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Gender Based Perception of Successful Construction of Project Managers’ Attributes

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Received: 30 May 2018; Accepted: 6 July 2018; Published: 11 July 2018

Abstract: Project Managers (PMs) are assets for every construction enterprise. The PM’s personality is essential as it defines the way that PMs cooperate with the project team and thus influence drastically the project performance. The current research focused on identifying the way gender influences the perception of required PMs’ attributes. In this context, a survey questionnaire was administered over a five-year period. Research survey successfully recorded 497 responses from Greek engineers. The survey identified profile data regarding the respondents and the scores assigned to the desired characteristics of the PMs. Firstly, a database was organized in SPSS and was followed by descriptive statistics analysis, independent sample t-test and correlation analysis that succeeded in identifying the way that gender influences the perception of PMs’ personality characteristics. It was found that in general, female engineers have a different perspective on the attributes required for competent PM that their male counterparts do. Independent sample t-test and correlation analysis led to the same conclusions. More specifically, it became evident that female engineers tend to assign the highest Likert scale based scores (five), whereas male respondents tend to assign lower scores to all considered attributes. It is also worth mentioning that a significant amount of correlation appeared in the sample, significantly greater in number than the previous research initiatives. The most highly ranked abilities include: “Capability of Risk Evaluation”, “Promptness on Solution Provision” and “Collaborative—Team Spirit”. These attributes are anticipated due to the effects of the financial crisis on the implementation of construction projects in Greece.

Keywords: competent project managers; personality characteristics; attributes; gender; perceptions

1. Introduction

Construction projects are essential for the economic development of a country. Especially in the case of Greece, construction projects implementation could have a positive effect on the national economy and development. Such projects depend primarily on the human capital available. Project teams require coordination, guidance and control to reach peak performance. The person who orchestrates the construction personnel is the project manager. It is no coincidence that literature is greatly focused on the PM roles, duties, responsibilities, capabilities, knowledge, personality traits and facets.

The effectiveness and productivity of organisations have always depended heavily on the quality of their workforce, or their human capital (Wolf and Jenkins 2006). Crawford (2000), Stevenson and Starkweather (2010) emphasize that the importance of the project manager has generated a significant body of research based literature. Project management practices are becoming increasingly crucial, as more and more work is organized through projects and programmes (Winter et al. 2006). It is true that PMs’ field of expertise is quite extensive and this creates difficulty in defining the manager’s responsibilities and required attributes (Carter 1988).
A project team performs better when team members’ personalities are compatible with each other. The current research aims to identify if and how a perception of the competent PM changes based on the gender of the engineer. Thus, this research aims at examining the required attributes of a competent PM, investigate whether gender influences the acknowledgement and assessment of these attributes and finally, the current paper tries to establish the basis for compatible personalities, leading to efficient project teams. Studies concerning the gender and occupation is a topic of interest for many researchers (Griffith and Dasgupta 2018; Sarathchandra et al. 2018; Banchefsky and Park 2018).

In the following sections, a literature review will be presented covering aspects of PMs attributes and identifying as much of the relevant research as possible. Literature review aimed at identifying required attributes of a competent Project Manager and at the same time illustrate the professional environment and conditions met in the case of male and female project managers. The goal was to highlight the different reality that male and female project managers face and provide a background that could facilitate a logical interpretation, of different attitudes and perceptions regarding the significance of the competent PM’s attributes. Relevant research also covers aspects of behaviours and attitudes from PMs toward male and female project participants. Literature emphasizes the variations in behaviour and attitude of the PMs towards male and female employees. This fact produces a corresponding emotional reaction on behalf of male and female project stakeholders creating at the same time a continuous feedback loop. The latter may potentially justify the different needs and assessment of PMs. Then the methodological approach that describes the steps taken is depicted. A number of analyses followed that included: reliability analysis, descriptive statistics regarding the respondents’ profiles and the scores assigned to attributes, independent sample t-test and finally correlation analysis. After considering the findings of the analyses, discussion on the results follows and finally, conclusions and further research.

2. Literature Review on PMs Attributes

Literature on PMs is quite extensive. PM is the person of interest when it comes to construction projects. The current section aims at briefly reviewing critical material regarding the PMs. PM has been identified as the person responsible for orchestrating the entire construction process (Cheung et al. 2004). Dziekoński (2017) introduced a model of construction project managers’ competencies in Poland. The findings involved acknowledged literature definitions of competence, such as the behaviourist, the generic and the cognitive but could not determine which ones have the greatest impact on the competence of construction project managers.

As far as gender is concerned, male and female PMs are equally good (Müller and Turner 2007b). Buckle and Thomas (2003) suggest that contemporary gender scholarship reveals that different skill sets are founded on inherently gendered logic systems. It is critical to examine the role of masculine and feminine logic systems in project management. Their study deconstructs portions of the Project Management Body of Knowledge (PMBOK) in order to investigate the means in which gendered logic systems play a role in generally-accepted project management practice.

In the same context, Gale and Cartwright (1995) focus on women in project management. Then, their research embarks on a discussion on gender and organizational culture. The authors wondered whether the quantification of individual differences in the abilities, attitudes and managerial style of men and women could lead to gender polarization. Their research advised that organizational cultures should nurture and promote the behaviours and values of team working.

PIM focuses on the importance of leadership for project managers (Neuhauser 2007). Therefore, leadership style has been the focus of a lot of research dealing with the project manager competence. Men and women have differentiated managerial styles. This conclusion was based on the answers provided by the students of a Master on Project Management to a case study (Rodríguez et al. 2017). It became evident that men and women make different decisions at least in relations to some scenarios regarding project management. Differences were identified in 5 out of 53 situations that were presented to the students. Statistically significant difference was observed in at least one case. It became evident
that men follow a more authoritarian approach, whereas women a more social one, especially when it comes to leadership style (Rodríguez et al. 2017).

Pinto et al. (2017) focused their research on gender bias in selection for a project manager job. A lot of research examines the fact that female managers are subjected to negative stereotypes and bias. The latter influences hiring decisions. Current research aims at a job selection challenge within the context of project management. Findings suggest that in cases where the perceived technical competence of the job candidate was low, male candidates would be preferred. However, as a candidate’s perceived technical competence increased, female job seeker was more likely to be hired over a male candidate.

