Engineering and Construction (AEC) domain(s) involves the use of 'vignettes'. The aim of this work is therefore to explore the extent of, and potential greater use for, vignette techniques. This is done to see if, and how, they can assist the efforts of the academic network which engages in the LSI, and contributes toward the type of research activity presented at the SEEDS conferences.

Vignette Techniques

Vignette techniques, as a means of data collection, are used, albeit relatively infrequently, in Survey Research methods. Survey research is used to solicit and measure attitudes, opinions, and values, about some 'thing' of importance or relevance that is highly related to the focus of the research enquiry. Typical survey research instruments include questionnaires or interviews. Criticisms of survey research revolve around the fact that such tools are generally not used to directly observe or measure actions, but instead data are obtained which has been 'filtered' by actors, and is therefore somewhat untrustworthy. This is explained by Leiringer and Dainty (2017) thus: *"we have seen a proliferation of papers where the research is seeking the opinions of respondents, typically through surveys or interviews. And so what we know about construction is largely framed by what practitioners tell us about it, and not what we observe in and through our engagements"*. Bryman (2015) identifies several problems with using survey research to investigate behaviours, that:

- respondents interpret different meanings from questions;
- there is omission of key terms when reading questions;
- there is a reliance on people's memories of their behaviour;
- the 'Social desirability effect' manifests;
- threatening questions produce invalid answers;
- there is interviewer bias, and;
- there are 'gaps' between stated and actual behaviours.

To counteract some of these problems, researchers can make use of vignette techniques. These present research participants with credibly designed scenarios, and are believed to help reveal more normative behaviours. As such, they are particularly appropriate for use when broaching difficult or sensitive issues. Atzmüller and Steiner (2010), define a vignette as, *"a short, carefully constructed description of a person, object, or situation, representing a systematic combination of characteristics"*. Sandri *et al.*, (2016) distinguishes between 'vignettes' and 'situations', to wit, vignettes are often presented as impersonal narratives (i.e. where the focus of the narrative is on hypothetical actors), rather than the more personal narratives, sometimes known as 'situations' (where the narrative instead positions the respondent into such a hypothetical situation). Here however, 'vignettes' are used to cover both construction types, as such a distinction is not necessary for the purposes of this work. When used as part of survey research, vignettes are presented, questions are then asked, and responses can potentially reveal how participants would 'actually' react in such circumstances. Qualitative data can be captured, but survey design can also make use of closed-, rather than open-ended responses, to generate quantitative data for purposes of statistical analysis. A good

example of the technique in use is provided by Loo (2002), who investigated ethical dilemmas in project management practice. He constructed several vignettes that participants could readily identify with, as happening during project delivery, and then measured participant responses quantitatively using a Likert-type scale to facilitate data analysis. One example which focused on 'honesty' and 'transparency', is reproduced below:

“About half-way through a major project, a project manager becomes anxious about the schedule because the project has been falling behind schedule for some- time and a formal project review with the client is set for four weeks from today. The project manager discusses the situation with several senior members of the project team and there is much heated discussion. At the end of the meeting, the manager decides not to mention the schedule problem to the client or to senior management in the hope that the project might get back on schedule by the time the project review is held in four weeks.”

Despite their apparent suitability for AEC research however, the present research team believed the technique to be under-used. This perception prompted a structured literature search to be undertaken, the process and results of which are now discussed, then accompanied with a discussion of the literature sourced.

STRUCTURED LITERATURE SEARCH: EXPLORING THE USE OF “VIGNETTES”.

To locate examples of vignettes used as a method of data collection in the field of 'Construction', or in general 'Survey Research', the lead researcher¹ collaborated with an Information Science and Data Analytics MSc distance-learning student² who ensured a highly structured search was performed. This collaborative opportunity came about because of an innovative coursework assessment at Northumbria University, that required the MSc student to act as an 'information provider' to help resolve an 'information need' from an informed 'client' (the lead researcher). The student and researcher were 'matched' by the programme leader of the Information Science and Data Analytics MSc degree who originally had circulated an 'expressions of interest' message about such information sourcing and retrieval project opportunities. Because both researcher and student were based in different locations, several discussions about the scope of the project were held, making use of collaborative video conferencing technology to plan the search, and assess the results. It was ensured that:

1. A list of online databases potentially holding information relevant to information needs was compiled. These initially included: SCOPUS, Web of Science, and Google Scholar.
2. A systematic -type keyword search was performed on databases to identify relevant items.
3. Citation analysis was performed where necessary to identify further items.
4. Relevant results were pooled.
5. An evaluation occurred to assess how relevant each item was to the information need.

