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The relationship between traditional project management, agile project management and teamwork quality on project success

Adebayo Agbejule and Lassi Lehtineva
Department of Mechanical and Energy Engineering, Vaasa University of Applied Sciences, Vaasa, Finland

Abstract

Purpose – The aim of the study is to explore how the different combinations of traditional and agile project management (APM) enhance project success under different levels of teamwork quality.

Design/methodology/approach – The study used system approach, using cluster analysis, to examine the relationships between project success and traditional project management (TPM) and APM under different levels of teamwork quality. A cluster analysis approach provides a method to examine how the entire range of variables combine to improve project success.

Findings – The results of the study revealed three profiles of project managers' differences in teamwork quality and type of project management used: pure agile, TPM leaning hybrid and APM (APM) leaning hybrid. The results found evidence that TPM leaning hybrid received the highest score in project success.

Practical implications – Organizations should develop teamwork skills to learn to use both TPM and APM so that specific risks presented by one approach use are compensated by the use of other. Finally, organizations should have good TPM practices before planning to implement agile practices.

Originality/value – The findings of this study suggest that TPM with high teamwork quality supported by APM can enhance project success. APM supported by TPM contributes to improved project success.

Keywords Traditional project management, Agile project management, Team work quality, Project success

Paper type Research paper

1. Introduction

The role of teamwork quality (TWQ) in traditional and agile project management (APM) has attracted the attention of researchers (Lindsjørn, 2016; Layton and Ostermiller, 2020). TWQ is considered to be a critical factor in the success of project management (Hoegl and Gemuenden, 2001; Hoegl *et al.*, 2003; Malik *et al.*, 2021; PMBOK, 2021). TWQ

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focuses on the role of communication, collaboration, trust and motivation within a project team (Diallo and Thuillier, 2005; Chiocchio *et al.*, 2011). Traditional project management (TPM) places emphasis on linear processes, predictability and upfront planning. On the other hand, APM is based on iterative or adaptive life cycle and is designed to accept and embrace change (Wysocki, 2009). Vinekar *et al.* (2006) proposed that the role of team work quality differs in agile and TPM. APM focuses on collaborative work, which requires interaction among multidisciplinary skills, high customer involvement and small teams, while TPM emphasizes individual work, low customer involvement and larger teams (Lindsjørn *et al.*, 2016). Previous studies have either explored the role of TWQ on TPM (Hoegl and Gemuenden, 2001; Li *et al.*, 2010) or on APM (Lindsjørn *et al.*, 2016) and project success (PS). To the best of the authors' knowledge, there is no study investigating the role of team quality when project managers adopt simultaneously both TPM and APM. Thus, given the existing gap in the project management literature, this study is motivated to integrate the literature on APM into those of TPM by exploring the role of TWQ. Consequently, the following research question is proposed:

RQ1. What is the effect of teamwork quality on the simultaneous use of TPM and APM on project success?

While our study provides practical suggestions for managers, the study also contributes to theory building to literature in the following ways. Although researchers have suggested the importance of the simultaneous use of TPM and APM (hybrid) in PS (Cobb, 2011; Salameh, 2014; Conforto and Amaral, 2016), little has been done in investigating the roles of TWQ in a hybrid environment. Researchers (Layton and Ostermiller, 2020; Malik *et al.*, 2021) have focused on the role of teamwork in only APM environments. Secondly, the PMBOK (2021) deals with team characteristics in TPM and APM, but does not consider the role of TWQ in a hybrid environment.

2. Literature review and theoretical development

2.1 Team work quality

TWQ is the level of interactions and motivations among project team members (PTMs; Hoegl and Gemuenden, 2001; Lindsjørn *et al.*, 2016). Hoegl and Gemuenden (2001) identified aspects of TWQ to include:

> (Communication, i.e., the open discussion and sharing of information; coordination, i.e. coordinating tasks between team members; balance of member contributions, i.e. utilizing team members' knowledge; mutual support, i.e., team members supporting each other; effort, i.e. expending effort on given tasks; and cohesion, i.e. promoting team unity and consistency), holding the quality of task-related and social interaction within teams.