Cartwright and Gale (1995) through statistical analysis revealed that women are underrepresented in managerial positions throughout Europe. This is particularly true in project-based industries such as construction. Parameters that affect this situation include: education, training, women’s role in society and discrimination, at all levels of education and selection and promotion. At the same time, Chasserio and Legault (2010) highlight the difficulties that women face in project—based firms such as organization and management of information and communication technologies (ICT) enterprises. This fact leads to: long working hours, unpaid overtime, high management expectations to meet unanticipated client requirements and the need for employees to respond to flexible work arrangements. Women are disadvantaged in such a system. This could explain their under-representation in such sectors. Furthermore, Cavallo and Brienza (2006) identified gender difference. Supervisors rated Females higher in “Adaptability” and “Service Orientation”, while Peers rated Females higher on “Emotional Self-Awareness”, “Conscientiousness”, “Developing Others”, “Service Orientation” and “Communication”. Direct reports scored Males higher in “Change Catalyst”.

Project manager profile and professional or project success have been the focus of research in the last decade. In this context, Obradovic et al. (2013) aimed to identify correlation between project managers’ emotional intelligence and their professional success. They emphasized that important skills in project management included: ability of teamwork and the leadership ability. Research highlighted that a person’s ability to manage their emotions and the emotions of others would help in teamwork and leadership development process.

In this context, researchers highlight correlation among leadership, team interaction-collaboration and project performance. Turner and Müller (2005) and Müller and Turner (2005, 2007b, 2010) identified the leadership competency profiles of successful PMs in projects of different type. They observed differences in the leadership competencies of managers in different types of projects. In the same context, Carter (1988), suggested that project management skills are a dynamic group of factors, with different importance not only among projects but within different stages of the same project. A number of very interesting additional observations from Müller and Turner (2007a) include the fact that experienced PMs assign higher importance to teambuilding, than their younger colleagues.

El-Sabaa (2001) emphasizes that during project crisis, the corresponding uncertainty and suspense continually test PMs, who much figure out what to do with the execution of their projects through a large and diverse set of people. It is very interesting to note that Ogunlana et al. (2002) suggest that different projects require customizable and corresponding skills and capabilities on the part of the PM. Mastrandrea (1986) mentions that a PM should, at the same time, be a lawyer, economist, accountant, sociologist and psychologist. Social skill, decision making, handling problems, recognizing opportunities, managing change are only a few of the attributes identified by Fryer (1997).

Aitken and Crawford (2007) investigated the reactions of PMs under pressure and suggested the importance of experience. Furthermore, nationality, culture and age of the PM appear to influence the rating of success criteria and performance (Müller and Turner 2007b). Neuhauser (2007) investigates project management leadership behaviours. More specifically, the study focuses on the frequency of use, of such behaviours, by female project managers. The first step was to identify the most efficient project management leadership behaviours and then evaluate the frequency of use by female managers. The survey recorded the ratings provided by female PMs, to each behaviour. The scores assigned to
each attribute, were based on the importance of the specific behaviour towards an effective project manager. The least important behaviours, included: intellectual stimulation, influence, inspirational motivation and individualized consideration. The important behaviours focused on: attributed charisma, delegation and contingent reward. Finally, Rees-Caldwell and Pinnington (2013) emphasized that PMs from different national backgrounds manage similar projects in different ways, due to different PM cognitive schema. Taking into consideration all the above, it is interesting to recognize competent PMs’ profiles per each country and gender.

A summary of the main literature review is depicted in the following Table 1 (Aretoulis et al. 2017):

| Authors and Date          | Project Managers’ Roles and Factors Affecting Performance                                                                 |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Sayles and Chandler (1971)| Scheduling of activities, control systems and responsibilities, monitoring of project                                      |
| Mastrandrea (1986)        | Lawyer, economist, accountant, sociologist, psychologist                                                                  |
| Carter (1988)             | Project management skills’ importance per stages and type of project                                                       |
| Anderson (1992)           | High-quality or above-average managerial skills and experience                                                             |
| Sauer (1993)              | Not-technical factors, management, organization, culture                                                                    |
| Pikher (1994)             | Control over progress, cost, quality and influences from external environment                                               |
| Briner et al. (1996)      | Facilitator, coordinator, motivator, politician cited in Dainty et al. (2004)                                               |
| Fryer (1997)              | Social skill, Decision Making, Handling Problems, Recognizing Opportunities, Managing Change                               |
| Sadler-Smith (1998)       | Cognitive ability, style and strategies                                                                                   |
| Shahid and Freese (1998)  | Access to a large amount of project information for avoiding problems, delays, claims                                      |
| El-Sabaa (2001)           | Human skill, conceptual and organizational skill, technical skill                                                         |
| Ogunlana et al. (2002)    | Different projects require different skills and capabilities                                                             |
| Spony (2003)              | Cultural concepts                                                                                                        |
| Cheung et al. (2004)      | Managing cost issues, balance of income and expenses, orchestrating construction                                          |
| Herrbach et al. (2004)    | Company’s reputation, prestige and social identity                                                                       |
| Zeira et al. (2004)       | Trust and reliability                                                                                                |
| Kerzner (2005)            | Initiative, leadership, ambition, creativity, flexibility, adaptability, commitment, vision, creating trust, effectiveness, ability to: persuade, make decisions, identify problems, organize work to subordinates |
| Debrah and Ofon (2005)    | Occupational and organizational competencies                                                                            |
| Muller and Turner (2005, 2007b, 2010)| Leadership competency profiles per type of project, stage of project, multi-cultural projects                              |
| Chen and Partington (2006) | PMs use the attributes described in PM standards based upon their conceptions of the work                             |
| Jha and Iyer (2006)       | Planning, controlling, negotiating, developing bid proposal, project organization and staffing, leadership, profit generation, new business development |
| Moore (2006)              | Dynamic negotiation                                                                                                      |
| Aitken and Crawford (2007)| Experience                                                                                                                |
| Muller and Turner (2007a) | Teambuilding, certificated, high degree of involvement                                                                   |
| Ahadzie et al. (2008)     | Contextual and task behaviours                                                                                            |
| Puck et al. (2008)        | Cross-cultural sensitivity                                                                                               |
| Yang et al. (2011)        | Leadership style, team interaction                                                                                        |
| Fisher (2011)             | Understanding behavioural characteristics, Leading, Influencing, Conflict management, Cultural awareness                  |
| Lindebaum and Jordan (2012)| Emotional Intelligence                                                                                                    |
| Park and Rainey (2012)    | Work motivation and social communication                                                                                   |
| Yang et al. (2012)        | Transformational leadership improves team communication and has positive influences on team collaboration                   |
| Diefenbach (2013)         | Managers’ interests and decision making                                                                                   |
| Hadad et al. (2013)       | Properly match the right person to the right project                                                                      |
| Wang et al. (2013)        | Cross-cultural competence, conscientiousness, openness                                                                  |
| Yang et al. (2013)        | Leadership, teamwork                                                                                                     |
| Zhang and Fan (2013)      | Emotional intelligence: Emotional self-awareness, emotional self-control, empathy, organizational awareness, cultural understanding, communication |
| Caputo (2014)             | Agreeableness, openness to experience                                                                                     |
| Sunindipo (2015)          | Emotional intelligence, sincerity, budgeting, visioning, interpersonal skill, transformational leadership, quality management, contract administration |
3. Methodological Approach