Initially the search term was phrased as vignette AND (“Construction Project Management” OR “Built Environment” OR “Architecture Engineering and Construction”). These were soon widened to also include “Construction”, because of the difficulties in generating relevant results which mentioned vignette in the required context of vignette survey/question design. Even then, after subsequent filtering, evaluation, and analysis occurred, only 35 relevant sources were located, with most results employing the term to mean something different. Because of this low yield, the lead researcher then performed a keyword search of the abstracts database within a known, further relevant database, the Association of Researchers in Construction Management (ARCOM) abstracts web-portal and was able to retrieve 5 additional sources. Table 1 summarises the use of the term Vignette in each document from the search results in relation to ‘Examples of vignettes within construction’:

Table 1: Reviewing the meaning and application of vignettes in initial pool of 40 documents

<i>Perceived meaning and use of ‘vignettes’ in document</i>	<i>Number of sources</i>
Vignette question design (i.e. for the purposes of data collection)	3
Presenting of data (i.e. constructing narratives from any primary data collected)	23
Illustrative vignettes (i.e. constructing scenarios not for the purposes of data collection, but to establish a narrative to assist understanding. The distinction here is that such vignettes have not been constructed through any primary data collection, but instead are either hypothetical, or grounded in reality but have been constructed using existing materials or artefacts such as case study materials).	9
Other (1 – Vignette is considered as a research technique; 1 – ‘Vignette’ software referred to; 2 – 0 counts of vignettes in document itself; 1 – Book review)	5

As would be expected, much more success was had in relation to a more general the Survey/Social Research search. For example, the search for: vignette AND TOPIC: (“social research OR “research methodology” OR “survey research”) presented a greater number of relevant results, although again after the necessary filtering, evaluation, and analysis had been undertaken, these results were not that much larger than the ‘construction’ search ($n=47$ in Web of Science, and $n=74$ in SCOPUS). From these searches, the most relevant were evaluated by the lead researcher, and an overview of these are discussed

below, starting briefly with the wider social research literature, before narrowing on construction related-literature.

REVIEWED LITERATURE: DISCUSSION OF THE USES OF 'VIGNETTES' WITHIN THE LITERATURE 'YIELD'.

Martin (2004), recounts how the use of vignettes can be attributed back to Jean Piaget's use of "*story situations*" in his research into the educational research of children. The wider Survey/Social Research search reveals that Alexander and Becker (1978), Rossi and Nock (1982) and Finch (1987) were all enthusiastic early proponents of the vignette within survey research, and appear to be the most highly cited gathering (at the time of the research) 993, 510, and 819 citations respectively. Alexander and Becker (1978) noted that because of the vivid descriptions produced in vignette questions, can produce more "*valid and reliable measures of respondent opinion*", a point supported by Martin (2004). Although Finch (1987) argued that there was increasing interest in their use, this was not readily apparent across the literature sourced, with several different representations of the term being apparent. Indeed, in a review of 25 years of 'factorial surveys' in sociology, Wallander (2009), first cites Rossi, stating: "*it will be some time before the vignette technique becomes entrenched as a common tool in social research*" (Rossi, 1979), before herself adding: "*Hopefully, this moment is approaching*".

However, within the AEC-related research, and as identified in Table 1, 'vignette' is used in several different ways. For data collection, which is the primary concern of this work, only the work of Loo (2002), described above, Adams (2006), and Nejat *et al.*, (2016) can be referred to. Adams (2006), employed the vignette technique to elicit subjective 'open-ended' responses from 'experts' around the risk of facing adverse ground conditions on construction sites. To do this, he produced a descriptive account of a hypothetical construction project then constructed several questions aiming to generate responses containing: "*the experts' estimates of the relative likelihood of occurrences of risk of adverse ground conditions on a set of projects similar to the one described in the vignette*" (Adams, 2006, p86). Also employing survey research Nejat *et al.*, (2016), incorporated the use of a hypothetical family in their vignette questions which enabled them to collect data for a study explaining how 'family bonds' affect any relocating or rebuilding decisions made by individuals who experienced property destruction from Hurricane Sandy in the United States.

As also identified within Table 1, other efforts have employed the term 'vignette' in alternative ways, either for 'illustrative' purposes, or for the presentation of any primary data collected. For example, in a study investigating how practitioners were adapting to newer ways of working using 'design-authoring', and 'management', innovations, Harty and Whyte (2010) constructed a number of vignettes based upon studies involving the implementation of such tools on large scale construction projects. However, these vignettes were used to (richly) describe and illustrate issues of practice, rather than for the collection of data. Similarly, both Barrett and Barrett (2006), and Monson *et al.*, (2015), use the term 'vignettes', to instead describe the production and dissemination of illustrative case-study materials, with the latter describing their usefulness when issued as

part of teaching instructions, presenting problems for students to engage with, and learn from.