The definition of TWQ can be classified into aspects of interaction (communication, coordination and mutual support) and motivation (effort, balance of member contribution and cohesion). This research focuses on the interaction aspect of TWQ (collaboration, communication, trust and team environment) among PTMs as key factors contributing to project performance (Diallo and Thuillier, 2005; Chiocchio *et al.*, 2011; Petrén, 2012). Handy (1995) found that the ability to work collaboratively is a core competency of TWQ. Communication is the ability to discuss openly and effectively inform and share information and knowledge, with other team members, without hiding critical information (Dietrich *et al.*, 2010). Communication is the core of TWQ and critical for team collaboration. The ability to communicate directly and freely with PTMs without a mediator (i.e. coordinator or

team leader) is vital in a multiple project management setting as the multiple project manager leads multiple teams; therefore, communication among team members is vital to avoid delays in processing tasks (Al-Shatti, 2018). Trust improves cooperation and collaboration processes, which contribute to an improved capacity to manage the interdependencies of tasks among PTMs. For example, collaboration enables agile teams to communicate quickly and respond rapidly to changes as they emerge. A favourable team environment creates a climate of trust where project members can freely express ideas without the fear of making mistakes. Creating such a work environment is critical to TWQ and can lead to generation of innovative ideas, which in turn influence project performance. Table 1 shows the differences between the TWQ constructs used in the current study in TPM and APM.

2.2 Traditional project management

TPM emphasizes disciplined planning and control methods and brings formality into project management (Kerzner, 2013; Salameh, 2014; Conforto and Amaral, 2016). Kerzner (2013) gives three major benefits for the plan-driven approaches: providing structure to project management, providing possible standardization in planning, scheduling and control (i.e. forms, checklists and guidelines) and allowing for a structured decision-making process. The traditional plan-driven approach is most effective in projects with stable and well-known requirements. On the other hand, the approach typically faces challenges in projects with high level of uncertainty (Bianchi *et al.*, 2018).

2.3 Agile project management

The agile framework has four core values: individuals and interactions over processes and tools, working software over comprehensive documentation, customer collaboration over contract negotiation, responding to change over following a plan. Aguanno (2004) suggests that the core values of manifesto can be applied to APM. Unlike the TPM, which try to predict and minimize change and uncertainty, APM is seeking to adapt to uncertainty and accommodate changes even in later phases of a project (Cooke-Davies, 2002). APM relies heavily on the collaboration and communication between the project team and the customer or customer representative to create the right product in a lean fashion (Aguanno, 2004;

TWQ	TPM	APM	References
Communication	Formal supported by detailed documentation, output and approval	Informal, interactive, face-to-face communication	Cram and Marabelli (2018)
Collaboration	Command and control	The team makes decisions, estimates, prioritizes	Cicmil and Marshall (2005); Dietrich *et al.* (2010)
Team environment	Mechanistic with high formalization	Organic/flexible and participative	Kadefors (2004)
Trust	Traditional project management focuses on monitoring roles. Not encouraging between the team members	Agile methods are about empowering individuals not governed by a rigid process but by trusting team members	Kadefors (2004); Diallo and Thuillier (2005); Petrén (2012)

Table 1.
TWQ in TPM vs AGM

Source: Adopted from Lindsjørn *et al.* (2016)

Collyer *et al.*, 2010; Sliger, 2011). APM is considered most effective in projects with a high level of uncertainty, such as new design, problem-solving and not-done-before work. This sort of high uncertainty work has a high rate of change, complexity and risk. Agile approaches explore feasibility in short cycles and quickly adapt based on evaluation and feedback (Bianchi *et al.*, 2018; Highsmith, 2004). The use of agile methods promotes a working environment that supports creativity and productivity, enables rapid adaptation to change and brings value for the customer, based on better identification of needs and priorities and faster multiple delivery of functionalities (Leffingwell, 2007).