Current research methodology greatly relies on a structured questionnaire survey. The latter assessed the Greek PMs’ attributes and identified the relative importance of the various cognitive abilities and personality characteristics. The survey lasted for five years and was administered to engineers from Greece (Aretoulis and Triantafyllidis 2014; Aretoulis et al. 2015a; Aretoulis et al. 2015b; Aretoulis et al. 2017). One of the last samples of questionnaires was collected and added in the last quarter of 2017. The pool of respondents is quite broad. It includes engineers from selected significant Construction Enterprises throughout Greece, Public Authorities, The Ministry of Infrastructure, Transport and Networks, Management Organization Unit of Development Programmes S.A. and Academians. The questionnaires were completed through interviews, emails and google forms.

The survey respondents provided scores on the PMs’ attributes. The number of respondents that participated to the current research was 497. The attributes presented in the research survey were all positive in nature. Research is using Correlation Analysis and Independent T Test to identify and highlight the way gender influences the perception of the desired attributes of a PM. The methodology is briefly depicted in Figure 1:

![Figure 1. Research Methodology.](image)

3.1. Questionnaire Structure and Survey Respondents’ Profiles

The current questionnaire has been used for relevant research in the past (Aretoulis and Triantafyllidis 2014; Aretoulis et al. 2015a; Aretoulis et al. 2015b; Aretoulis et al. 2017). The questionnaire consisted of two main parts, which included:

- Profile of the survey’s respondents
- Personality characteristics and abilities of PMs

More specifically, the first part of the questionnaire is devoted to the respondents, which have to answer 13 personal questions, ranging from age to academic and professional background (see Figure 2).
The second part focuses on PM’s attributes. Characteristics regarding abilities and personality traits and facets sum up to 47 elements. Survey respondents were asked to assign scores to each PMs’ characteristic on the basis of the effect of these attributes to project success. The majority of the answers were collected through check boxes and use of a Likert scale, ranging from 1 to 5. One point represents the lowest value and five points represent the highest value, meaning the most desirable attribute for optimum team collaboration and maximum team performance. The reliability test Cronbach Alpha on the 47 selected attributes returned a value of 0.932. Furthermore, when all 67 variables were selected, the Cronbach Alpha test returned the value 0.908. Both values suggest that the results of the survey are reliable.

The results of the research (valid percents) are based on a sample of 497 Greek Project Engineers. The respondents identified their roles as “Designer Engineers” 58.4%, “Construction Engineers” 14.3%, “PMs” 22.0% and finally “Contractors” 5.0%. Regarding their discipline, the 70.3% were Civil Engineers and another 6.7% Land Surveyors, 7.5% Architects, 4.1% Mechanical Engineers, Electrical Engineers 2.6%, Chemical Engineers 2.0% and Other Engineers 6.7%. In terms of gender breakdown, 58.6% of the respondents were male and 41.4 were female. Their ages varied from 24 to 65, with the 45.9% being among the ages of 27 and 38. Almost half of the respondents, 50.9% were involved in “Building Projects”. In absolute numbers, 290 of the respondents were men and 205 were women.

3.2. Descriptive Statistics of the PMs’ Attributes

The descriptive statistics were calculated with the aid of SPSS v.22. The replies regarding the questionnaire survey respondents’ profile were processed and parameterized into categorical data. Then, an SPSS database was constructed. The scores per each attribute, trait, skill and ability were also included in the database, as well as the knowledge that was considered essential. These were recorded in their original format, as the Likert scale is regarded as categorical data. The final SPSS database consists of 497 cases (respondents) and 67 variables in total. The incorporated variables represented the respondents’ profile (13 variables) and at the same time the attributes of the PM (47 variables) and finally variables describing the essential PMs’ knowledge (7 variables). The frequency analysis’ results concerning the cognitive abilities and personality characteristics of PMs are presented in the following Table 2:
Table 2. Resulting Frequencies Concerning PMs’ Attributes.