The most frequent use of the term 'vignettes' within the AEC-related literature sourced instead refers to the presentation (rather than collection) of highly relevant, qualitative data, and was found principally in ethnographic, or survey research efforts. For example, in an article that contains 24 instances of the term, Shipton *et al.*, (2014), identifies that *"ethnographic findings are frequently presented within vignettes which describe particular events within the fieldwork that highlight certain issues and patterns of practices"*. Use of vignettes to present ethnographic findings, was performed by Orstavik and Dainty (2016) as well as Shipton *et al.*, (2014) themselves, whose solitary vignette of 1,544 words contains a good example of such practice, describing the workings of a site meeting, and presents in-depth, and rich qualitative data. In contrast Rawlinson and Farrell (2009), incorporated a series of much shorter (approximately 222 words each) personalised 'point-of-view' vignettes, constructed from first hand interview notes (i.e. Survey research), into their investigation of the attitudes and other underlying drivers behind risk-taking behaviour in site workers. Also categorised as survey research, the work of Saunders *et al.*, (2016), is noteworthy for how, in their investigating of uncertainty in major, 'safety-critical' projects, the researchers instead present the term 'vignettes', as a kind of shorthand for the series of qualitative accounts obtained directly from their participants.

It seems therefore, that understanding and usage of 'Vignettes' across the research community appears to be inconsistent, with differing interpretations being held by various research actors. Because of such variability, and in an attempt to better understand the wider use of Vignettes across the broader research community (i.e. not just AEC research) it was decided to attempt to 'crowd-source' this issue via some first-hand research.

FURTHER EXPLORATION

Use was made of the academic social networking site (ASNS) well used by researchers and scientists, 'ResearchGate', which advertises its purpose as allowing such actors to 'to share papers, ask and answer questions, and find collaborators'. As such, an open question was posed under the title of *'The use of Vignettes as a research method within Project Management?'* (see Gledson, 2016), the question (slightly amended for clarity) was:

"I am interested in exploring the use of Vignettes in this (AEC) area either for teaching or research purposes. [are you aware of] any notable examples of well-constructed or prominent vignettes within project management or related fields?"

Some qualitative data were received, but only from a handful of respondents (n=2), which again potentially indicates low-levels of understanding and use of the term. Comments included how valuable a tool vignettes can be in business and teaching arenas, and how the construction of the vignette is generally not as important as the 'issues' within the presented scenarios. Regarding practical (rather than data gathering) applications, it was discussed how these could be used in: staff recruitment (when used in job interviews) and

staff development (e.g. to enhance decision making skills); and for the teaching of students. It was stated by Respondent A, that “[the] *application of the vignette can be to a simple or complex point ... It is an amazing tool with an almost unlimited application*”. This respondent also advised that a range of areas in which vignette scenarios could focus on could include areas of: *“ethics, process, legal, practical, interpersonal development and impact, internal/external perceptions, and more”*, all of which can be related to areas of specific SEEDS research interests. Additionally, this respondent was also able to offer some practical guidance which would be of use for any researcher interested in applying the technique: *“The source of the vignette generally comes from three areas: a situation already encountered and solved, a situation encountered and not solved, or a situation expected - but not yet encountered and not solved.”*

Rather than focus on data gathering Respondent B focused on their benefits in the analysis and presentation of data, and offered some practical and ‘positioning’ advice: *“Vignettes can be an excellent tool for research. It enables researchers to make use of the subject's own voice and produce a rich narrative, rather than simply presenting analysis of dry data. Thus, it is more interesting to the end reader. Within a positivist research paradigm, such an instrument would probably be regarded as lacking rigour but could still be useful in generating discussion and developing research background and questions/hypotheses. Within an interpretive or critical paradigm, vignettes can provide rich, anecdotal evidence for reflection”*. Indeed, within the structured literature search, the use of vignettes to present data was found to be much more frequent than any use in data gathering opportunities, as previously identified in Table 1.