2.4 Hybrid project management, team work quality and project success

Hybrid project management is combining the plan-driven approach of TPM and the flexibility of APM to achieve PS. A good project management methodology delivers a successful project and includes better control of project scope, faster delivery, quality management process and better customer satisfaction supported by effective information exchange among key stakeholders (Kerzner, 2013). PS is a multi-dimensional construct that can be defined into two key components: short-term project management success (efficiency) and the long-term goals of the project (effectiveness) (Serrador and Turner, 2015). This study focuses on project effectiveness dimension of PS. Sommer *et al.* (2015) found out that the combination of agile and traditional stage-gate approach generates a healthy tension between fixed planning and iterative problem-solving that can lead to PS in product development projects. The challenge is to balance the two approaches to leverage their strengths in a given situation while compensating for their weaknesses (Boehm and Turner, 2003; Aguanno, 2004; Carlsen and Pitsis, 2020). Both agile and TPM practices have situation-dependent shortcomings that, if not addressed, can lead to project failure. APM is a combination of TPM concepts and flexible lightweight, collaborative, adaptable to frequent change, yet highly discipline practice (Salameh, 2014). Because of constant changes and frequent modifications, APM requires improved project, communication, monitoring, coordination and trust among team members to ensure the project falls within the business need and vision of the company (Haas, 2007).

TWQ becomes essential to ensure dialogue, communication and collaboration in an environment of frequent changes. The climate for trust can reduce the stress and conflicts associated with changes in adopting an agile way of working. Coram and Bohner (2005) found that an APM method requires upfront planning to ensure that project requirements are met for the first release. This shows that one methodology is not enough, and both agile and TPM can use the different elements of project management methodology to capture the various aspects of both project and organizational environment to ensure PS. For example, the potential benefits of APM, which is interactive in nature, may be reduced because of insufficient coordination among team members to set boundaries and highlight effective issues (Serrador and Turner, 2015). On the other hand, the use of TPM use can prevent organizations that are continually seeking innovation from squandering resources on redundant ideas (Miller and Friesen, 1982). Consequently, dynamic tension motivates constant dialogue and debate concerning strategic issues and encourages shared communication and coordination (Henri, 2006; Sommer *et al.*, 2015). Batra *et al.* (2010) found out that APM without structure/coordination can lead to chaos in large complex distributed project. On the other hand, structure without agility creates rigidity in projects that require a great deal of learning, discovery and changes (Stare, 2014). There are many ways to set up an agile–TPM hybrid model. Depending on the project type and organization, the model can be either more agile or TPM-focused. For example, only a limited part of the project could be done in a single sprint and the rest of the project completed according to the stage gate

model (Bianchi *et al.*, 2018). Organizations using a traditional plan-driven approach may improve their new product development performance by incrementally transitioning towards a more agile way of working by improving TWQ, informal communication and trust among PTMs (Cooke-Davies, 2002).

The literature presented above shows the role of team quality in both TPM and agile methods can influence PS. When team members collaborate with each other, it creates the opportunity for knowledge sharing, dialogue and exchange of ideas that can lead to innovative skills that in turn can influence PS. The hybrid approach offers the additional benefits of managing high uncertainty through incremental product versions, quick learning cycles and frequent customer involvement (Cooper and Sommer, 2016). Therefore, this paper aims to explore the different combinations of TWQ on the simultaneous use of traditional and APM on PS. This is consistent with contingency research that suggests that different project management methodologies and processes combine to affect PS (Hanisch and Wald, 2012). To do so, this study will identify different profiles of PTMs using TPM and APM and examine differences among TWQ and its impact on PS. With our results, the study aims to contribute to a better cluster of PTMs who are using both TPM and APM.

3. Research method

3.1 Sampling characteristics

The company is a Finnish company and a global leader in energy business and provides EPC (engineering, procurement and construction) and life cycle support services for their customers in three business areas (marine, energy business and services), and has over 19,000 employees. The company delivers three types of projects in the energy business: customer delivery projects, operational development projects and product and solutions development projects. A survey was randomly sent to 1,000 PTMs in the energy business section of the company globally. A total of 209 responded, making it a response rate of 20.9%. Out of the 209 received, the total amount of eligible answers was 202, which gives a valid response rate of 20.2%. The average age of the respondents was between 31 and 40 years and they had worked in their field for over 10 years. About 55.9% of the respondents had worked over 10 years in the company, thus having most likely a good understanding of the company practices. About 54.4% of the respondents are working in projects teams or an expert role, 12.4% as project managers, 13.9% as steering group members and 19.3% in other supporting functions. Additionally, 78.7% of the respondents are working on customer delivery projects, 11.9% on products and solutions development project and 9.4% on operational development project (see Table 2).