| Attributes                                      | Score Percentages (Likert Scale 1–5) |
|------------------------------------------------|--------------------------------------|
| Diligent                                        | 0.4 1.6 18.1 38.2 41.7               |
| Capability of Predicting                       | 0.2 2.7 10.3 34.9 52.0               |
| Capability of Risk Evaluation                  | 0.4 0.8 7.0 28.8 63.0               |
| Respected                                       | 0.6 3.7 18.4 43.2 34.0               |
| Practical Way of Thinking                      | 1.6 11.5 41.1 45.8                  |
| Diplomacy                                       | 3.0 7.0 21.9 40.7 27.5               |
| Conflict Resolution                             | 0.6 2.7 15.4 34.0 47.3               |
| Conflict Management                             | 0.4 1.0 7.1 32.2 59.2               |
| Capability of Outsourcing                       | 0.4 2.1 11.9 38.4 47.2               |
| Capability of Assigning Responsibilities       | 0.4 4.3 17.7 37.8 39.6               |
| Perception of the Whole Picture                 | 0.4 1.6 11.1 30.5 56.4               |
| Perception of Scale                             | 1.0 2.7 19.3 42.1 34.9               |
| Inspiration                                     | 0.2 5.7 17.2 37.7 29.5               |
| Creative                                        | 0.2 3.9 15.0 39.1 30.3               |
| Leadership Capabilities                         | 0.6 2.0 9.6 33.6 54.1               |
| Collaborative—Team Spirit                       | 0.4 6.0 35.8 57.8                   |
| Communication Skills                            | 0.2 1.0 7.8 34.2                   |
| Integrity                                       | 1.2 4.1 20.2 38.7 35.8               |
| Ethics                                          | 2.7 6.8 19.3 33.6 37.7               |
| Justice                                         | 2.3 5.3 19.5 34.0 38.9               |
| Methodical                                      | 0.8 1.4 13.7 41.2 42.8               |
| Flexible                                        | 0.6 2.2 16.2 40.1 40.9               |
| Capability of Considering Alternative Scenarios | 0.6 1.2 13.3 37.1 47.8               |
| Self Confidence                                 | 0.6 4.9 21.9 41.5 31.1               |
| Commitment                                      | 2.3 7.2 30.5 39.5 20.5               |
| Promptness on Decision Making                   | 1.2 10.2 38.9 49.6                  |
| Promptness on Solution Provision                | 0.2 1.0 7.1 29.2 62.4               |
| Decisiveness                                    | 1.8 8.6 39.9 49.7                  |
| Effectiveness                                   | 0.2 0.8 8.4 36.9 53.7               |
| Self-Control                                    | 0.6 5.9 26.6 38.7 28.1               |
| Politeness                                      | 3.7 11.3 32.0 35.9 16.8              |
| Understanding                                   | 1.6 8.8 32.4 39.8 17.2               |
| Responsible                                     | 0.4 0.8 12.3 36.7 49.8               |
| Punctuality                                     | 0.6 2.1 11.5 37.0 48.9               |
| Capable of Psychological Evaluation             | 1.9 9.5 32.4 38.8 17.5               |
| Scheduling Capability                           | 0.8 1.0 8.0 32.9 57.3               |
| Perception of Time                              | 0.2 1.4 8.6 34.2 55.5               |
| Strategic Capability                            | 1.6 3.7 13.3 34.0 47.3               |
| Friendliness                                    | 5.9 17.0 39.7 29.0 8.4               |
| Social Consciousness                            | 5.7 15.3 34.6 30.9 13.5              |
| Organizational Skill                            | 0.4 1.0 6.9 34.5 57.1               |
| Patient                                        | 1.8 6.2 28.1 34.9 29.0               |
| Persistence                                     | 1.4 4.7 18.6 39.7 35.4               |
| Inventive                                       | 0.6 6.2 22.2 40.0 30.8               |
| Hardworking                                     | 0.8 2.5 17.0 41.3 38.2               |
| Experience                                      | 0.4 1.9 13.4 34.4 50.0               |
| Dynamic                                         | 0.8 3.7 20.0 39.6 35.9               |

Moreover, the descriptive statistics regarding the PMs’ attributes are presented in the following Table 3 ranked in descending order based on the mean score (rounded to two decimal places):
Table 3. Resulting Mean Scores Concerning PMs’ Attributes and Ranking.

| Ranking | Attributes                              | Minimum | Maximum | Mean  |
|---------|-----------------------------------------|---------|---------|-------|
| 1       | Capability of Risk Evaluation           | 1.00    | 5.00    | 4.53  |
| 2       | Promptness on Solution Provision        | 1.00    | 5.00    | 4.53  |
| 3       | Collaborative Team Spirit               | 2.00    | 5.00    | 4.51  |
| 4       | Conflict Management                     | 1.00    | 5.00    | 4.49  |
| 5       | Organizational Skill                    | 1.00    | 5.00    | 4.47  |
| 6       | Communication Skills                    | 1.00    | 5.00    | 4.46  |
| 7       | Scheduling Capability                   | 1.00    | 5.00    | 4.45  |
| 8       | Perception of Time                      | 1.00    | 5.00    | 4.43  |
| 9       | Effectiveness                           | 1.00    | 5.00    | 4.43  |
| 10      | Perception of The Whole Picture         | 1.00    | 5.00    | 4.41  |
| 11      | Leadership Capabilities                 | 1.00    | 5.00    | 4.38  |
| 12      | Decisiveness                            | 2.00    | 5.00    | 4.37  |
| 13      | Promptness on Decision Making           | 2.00    | 5.00    | 4.37  |
| 14      | Capability of Predicting                | 1.00    | 5.00    | 4.36  |
| 15      | Responsible                            | 1.00    | 5.00    | 4.35  |
| 16      | Experience                              | 1.00    | 5.00    | 4.32  |
| 17      | Punctuality                             | 1.00    | 5.00    | 4.31  |
| 18      | Practical Way of Thinking               | 2.00    | 5.00    | 4.31  |
| 19      | Capability of Considering Alternative Scenarios | 1.00 | 5.00 | 4.30 |
| 20      | Capability of Outsourcing               | 1.00    | 5.00    | 4.30  |
| 21      | Conflict Resolution                     | 1.00    | 5.00    | 4.25  |
| 22      | Methodical                              | 1.00    | 5.00    | 4.24  |
| 23      | Strategic Capability                    | 1.00    | 5.00    | 4.22  |
| 24      | Diligent                                | 1.00    | 5.00    | 4.19  |
| 25      | Flexible                                | 1.00    | 5.00    | 4.18  |
| 26      | Hardworking                             | 1.00    | 6.00    | 4.14  |
| 27      | Capability of Assigning Responsibilities| 1.00    | 11.00   | 4.13  |
| 28      | Perception of Scale                     | 1.00    | 5.00    | 4.07  |
| 29      | Respected                               | 1.00    | 5.00    | 4.06  |
| 30      | Dynamic                                 | 1.00    | 5.00    | 4.06  |
| 31      | Integrity                               | 1.00    | 5.00    | 4.04  |
| 32      | Persistence                             | 1.00    | 6.00    | 4.03  |
| 33      | Justice                                 | 1.00    | 5.00    | 4.02  |
| 34      | Self Confidence                         | 1.00    | 5.00    | 3.97  |
| 35      | Ethics                                  | 1.00    | 5.00    | 3.97  |
| 36      | Inventive                               | 1.00    | 6.00    | 3.95  |
| 37      | Self-Control                            | 1.00    | 5.00    | 3.88  |
| 38      | Diplomacy                               | 1.00    | 5.00    | 3.86  |
| 39      | Patient                                 | 1.00    | 5.00    | 3.83  |
| 40      | Politeness                              | 1.00    | 5.00    | 3.71  |
| 41      | Commitment                              | 1.00    | 5.00    | 3.69  |
| 42      | Understanding                           | 1.00    | 5.00    | 3.62  |
| 43      | Capable of Psychological Evaluation      | 1.00    | 5.00    | 3.61  |
| 44      | Social Consciousness                    | 1.00    | 5.00    | 3.31  |
| 45      | Creative                                | 0.00    | 5.00    | 3.30  |
| 46      | Inspiration                             | 0.00    | 5.00    | 3.19  |
| 47      | Friendliness                            | 1.00    | 5.00    | 3.17  |