AN ETHICAL DILEMMA VIGNETTE

Through exploration of the suitability of using vignettes for data collection techniques, and to develop further competence in the technique, the lead researcher has constructed the following ‘ethical dilemma’ vignette, to be piloted, refined as necessary, then embedded into a suitable future research instrument:

“Yohan recently joined a large international contracting organization as project manager and is overseeing the construction of a UK hospital for the NHS. He had previously worked for a small organization that had far fewer specialist resources, such as Ben, the specialist regional ‘environmental manager’, responsible for assessing sustainability issues, and determining their impact on project performance. Over the course of his first year in the job, Yohan begins to suspect that Ben, is both under-reporting ‘bad’ metrics (e.g. levels of waste arising; energy used) and over-reporting ‘good’ metrics (e.g. levels of public transport use). Around this time, Yohan is advised by his director, Catherine, that at the upcoming stakeholder engagement (public forum) meeting, the client wishes to specifically focus upon the enviable environmental performance as one of the key project successes. This is being done to appease members of the local community who have always opposed the location of the project.”

Such a vignette could then be used in survey research, to collect either qualitative or quantitative data.

For qualitative research efforts: ‘open’ responses could be allowed for the following types of questions: *“What should Yohan do?”*.

This type of question keeps the scenario impersonal and helps assess the ‘intentions’ and ‘standards’ of the participants. Alternatively, to personalize it (i.e. a ‘scenario’), the interviewee could be asked: *“Have you encountered any similar situation before?”*

If the response is ‘no’, the interviewee could then be asked: *“What would you do?”* Again, this may only help assess the ‘intentions’ and ‘standards’ of the participants, however if the response is ‘yes’, then the interviewee could then be asked: *“What did you do?”*, as this instead helps assess the ‘ethics’ and ‘behaviors’ of the participants.

For quantitative research efforts: such a vignette could be accompanied with various ‘closed response’ options that would assist in statistical analysis, through the collection of ordinal or categorical data to be able to perform subsequent standardized statistical tests:

Via ordinal data - by using Likert-type scale responses, e.g.:

“Please provide your level of agreement to each of the following statements using either 1 – Strongly disagree; 2 – disagree; 3 – Unsure; 4 – Agree; 5 - Strongly agree”

Statements

- A. Yohan should discuss his suspicions with Ben in private: ____
- B. Yohan should share his suspicions with Hazel: ____
- C. Yohan should present the positive results provided by his colleague, ‘as is’, at the stakeholder engagement (public forum) meeting: ____

Via categorical data – by using the following type of question/response option combination, to try to assess ‘intentions’ and ‘standards’, research respondents could be asked to either ‘select one’, or, ‘rank in order’, the response options to the following question:

“What should Yohan do next?”

- Yohan should discuss his suspicions with Ben in private.
- Yohan should share his suspicions with Hazel.
- Yohan should present the positive results provided by his team, ‘as is’, at the stakeholder engagement (public forum) meeting.

A suitable follow up question could be: *“Have you encountered any similar situation before?”* with Yes/No closed response options being provided, and then depending upon each response, the questions: *“What would you do?”* (could be asked for assessing ‘intentions’ and ‘standards’) OR *“What did you do?”* (could be asked for assessing ‘ethics’ and ‘behaviors’):

- Discuss my suspicions with the individual in question.
- Shared my suspicions with my superior.
- Present the results provided by my team member when required (progress report; stakeholder meeting etc.).

It is hoped that the strength and flexibility of the vignette technique is apparent from the content outlined above.

CONCLUSION

In AEC research, there are several different uses of the term 'vignette' in circulation. The 'vignette technique' when used for the purposes of data collection, seems to be an ideal mechanism for helping understand the intentions, ethics, behaviours and standards of designers, constructors and users of our built assets. However, its use appears limited within wider survey research, and certainly within AEC related research, efforts related to the obtaining of data were scarce. Although each of the different aspects referred to as vignettes were of value, having several different uses of the term in circulation does not help researchers establish the type of 'common language' useful for greater application of research techniques. Despite such concerns, this work has helped to increase understanding about the potential of the technique for data collection purposes, as well as evidence existing levels of use for other purposes. The work now concludes with a simple challenge to the SEEDS community to make greater use of 'sustainability focused' vignettes, in their future data collection efforts, so that such 'intentions, ethics, behaviours and standards' of AEC actors and stakeholders can be better understood, and therefore, influenced.

Limitations.

Although described above as a highly 'structured' literature search, the lead researcher cannot absolutely state if a full 'systematic' literature search occurred by the Information Science and Data Analytics MSc distance-learning student², although it can be confirmed that a sufficient level of sorting, evaluation, and analysis of the literature was performed. However, because of this approach, it may be possible that, as evidenced through the ARCOM keyword search performed by the lead researcher¹, some other valuable sources were not collected, though in several subsequent checks made by the lead researcher, any such sources from the construction domain were not readily apparent.