3.2 Assessment of reliability and validity

Content validity was obtained by using measurements derived from the literature and face validity was tested and ensured during the pretesting phase (Hair *et al.*, 2012). To establish content validity, existing measures of TPM, APM and PS was adopted and modified. In addition, the questionnaire was pre-tested. In the pre-test, inputs were received from two Senior Development Project Managers of the company and three project managers. They were asked to review the questionnaire and to comment on the language clarity of each question as well as the overall format of the instrument. Convergent validity refers to the state when items measure their intended construct. Convergent validity is done using the principal component analysis. Principal component analysis using varimax rotation method was used because the primary goal was to identify and compute composite scores for the variables of the study. Varimax rotation ensures independence among the mathematical factors, meaning that during the rotation, the axes remain orthogonal. Bartlett's test of

sphericity and Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy were performed on the data to confirm the suitability of the data for factor analysis. The KMO measure of sampling adequacy is above the recommended value of 0.6, showing that the sample from which the data was collected was adequate. Barlett's test of sphericity was significant. All the factors loading are positive and above the minimum acceptable loading of 0.30 (Hair *et al.*, 2012). The reliability of each construct exceeds the minimum acceptable cut-off point of 0.60 (Nunnally and Bernstein, 1994; Taherdoost, 2016).

3.3 Measurement of the variables

3.3.1 Traditional project management practices. The dimension of project management practices was adapted from O'Sheedy (2012). The dimension was evaluated on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). The following items were used:

- Projects are carefully planned.
- Project scope is well known in the beginning of projects.
- Changes in project scope are well managed and documented.
- Foreseeable risks are well managed.
- There is a common way of managing projects in the company.
- There are sufficient tools for project management in the company.
- Project lifecycle always follows a stage gate model.

A factor analysis using principal component analysis shows the seven items loaded on a single factor with an eigen value of 3.788, explaining 54% of the variance of the underlying the variable. A KMO of 0.86 ($p < 0.001$) indicated the data's appropriateness for this analysis (Hair *et al.*, 2012). The Cronbach's alpha coefficient was 0.85, indicating internal reliability (see Table 3).

3.3.2 Agile project management. The dimension regarding APM practices was measured using the instrument from O'Sheedy (2012). The dimension was evaluated using a five-point scale (1= strongly disagree, 5 = strongly agree) on the following items:

Item	Frequency	(%)
How many years have worked in your field?		
Less than 1	7	3.5
1–3	30	14.9
4–6	20	9.9
7–10	32	15.8
Over 10	113	55.9
What is your most recent role in a project organization?		
Project team member/expert	110	54.4
Project manager	25	12.4
Steering group member	28	13.9
Other	39	19.3
What is the typical type of project your are working in?		
Customer delivery project	159	78.7
Product and solutions development project	24	11.9
Operational development project	19	9.4

Table 2. Summary of respondents' demography

Questions	Factor loading
Projects are carefully planned	0.781
Changes in project scope are well managed and documented	0.775
Project scope is well known in the beginning of projects	0.753
Foreseeable risks are well managed	0.736
Project lifecycle always follows a stage gate model	0.727
There is a common way of managing projects in the company	0.707
There are sufficient tools for project management in the company	0.669
Eigen value 3.788	
% of total variance 54%	
Cronbach's alpha 0.83	
KMO 0.86	
Barlett's test of sphericity 539.38	
Degree of freedom (df) 21	

Table 3.
Factor analysis of traditional project management

- In a new unique situation, not all facts of a project may be known before the project starts.
- It is important that projects can react quickly to unforeseen problems.
- If changes occur in a project, the people involved need to be informed quickly.
- A project method that can help projects react more quickly to change would be useful in our company.
- A project method needs to be less formalized to be able to react to change.
- People may require a longer time to get adapted if a project produces major changes.

A factor analysis shows the six items loaded on a single factor with an eigen value of 2.350, explaining 40% of the variance of the underlying the variable (see Table 4). KMO is 0.65 ($p < 0.001$). The Cronbach's alpha coefficient was 0.62, indicating internal reliability for the scale.

3.3.3 Team work quality. The dimensions of team work quality were adapted from O'Sheedy (2012). The four items identified derived from the literature theories are team communication, trust, collaboration, team environment and team trust. The following items were used:

- There is good communication between teams in the project.
- There is open communication within team members.
- There is a good team environment among project members.
- There is a good level of trust inside the team.

Table 5 shows the four items loaded on a single factor with an eigen value of 2.707, explaining 67% of the variance of the underlying variable and a KMO of 0.73 ($p < 0.001$).