The most important attribute was identified as the “Capability of Risk Evaluation”. This was anticipated as the professional environment was quite volatile. The amount of available jobs was limited, both for public and private projects, the discounts provided for public projects on behalf of contractors were extremely extensive, the profit margin was limited and finally the project financing was difficult as cash liquidity was scarce. The next attribute is “Promptness on Solution Provision”. This is also logical as the “risky” business environment, accompanied by continuous change require preventive and corrective actions and ability to adapt quickly by identifying appropriate course of action. Timely response is a key success factor. The third most important factor includes “Collaborative—Team Spirit”. This attribute is among the top characteristics reported in the international literature. PM is expected
to be a team player inside a project. Furthermore, the workforce in Greek construction projects is multinational and multicultural. Thus, it is important to be able to make arrangements for completely different people and provide a context for smooth collaboration and high performance.

On the other hand, “Inspiration” and “Friendliness” are at the bottom of the list regarding their significance for the project manager, according to the survey respondents. Engineers consider themselves as professionals, being able to guide the project teams, using their leadership capabilities and keeping a required “professional” distance. “Inspiration” is not considered essential for technical projects and therefore, this attribute was assigned very low scores regarding the required characteristics of the project managers. Inspiration is indeed a soft skill, not necessarily needed for a technical project. It is usually connected to projects dealing with art and major breakthroughs. It should be emphasized that the conceptual content, essence or meaning of each term, is different in each language.

3.3. Independent Sample t-Test among Gender and PM Attributes

An independent-samples t-test was conducted to compare the required personality characteristics’ scores for project managers assigned by female and male survey-participating engineers. The results are presented in detail in the following section. Firstly, mean and standard deviation among male and female respondents per PMs’ attributes are presented in Table 4. Then follows, Table 5, that includes data relevant to: “Attribute”, Mean Score, Standard Deviation (SD), t value, Degrees of Freedom and the value of “p” (2-tailed significance). Levene’s test for equality of variances has taken place, in order to choose the appropriate data to interpret, based on the validity of the assumption of equal variances (Table 5). The data reveals that there was a statistically significant difference in the scores among male and female engineers:

Table 4. Mean and SD among Male and Female Respondents per PMs’ Attributes.

| Attribute                        | Gender | Mean   | Std. Deviation |
|----------------------------------|--------|--------|----------------|
| Capability of Predicting         | Male   | 4.28   | 0.84           |
|                                  | Female | 4.47   | 0.69           |
| Capability of Risk Evaluation    | Male   | 4.47   | 0.71           |
|                                  | Female | 4.62   | 0.68           |
| Practical Way of Thinking        | Male   | 4.24   | 0.77           |
|                                  | Female | 4.43   | 0.68           |
| Diplomacy                        | Male   | 3.77   | 1.00           |
|                                  | Female | 4.00   | 0.87           |
| Capability of Outsourcing        | Male   | 4.21   | 0.78           |
|                                  | Female | 4.42   | 0.78           |
| Capability of Assigning Responsibilities | Male  | 4.01   | 1.00           |
|                                  | Female | 4.31   | 0.79           |
| Perception of The Whole Picture  | Male   | 4.35   | 0.82           |
|                                  | Female | 4.50   | 0.71           |
| Perception of Scale              | Male   | 4.00   | 0.90           |
|                                  | Female | 4.19   | 0.79           |
| Inspiration                      | Male   | 3.21   | 1.06           |
|                                  | Female | 3.18   | 1.00           |
| Collaborative Team Spirit        | Male   | 4.47   | 0.65           |
|                                  | Female | 4.58   | 0.60           |
| Communication Skills             | Male   | 4.41   | 0.73           |
|                                  | Female | 4.55   | 0.65           |
| Integrity                        | Male   | 3.89   | 0.94           |
|                                  | Female | 4.26   | 0.83           |
| Ethics                           | Male   | 3.82   | 1.12           |
|                                  | Female | 4.19   | 0.88           |
Table 4. Cont.

| Attribute                              | Gender | Mean  | Std. Deviation |
|----------------------------------------|--------|-------|----------------|
| Justice                                | Male   | 3.86  | 1.07           |
|                                        | Female | 4.26  | 0.84           |
| Methodical                             | Male   | 4.12  | 0.82           |
|                                        | Female | 4.42  | 0.73           |
| Flexible                               | Male   | 4.08  | 0.83           |
|                                        | Female | 4.34  | 0.81           |
| Capability of Considering Alternative Scenarios | Male | 4.22  | 0.81           |
|                                        | Female | 4.41  | 0.76           |
| Commitment                             | Male   | 3.58  | 0.97           |
|                                        | Female | 3.86  | 0.90           |
| Promptness on Decision Making          | Male   | 4.29  | 0.74           |
|                                        | Female | 4.50  | 0.66           |
| Promptness on Solution Provision       | Male   | 4.47  | 0.75           |
|                                        | Female | 4.62  | 0.59           |
| Decisiveness                           | Male   | 4.27  | 0.77           |
|                                        | Female | 4.54  | 0.60           |
| Effectiveness                          | Male   | 4.36  | 0.75           |
|                                        | Female | 4.53  | 0.60           |
| Self-Control                           | Male   | 3.78  | 0.91           |
|                                        | Female | 4.02  | 0.88           |
| Understanding                          | Male   | 3.54  | 0.93           |
|                                        | Female | 3.75  | 0.91           |
| Responsible                            | Male   | 4.19  | 0.82           |
|                                        | Female | 4.58  | 0.59           |
| Punctuality                            | Male   | 4.19  | 0.83           |
|                                        | Female | 4.50  | 0.72           |
| Capable of Psychological Evaluation    | Male   | 3.52  | 0.98           |
|                                        | Female | 3.73  | 0.88           |
| Scheduling Capability                  | Male   | 4.35  | 0.84           |
|                                        | Female | 4.58  | 0.59           |
| Perception of Time                     | Male   | 4.31  | 0.81           |
|                                        | Female | 4.60  | 0.56           |
| Strategic Capability                   | Male   | 4.12  | 0.75           |
|                                        | Female | 4.36  | 0.87           |
| Friendliness                           | Male   | 3.07  | 1.03           |
|                                        | Female | 3.32  | 0.94           |
| Social Consciousness                   | Male   | 3.22  | 1.11           |
|                                        | Female | 3.45  | 0.99           |
| Organizational Skill                   | Male   | 4.42  | 0.75           |
|                                        | Female | 4.55  | 0.63           |
| Patient                                | Male   | 3.72  | 1.00           |
|                                        | Female | 3.99  | 0.93           |
| Persistence                            | Male   | 3.95  | 0.94           |
|                                        | Female | 4.16  | 0.91           |
| Inventive                              | Male   | 3.84  | 0.94           |
|                                        | Female | 4.10  | 0.87           |
| Hardworking                            | Male   | 4.06  | 0.89           |
|                                        | Female | 4.27  | 0.76           |
| Dynamic                                | Male   | 3.94  | 0.92           |
|                                        | Female | 4.24  | 0.80           |