REFERENCES

- Adams, F.K. (2006), "Expert elicitation and Bayesian analysis of construction contract risks: an investigation", *Construction Management and Economics*, Vol. 24 No. 1, pp. 81–96.
- Alexander, C.S. and Becker, H.J. (1978), "The Use of Vignettes in Survey Research", *The Public Opinion Quarterly*.
- Atzmüller, C. and Steiner, P.M. (2010), "Experimental vignette studies in survey research", *Methodology*, Vol. 6 No. 3, pp. 128–138.
- Barrett, P. and Barrett, L. (2006), "The 4Cs model of exemplary construction projects", *Engineering, Construction and Architectural Management*, Vol. 13 No. 2, pp. 201–215.
- Fellows, R. and Liu, A. (2008), *Research methods for construction*, Wiley-Blackwell, West Sussex, 3rd Edition.
- Finch, J. (1987), "The Vignette technique in Survey Research", *Sociology*, Vol. 21 No. 1, pp. 105–114.

- Gledson, B.J. (2016), "The use of Vignettes as a research method within Project Management?", *ResearchGate*, available at: https://www.researchgate.net/post/The_use_of_Vignettes_as_a_research_method_within_Project_Management (accessed 29 April 2017).
- Harty, C. and Whyte, J. (2010), "Emerging hybrid practices in construction design work: role of mixed media", *Journal of Construction Engineering and Management*, American Society of Civil Engineers, Vol. 136 No. 4, pp. 468–476.
- Leiringer, R. and Dainty, A. (2017), "Construction Management and Economics: New Directions", *Construction Management and Economics*, Routledge, Vol. 35 No. 1–2, pp. 1–3.
- Loo, R. (2002), "Tackling ethical dilemmas in project management using vignettes", *International Journal of Project Management*, Vol. 20 No. 7, pp. 489–495.
- Martin, E. (2004), "Vignettes and respondent debriefing for questionnaire design and evaluation", *Methods for testing and evaluating survey questionnaires*, Citeseer, pp. 149–171.
- Monson, C., Homayouni, H., Dossick, C.S. and Anderson, A.K. (2015), "Improving the Understanding of BIM Concepts Through a Flipped Learning Lab Environment : A Work in Progress Improving the Understanding of BIM Concepts Through a Flipped Learning Lab Environment : A Work in Progress", *American Society for Engineering Education*, p. 16.
- Nejat, A., Cong, Z. and Liang, D. (2016), "Family Structures, Relationships, and Housing Recovery Decisions after Hurricane Sandy", *Buildings*, pp. 1–16.
- Orstavik, F. and Dainty, A. (2016), "On The Doing of Building Work: 'Ways of Knowing' As Modes of Coping with Complexity", in Chan, P. and Nielson, C. (Eds.), *Proceedings of the 32nd Annual ARCOM Conference*, Association of Researchers in Construction Management, Manchester, UK, Vol. 2, pp. 707–716.
- Rawlinson, F. and Farrell, P. (2009), "The Vision of Zero Risk Tolerance in Craft Workers and Operatives : an Unattainable Goal?", *25th Annual ARCOM Conference*, pp. 1203–1212.
- Rossi, P.H. (1979), "14. Vignette analysis: uncovering the normative structure of complex judgments", *Qualitative and quantitative social research: Papers in honor of Paul F. Lazarsfeld*, Simon and Schuster, p. 176.
- Rossi, P.H. and Nock, S.L. (1982), *Measuring social judgments: The factorial survey approach*, SAGE Publications, Incorporated.
- Sandri, O., Holdsworth, S. and Thomas, I. (2016), "Vignette question design for the assessment of graduate sustainability learning outcomes", *Environmental Education Research*, Routledge, No. December, pp. 1–21.
- Saunders, F.C., Sherry, A.H. and Gale, A.W. (2016), "Dualities and dilemmas: contending with uncertainty in safety-critical projects", *Construction Management and Economics*, Routledge, Vol. 6193 No. December, pp. 1–19.
- Saunders, M., Lewis, P. and Thornhill, A. (2009), *Research methods for business students*, Pearson Education Limited, Essex, 5th Edition.
- Shipton, C., Hughes, W. and Tutt, D. (2014), "Change management in practice: an ethnographic study of changes to contract requirements on a hospital project.", *Construction Management & Economics*, Routledge, Vol. 32 No. 7/8, pp. 787–803.
- Smith, P. (2014), *The PhD Viva: How to prepare for your oral examination*, Palgrave Macmillan, Basingstoke, 1sted.

- Wallander, L. (2009), "25 years of factorial surveys in sociology: A review", *Social Science Research*, Elsevier Inc., Vol. 38 No. 3, pp. 505–520.
- Yin, R.K. (2009), *Case study research: design and methods*, Sage Publications, Thousand Oaks, California, 4th Edition.