3.3.4 Project success. The dimension of PS was adapted from O'Sheedy (2012) and Serrador and Turner (2015). Six items are used to measure PS on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). The following items were used:

- The company measures project management success systematically.
- The company implements lessons learned from previous projects.
- Project customers are satisfied with the outcome of the projects.
- We are satisfied with the outcome of the projects.
- The projects are officially closed.
- The project team is rewarded according to success.

Questions	Factor loading
It is important that projects can react quickly to unforeseen problems	0.812
A project method that can help projects react more quickly to change would be useful in our company	0.708
If changes occur in a project, the people involved need to be informed quickly	0.676
In a new unique situation, not all facts of a project may be known before the project starts	0.552
A project method needs to be less formalized to be able to react to change	0.461
People may require a longer time to get adapted if a project produces major changes	0.341
Eigen value: 2.350	
Percentage of variance: 40%	
Cronbach alpha: 0.62	
KMO 0.65	
Barlett's test of sphericity 210.09	
Degree of freedom 15	

Table 4.
Factor analysis of agile project management

Questions	Factor loading
There is open communication within team members	0.834
There is good communication between teams in the project	0.825
There is a good team environment among project members	0.839
There is good level of trust inside the team	0.791
Eigen value: 2.707	
Percentage of variance: 67%	
Cronbach's alpha: 0.83	
KMO: 0.73	
Barlett's test of sphericity: 337.95	
Degree of freedom: 6	

Table 5.
Factor analysis of teamwork quality

A factor analysis shows the six items loaded on a single factor with an eigen value of 3.009, explaining 51% of the variance of the underlying the variable (see Table 6). The Cronbach's alpha coefficient was 0.79, indicating internal reliability for the scale and a KMO of 0.78 ($p < 0.001$).

4. Results

Researchers have suggested three different approaches in analysing data in contingency studies in organizational and project management: selection, interaction and system approaches (Drazin and Van de Ven,1985). In this study, the system approach was adopted because it takes a holistic view of fit and supports that different combinations of TPM, APM and TWQ can enhance PS. Composite scores were created for each of the four factors based on the mean of the items that had loadings on each factor. The skewness and kurtosis were well within recommended ranging for assuming normal distribution. By following the recommendations of Hair *et al.* (2012), the absolute value for both skewness and kurtosis did not exceed the critical value of 3 and 10, respectively. Thus, the normality assumption was not violated. The descriptive statistics is presented in Table 7.

Question	Factor loading
Company implements lessons learned from previous projects	0.786
We are satisfied with the outcome of the projects	0.778
Company measures project management success systematically	0.741
Project customers are satisfied with the outcome of the projects	0.719
The project team is rewarded according to success	0.608
The projects are officially closed	0.593
Eigen value: 3.009	
Percentage of variance: 51%	
Cronbach's alpha: 0.79	
KMO: 0.78	
Barlett¨s test of sphericity: 365.65	
Degree of freedom: 15	

Table 6.
Factor analysis of project success

Variable	*N*	Mean	SD	Skewness	Kurtosis
Traditional PM	202	3.58	0.68	2.54	0.640
Agile PM	202	4.21	0.45	2.60	2.58
TWQ	202	3.85	0.69	−0.54	0.51
Project success	202	5.48	0.64	1.30	1.54

Table 7.
Descriptive statistics

4.1 Statistical analysis

Cluster analysis is a multivariate statistical tool for detecting groups and patterns in a data set (Hardle and Simar, 2019). Two of the most common types of cluster analysis are hierarchical and nonhierarchical clustering. In this study, the nonhierarchical clustering (k mean clustering) was used as it reduces the data dimension by finding appropriate representatives or *centroids* for clusters, or groups, of data points (Subasi, 2020). A k-means cluster analysis was used to identify how team work quality differs in the different combinations of TPM and APM. PTM scores on their use of TPM, APM and team work quality were standardized and used as clustering variables. To compare the cluster solutions, one-way analyses of variance (ANOVAs) with Tukey's post hoc comparisons were conducted to compare clusters. The data were analyzed using the SPSS version 26. The k-means cluster analysis identified a three-cluster solution that provided the best theoretical fit. The identified clusters differed in team work quality and use of TPM and APM and impact on PS. The first cluster comprised 19% of the PTM ($n = 38$) and comprises those characterized by relatively low levels of use of TPM, APM and team quality and PS. This cluster is labelled "pure agile" due its high score on APM compared to TPM. The second cluster included 27% of the project members in the