PMs’ attributes where the independent sample t test did not identify statistically significant differences include: “Diligent”, “Respected”, “Conflict Resolution”, “Conflict Management”, “Inspiration”, “Inventive”, “Leadership Capabilities”, “Self-Confidence”, “Politeness” and “Experience”.
The reason may rely on the fact that survey respondents tend to agree on the significance or lack thereof regarding these specific attributes.

It is very interesting to mention that female engineers assigned greater scores to all the considered attributes, except one, which was “Inspiration”. “Inspiration” is the unique attribute identified within the independent sample t-test that male engineers assigned a little greater score than female ones. The differences among the mean scores was equal to 0.02629, which was an extremely small difference.

It is also worth mentioning that among the attributes identified in the independent sample t-test, the least mean score differences were identified in “Experience”, “Politeness” and “Respected”. The greatest differences among the mean scores focused on: “Justice”, “Responsible”, “Integrity” and “Ethics”.

It could be suggested that “experience” is a key attribute in project management, directly related to project success. “Politeness” refers to the behaviour of the project manager towards his/her colleagues while “Respected” reflects the “feelings”/“opinion” and “beliefs” of colleagues towards the project manager. However, the mean scores tend to largely deviate with regard to attributes focusing on the ethical side of the personality of the project manager.

**Table 5. Independent Sample t-test results among Male and Female Respondents per PMs’ Attributes.**

| Attributes                        | Levene’s Test for Equality of Variances | t-Test for Equality of Means |
|----------------------------------|----------------------------------------|-----------------------------|
|                                 |            | F    | Sig. | t       | df  | Sig. (2-Tailed) |
| Capability of Predicting         |            | 5.918 | 0.015 | −2.804  | 468.741 | 0.005          |
| Capability of Risk Evaluation    |            | 3.787 | 0.052 | −2.281  | 442.842 | 0.023          |
| Practical Way of Thinking        |            | 0.704 | 0.402 | −2.816  | 461.085 | 0.009          |
| Diplomacy                        |            | 13.442| 0.000 | −2.610  | 461.085 | 0.009          |
| Capability of Outsourcing        |            | 0.431 | 0.512 | −2.781  | 461.085 | 0.006          |
| Capable of Assigning Responsibilities |        | 0.770 | 0.381 | −3.541  | 461.085 | 0.006          |
| Perception of The Whole Picture  |            | 3.121 | 0.078 | −2.152  | 461.085 | 0.032          |
| Perception of Scale              |            | 0.243 | 0.622 | −2.400  | 461.085 | 0.017          |
| Collaborative Team Spirit        |            | 6.059 | 0.014 | −2.027  | 444.340 | 0.043          |
| Communication Skills             |            | 3.363 | 0.067 | −2.220  | 455.996 | 0.027          |
| Integrity                        |            | 0.841 | 0.359 | −4.514  | 461.085 | 0.000          |
| Ethics                           |            | 14.502| 0.000 | −4.096  | 476.702 | 0.000          |
| Justice                          |            | 10.373| 0.001 | −4.545  | 478.038 | 0.000          |
| Methodical                       |            | 0.003 | 0.954 | −4.077  | 484    | 0.000          |
| Flexible                         |            | 1.998 | 0.138 | −3.468  | 485    | 0.000          |
| Capability of Considering Alternative Scenarios | | 0.100 | 0.752 | −2.558  | 486    | 0.011          |
| Commitment                       |            | 5.417 | 0.020 | −3.244  | 448.468 | 0.001          |
| Promptness on Decision Making    |            | 1.705 | 0.192 | −3.192  | 484    | 0.002          |
| Promptness on Solution Provision |            | 17.972| 0.000 | −2.531  | 480.846 | 0.012          |
| Decisiveness                     |            | 6.900 | 0.009 | −4.364  | 480.846 | 0.000          |
| Effectiveness                    |            | 9.057 | 0.003 | −2.727  | 476.401 | 0.007          |
| Self-Control                     |            | 1.848 | 0.175 | −2.927  | 484    | 0.004          |
| Understanding                    |            | 1.410 | 0.236 | −2.538  | 483    | 0.011          |
| Responsible                      |            | 13.465| 0.000 | −6.143  | 483.573 | 0.000          |
| Punctuality                      |            | 2.208 | 0.138 | −4.152  | 483    | 0.000          |
| Capable of Psychological Evaluation |        | 5.020 | 0.026 | −2.354  | 447.486 | 0.019          |
| Scheduling Capability            |            | 18.022| 0.000 | −3.461  | 484.990 | 0.001          |
| Perception of Time               |            | 26.959| 0.000 | −4.679  | 483.802 | 0.000          |
| Strategic Capability             |            | 0.333 | 0.564 | −2.784  | 484    | 0.006          |
| Friendliness                     |            | 0.036 | 0.850 | −2.766  | 485    | 0.006          |
| Social Consciousness             |            | 2.274 | 0.132 | −2.415  | 485    | 0.016          |
| Organizational Skill             |            | 4.906 | 0.027 | −2.053  | 470.205 | 0.041          |
| Patient                          |            | 4.964 | 0.026 | −3.060  | 466.722 | 0.002          |
| Persistence                      |            | 0.000 | 0.998 | −2.486  | 485    | 0.013          |
| Inventive                        |            | 1.767 | 0.184 | −3.140  | 483    | 0.002          |
| Hardworking                      |            | 0.176 | 0.675 | −2.698  | 483    | 0.007          |
| Dynamic                          |            | 0.099 | 0.753 | −3.672  | 481    | 0.000          |
3.4. Correlation Analysis among Gender and PMs Attributes

IBM SPSS 25 software was employed for the statistical analysis. Chi—square test was used to examine the association of respondents’ profile and their assessment of skills, personal characteristics and knowledge for the PMs. The analysis revealed a number of interesting correlations. The findings will be presented in the following Table 6. The first column presents the attributes and the next columns highlight the 2-tailed asymptotic significance, adjusted residual and the Likert—score that each group tended to assign to each attribute. They all rated what attributes they considered essential for a competent PM.

Table 6. Asymptotic Significance (AS), Adjusted Residual (AR) and responses of identified correlations regarding “PMs Attributes”.

| Attribute                                | Male Engineers |                       | Female Engineers |                       |
|------------------------------------------|----------------|------------------------|------------------|------------------------|
| Capability of Risk Evaluation            | 0.052          | 2.803                  | 0.052            | 2.916                  |
| Practical Way of Thinking                | 0.041          |                        | 0.041            | 2.4                    |
| Capability of Outsourcing                | 0.013          | 2.7                    | 0.013            | 3.5                    |
| Capability of Assigning Responsibilities | 0.003          | 3.2                    | 0.003            | 3.3                    |
| Perception of Scale                      | 0.043          | 2.4                    | 0.043            |                        |
| Collaborative—Team Spirit                | 0.011          | 2.7                    | 0.011            |                        |
| Integrity                                | 0.000          | 3.4                    | 0.000            | 3.9                    |
| Ethics                                   | 0.002          | 2.4 / 2.2              | 0.002            | 2.1                    |
| Justice                                  | 0.001          | 2.2 / 2.7              | 0.001            | 2.8                    |
| Methodical                               | 0.001          | 2.7                    | 0.001            | 3.9                    |
| Flexible                                 | 0.003          | 2.5                    | 0.003            | 4.0                    |
| Commitment                               | 0.033          | 1.9                    | 0.033            | 2.0                    |
| Promptness on Decision Making            | 0.015          |                        | 0.015            | 3.0                    |
| Promptness on Solution Provision         | 0.016          |                        | 0.016            |                        |
| Decisiveness                             | 0.001          | 2.5 / 2.0              | 0.001            | 3.4                    |
| Self-Control                             | 0.047          |                        | 0.047            | 2.7                    |
| Politeness                               | 0.002          | 3.3                    | 0.002            | 2.7                    |
| Responsible                              | 0.000          | 4.3                    | 0.000            | 4.8                    |
| Punctuality                              | 0.001          | 3.1                    | 0.001            | 4.0                    |
| Scheduling Capability                    | 0.016          | 2.1                    | 0.016            | 2.1                    |
| Perception of Time                       | 0.000          | 2.2 / 3.4              | 0.000            | 3.1                    |
| Strategic Capability                     | 0.053          | (tendency)             | 0.053            | 2.8                    |
| Friendliness                             | 0.025          | 2.1                    | 0.025            | 2.7                    |
| Social Consciousness                     | 0.046          | 2.4                    | 0.046            | 1.9                    |
| Patient                                  | 0.060          | (tendency)             | 0.060            | 2.4                    |
| Inventive                                | 0.041          | 2.1                    | 0.041            | 2.4                    |
| Dynamic                                  | 0.007          |                        | 0.007            | 3.1                    |

3.5. Comparison of Ranking of Attributes Based on Mean Scores Provided by Male and Female Respondents

One final view on the data analysis focuses on a comparison of the ranking provided by female and male respondents. The following Table 7 presents the resulting ranking based on the mean scores assigned by male and female respondents. Grey highlighted attributes are the ones where female respondents assigned a lower rank. Blue highlighted attributes are the ones having same scores assigned to them by both female and male respondents.

The attributes with the same ranking include: “Promptness on Decision Making”, “Hardworking”, “Diplomacy” and finally, “Patient”. The attributes at the bottom of the list are close together with a single ranking position difference. Among almost the top ten places both female and male engineers assign the following attributes: “Capability of Risk Evaluation”, “Promptness on Solution Provision”, “Collaborative—Team Spirit”, “Conflict Management”, “Organizational Skill” and “Communication Skills”. It is worth noting that with the exception of risks, these attributes focus on project team collaboration and cooperation. This is one of the most important goals of each project manager as identified in international literature.
**Table 7.** Comparison of Ranking of Attributes Based on Mean Scores Provided by Males and Females Respondents.

| Rank Males | Rank Females | Attribute                                      |
|------------|--------------|------------------------------------------------|
| 1          | 2            | Capability of Risk Evaluation                  |
| 2          | 1            | Promptness on Solution Provision               |
| 3          | 4            | Collaborative Team Spirit                      |
| 4          | 7            | Conflict Management                            |
| 5          | 9            | Organizational Skill                           |
| 6          | 8            | Communication Skills                           |
| 7          | 11           | Effectiveness                                  |
| 8          | 16           | Leadership Capabilities                        |
| 9          | 6            | Scheduling Capability                          |
| 10         | 12           | Perception of The Whole Picture                |
| 11         | 3            | Perception of Time                             |
| 12         | 23           | Experience                                     |
| 13         | 13           | Practical Way of Thinking                     |
| 14         | 15           | Decisiveness                                   |
| 15         | 10           | Conflict Resolution                            |
| 16         | 17           | Capability of Outsourcing                      |
| 17         | 20           | Capability of Considering Alternative Scenarios|
| 18         | 25           | Leadership Capabilities                        |
| 19         | 18           | Diligent                                       |
| 20         | 14           | Methodical                                     |
| 21         | 5            | Strategic Capability                           |
| 22         | 29           | Flexible                                       |
| 23         | 19           | Responsible                                    |
| 24         | 21           | Tactics                                        |
| 25         | 22           | Capabilities                                   |
| 26         | 26           | Hardworking                                    |
| 27         | 35           | Respected                                      |
| 28         | 24           | Capability of Assigning Responsibilities       |
| 29         | 32           | Perception of Scale                            |
| 30         | 37           | Self Confidence                                |
| 31         | 33           | Persistence                                    |
| 32         | 30           | Dynamic                                        |
| 33         | 27           | Integrity                                      |
| 34         | 28           | Justice                                        |
| 35         | 34           | Inventive                                      |
| 36         | 31           | Ethics                                         |
| 37         | 36           | Self-Control                                   |
| 38         | 38           | Diplomacy                                      |
| 39         | 39           | Patient                                        |
| 40         | 42           | Politeness                                     |
| 41         | 40           | Commitment                                     |
| 42         | 41           | Understanding                                  |
| 43         | 42           | Capable of Psychological Evaluation            |
| 44         | 45           | Creative                                       |
| 45         | 44           | Social Consciousness                           |
| 46         | 47           | Inspiration                                    |
| 47         | 46           | Friendship                                     |