Variables	C1 (38)	C2 (55)	C3 (109)	*F* test	*p*
TPM	2.84 (3)	3.05 (2)	3.86 (1)	42.21	0.001
APM	3.90 (3)	4.64 (1)	4.10 (2)	114.75	0.001
TWQ	2.96 (3)	3.63 (2)	4.28 (1)	37.12	0.001
PS	2.95 (3)	3.22 (2)	3.79 (1)	118.18	0.001

Table 8.
Mean scores of the variables in the cluster

study sample (n = 55). PTM in this cluster also scored the highest in PS and had the highest use for TPM and ranked second in the use of APM and denotes "TPM leaning hybrid". This group is labelled as "agile leaning hybrid focused". The third and largest cluster included 54% of the managers in the study sample (n = 109). PTM in this cluster scored the highest in PS and also had the highest use for TPM and ranked second in the use of APM and denotes "TPM leaning hybrid". Table 8 provides the mean scores of the variables in the cluster.

5. Discussion and conclusion

The purpose of this paper was to contribute to the limited body of knowledge on how TPM and APM combine to enhance PS under different levels of team work quality. The applications of the k mean-cluster analysis provided the basis for identifying three profiles of PTMs based on the use of traditional and APM and their differences in terms of team work quality and impact on PS. The first group is classified as "pure agile" with a higher score on APM compared to TPM and with the lowest score in team work quality and PS among the clusters. The second group "agile leaning hybrid" ranked highest in APM, and second in both TWQ and TPM, confirming the role of TPM in agile setting. The third group, which is the largest in the sample, is "TPM leaning hybrid". This group had the highest score in TPM and TWQ, and ranked second in APM. Our study suggests the key role TWQ plays in the simultaneous use of TPM and APM. The adoption of agile by traditional project managers can create people and process conflicts (Boehm and Turner, 2003), requiring high TWQ to reduce the stress and conflicts associated with change. PTMs with high use of TPM requires a high level of team work quality to adopt APM to enhance performance. On the other hand, in agile leaning hybrid, PTM require TPM to ensure coordination and to prevent chaos during the interactive process (Batra *et al.*, 2010). For example, in customer delivery projects, agile may promote dialogue and interaction with customer (flexibility orientation), while the TPM might be vital in preventing scope creep (control orientation).

Our study makes two contributions to research literature. First, the current study highlights the importance of the role team work quality on TPM and APM, and PS. Second, the results of the present study increase our knowledge and understanding on simultaneous use of traditional and APM. It is important to acknowledge the limitations of the present study. First, the sample was drawn from a global company, and most of the respondents were from the energy business section of the company. Second, as in the case in most survey empirical studies, this study is static and may not capture the changes in organizational development over time. To prevent this bias, longitudinal follow-up studies would be required. Third, this study focuses on PS. Future research could explore the implications on job satisfaction and job performance.

Future research could expand the model to include variables, such as project risk factors and motivational aspects of team work quality. Another area of future research would be to develop additional variables to capture the different dimensions of hybrid project management. Such a measure would assist other researchers to explore the different variations of APM and TPM in improving job performance and PS.

Nevertheless, this study has important implications for the practice of project management. The study will assist to inform both researchers and practitioners to value the dynamic and healthy tension of different combinations of TPM and APM. For example, APM can be used only for certain types of projects. In addition, managers should develop team work skills to learn to use both TPM and APM so that specific risks presented by one

approach use are compensated by the use of other. Finally, organizations should have good TPM practices before planning to implement agile practices.

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Further reading

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About the authors

Dr Adebayo Agbejule is an Associate Professor at the Department of Mechanical and Production Engineering, Vaasa University of Applied Sciences in Finland, and the Program Coordinator of project management studies. His research and teaching focuses on business and finance models in renewable energy, project management and management accounting systems implementation. Adebayo Agbejule is the corresponding author and can be contacted at: ade@vamk.fi

Lassi Lehtineva obtained his Master of Engineering degree in Project Management from the Vaasa University of Applied Sciences in Finland. His research interests include project documentation, project management practices and tools and currently works as Senior Project Development Manager.

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