4. Conclusions

PMS’ performance greatly affects project performance; thus, PM is considered a critical success factor. The tasks that a PM is expected to carry out are many and broad regarding the field of activities. A comparison with general competencies identified in international literature reveals that there is agreement in the required attributes and in many cases this agreement extends to the significance and ranking. The research agendas regarding the PMs include but are not limited to: characteristics, skills, personality traits, performance, success factors, relationship to project success, assignment of the right
PM to the right “job”, decision making, career development, international assignments, salaries and gender issues are few of the research agendas focusing on PMs.

The current research investigated the perception of the PM competencies based on the gender of the survey participant. The findings reveal that indeed, statistically significance differences exist among male and female engineers regarding the required competencies. Similar findings were also observed by other researchers, using various yet different approaches. The main tool, of the current research, was the implementation of a structured questionnaire survey, which collected 497 responses from engineers working in Greece. In general, female engineers provided greater scores. This could indicate greater expectations with regard to the required attributes. At the same time, male engineers provided lower scores. It could be mentioned that they are more conservative in selecting attributes and assessing them. This could not be attributed generally to a specific parameter. An effort to justify or explain their different views could rely on the attitude toward the external business environment. Furthermore, relevant research also identified the existence of differences in attitudes and behaviours of male and female PMs. On the other hand, PMs seem to “customize” differently their attitude and behaviours towards male and female employees. The latter could also partly justify the variations in scores provided by male and female respondents.

The current survey identified profile data regarding the respondents and the scores assigned to the desired characteristics of the PMs. It became evident that female engineers tended to assign the highest Likert scale based scores, whereas male respondents tended to assign lower scores to all considered attributes. It is also worth mentioning that a significant amount of correlations appeared in the sample, which was a lot greater than the previous research initiatives. The most significant abilities included: “Capability of Risk Evaluation”, “Promptness on Solution Provision”, “Collaborative—Team Spirit”, “Organizational Skill”, “Scheduling Capability” and “Conflict Management”. The current research identified the following attributes: “Promptness on Solution Provision”, “Capability of Risk Evaluation”, “Collaborative—Team Spirit”, “Organizational Skill”, “Scheduling Capability”, “Conflict Management” and “Communication Skill”. The attribute “Collaborative—Team Spirit” has identical ranking in both research surveys. These attributes are considered essential for project management.

The previous research (Aretoulis et al. 2017) identified through a questionnaire survey administered to 305 engineers, certain attributes as the most significant that include but are not limited to the following: “Promptness on Solution Provision”, “Capability of Risk Evaluation”, “Collaborative—Team Spirit”, “Organization Skill”, “Scheduling Capability” and “Conflict Management”. The most significant abilities included: “Capability of Risk Evaluation”, “Promptness on Solution Provision” and “Collaborative—Team Spirit”. Regarding identified correlations, female respondents assigned 5 points to almost all the attributes. “Friendliness” and “Social Consciousness” were the only attributes that received 4 points on behalf of the female respondents. These two personality characteristics seem not to align with the strict professional profile of the PM and are not considered so essential for a competent PM.

Regarding the identified correlations and focusing on male respondents this time, it is apparent that they did not assign 5 points on the Likert scale to neither of the considered attributes. Their highest score was four and this was assigned to only three attributes, namely: “Capability of Risk Evaluation”, “Capability of Outsourcing” and “Flexible”. These are all very practical attributes useful for the construction site and in the case of risk, they have been identified as the most significant attributes. In general, male engineers seem to be less “generous”, regarding the assignment of scores, in comparison to female engineers. Another view would be that female engineers seem to be in a good way more “demanding” with regard to the PMs’ competencies.

It is very important to mention that these results originate from engineers working in Greece. An effort to explain or interpret the findings should also take into account the conditions that Greek engineers face today at their professional activities and the surrounding economic and working environment. Most of the research took place during the financial crisis in Greece. Therefore, jobs are limited, there exists an antagonistic environment, margins for errors are almost non-existent, profit margins for enterprises are very limited, risks are high, cash liquidity is very low and large enterprises are the main pillars left in the field of construction. Financing the projects is also a great problem due
to the absence of liquidity in banks. Each engineer relies on his or her experience and knowledge to make sure that he or she continue to be professionally “attractive”. Salaries are not adequate and do not correspond to the working hours, which along with working days stretch beyond the “usual” schedule. Furthermore, there exists insecurity among these engineers regarding their future professional activities and prospects. All the above issues influence the personality of the engineers as well as their professional attitude. This leads to developing specific viewpoints regarding the required PMs’ abilities and personality. It should also be noted that the conceptual content of each attribute may vary across languages and cultures. Thus, it would be expected that the importance of each attribute changes among respondents from different national, cultural background. One final phenomenon that should be considered is the fact that survey respondents may project their own personality when they assign scores to the PM.

Considering the contribution of the current research, it could be argued that it resides on two main areas:

- The identification and understanding of the preferences among different genders of engineers
- Findings that could help build and manage project teams which are more compatible and could facilitate cooperation and optimize project team performance

As part of a further endeavour, it is proposed that other profile attributes should be examined that may influence the assessment of the considered attributes. These could include experience, age, professional and educational background, specific roles and professional positions undertaken by the survey participant. Furthermore, it would be important to investigate potential correlation among the resulting rankings provided in the survey questionnaire with the special characteristics of the construction activity and economy in Greece. Finally, the use of psychometric tests in order to assess the personality characteristics of the survey respondents and correlate it with their scores would provide insightful findings.

**Funding:** This research received no external funding

**Conflicts of Interest:** The authors declare no conflicts of interest.

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