



WALKING THE MANAGERIAL TIGHTROPE: EXECUTIVE INVOLVEMENT IN PRODUCT INNOVATION PROJECTS

Journal:	<i>European Journal of Innovation Management</i>
Manuscript ID	
Manuscript Type:	Original Article
Keywords:	Top management involvement, personal relevance, organic communication, New product development project

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ABSTRACT

Design

Our data set, collected via surveys from top managers and project managers involved in 86 NPD projects in 85 firms, is analyzed using PLS structural equation modeling.

Purpose

This study examines how technical drivers as well as social drivers influence organic communication and top management involvement (TMI) in new product development (NPD) projects. Technical drivers are *strategic importance* and *product innovativeness* and social drivers are *intrinsic and extrinsic relevance*. Organic communication is defined as continuous, bi-directional, and informal communication between top management and the NPD teams. Further, arguing that TMI must be studied as multi-faceted construct, TMI is conceptualized to occur as *guidance*, *active motivation*, *providing resources*, and *creating a tolerant climate*. Subsequently, the effect of TMI and organic communication on NPD performance is investigated.

Findings

We show that the strategic importance of the project has a positive influence on TMI through active motivation, providing resources, and creating a tolerant climate for innovation, but does not have an effect on guidance. Results also show that active motivation and organic communication improve budget and schedule adherence, whereas providing guidance and stimulating a tolerant climate have detrimental effects. In summary, our results show that only active motivation enhances all types of performance while stimulating a tolerant climate appears to have the opposite effect. The results revealed that organic communication between top management and the NPD team has a strong positive effect on all elements of TMI (providing guidance, actively motivating the NPD team, providing resources, and creating a tolerant climate). In other words, when top management communicates with the NPD team throughout the project in an informal way and listens to the team in addition to engaging in a one-way communication, they are more likely to be seen by the team as being deeply involved in the project.

Practical implications

Executives must walk a managerial tightrope to actively motivate and to assist in providing resources, yet, they must not be overbearing with direct guidance and must limit their tolerance for failures.

Originality/value

Involvement of key organizational actors such as top management and the link to project performance has attracted significant attention in research. However, nuanced empirical insights into the dyad of top management and project teams has so far been absent. Our findings detail the effect of technical and social drivers of top management involvement in new product development projects. Most notably i) the effect of motivation and stimulating a tolerant climate on performance and ii) the effect of organic communication on top management involvement. Moreover, this study is unique in that it empirically examines TMI from both top management and team perspectives.

INTRODUCTION

Top management involvement¹ (TMI), which refers to the degree of top management's participation in technical and socially supportive activities related to a new product development (NPD) project, has long been identified as a 'critical success factor' in NPD (cf. Cooper & Edgett 2004, Barczak et al. 2009, Cormican & O'Sullivan 2004, Nicholas et al. 2011, Song & Noh 2006). Several studies have shown that insufficient or improper TMI is a critical contributing factor to unsuccessful projects (Young & Jordan 2008, Young and Poon 2013, Wheelwright & Clark 1995). It is well established that TMI is important for enhanced NPD performance, but the crucial subtleties around the nature of this involvement are not well understood. How much involvement is sufficient and what the nature of that involvement should be have not been studied in detail (cf. Barczak et al. 2009).

This paper seeks to understand in more detail, the reasons and ways in which top managers are involved in NPD and the impact that this involvement has on NPD performance. In so doing, we offer three main contributions:

- First, we examine the motivating factors for senior managers² to be involved in NPD projects. To date, there has been much research on the effects of TMI on NPD success (cf. Gomes et al. 2001, Kleinschmidt et al. 2007, Lee et al. 2000, Lin 2007, Swink 2000) although this has mostly been from the NPD team perspective (cf. Kelley et al 2011; Alexander and Van Knippenberg 2014, Pihlajamaa 2017). However, examining motivational drivers of participants in innovation has also been identified as a significant challenge in firms (O'Connor and McDermott 2004). Despite this, research on the drivers of TMI has received scant attention (Felekoglu and Moultrie 2013a).

The first contribution of our study is to address this gap by examining two groups of

¹ In a number of extant studies, the terms "involvement" and "support" of top management have been used interchangeably. Throughout this paper, involvement is viewed as inclusive of support as involvement can encompass activities other than mere support.

² In this study, we use the terms "top managers", "senior managers", and "executives" interchangeably.

TMI drivers: technical drivers ('strategic importance' and 'product innovativeness') and social drivers ('intrinsic' and 'extrinsic' relevance).

- Second, we investigate how the different ways in which top managers are involved has an influence on NPD performance. While many studies demonstrate the positive impact of TMI, some, albeit very few, noticed a detrimental effect (e.g., Bonner et al. 2002, Harmancioglu et al. 2007). This may be due to TMI being a complex concept, best viewed as composed of a variety of behaviors (Barczak et al. 2009). In fact, Felekoglu & Moultrie (2013a) identify four types of TMI in NPD at the project level: providing guidance to the team; actively motivating the team; providing resources; and stimulating a tolerant climate. Correspondingly, the second contribution of our study is to investigate the effect of different TMI types on performance.
- Finally, we investigate the impact of organic communication between top management and the NPD teams. Organic communication refers to whether the communication between the executives and NPD teams are two-way and the extent to which this is informal and continuous (Burns and Stalker 1994). An important factor in understanding TMI has been identified as the communication between top management and the project team (Cormican & O'Sullivan 2004, Ernst 2002). However, the nature communication between top management and the NPD team has not previously been investigated in detail and continues to be suggested as a key area for future studies (Anderson et al. 2014). Accordingly, the third contribution of this study is to specifically examine how organic communication influences TMI and NPD performance.

The remainder of this paper is organized as follows. In the next section, a brief review of literature is presented. This is followed by hypotheses development, including both the technical and social drivers of TMI and the effect of TMI on NPD performance. We also

hypothesize the effects of organic communication between top management and the NPD team and the influence this has on NPD performance. The research method, analyses, and results are then presented. The paper concludes with a discussion of the findings, implications, and future research directions.

LITERATURE REVIEW

Top managers can be involved in NPD in a variety of ways. One stream of literature takes a social view of TMI, in which top managers influence projects somewhat indirectly. For example, top managements function as guides or advice givers by being accessible, being knowledgeable about the firm culture, and dynamics in the industry (Rodriguez-Escudero et al. 2008, and Carbonell & Rodríguez-Escudero, 2009). Further, top managers may act as facilitators and bring the team and even other members of the company together to help overcome obstacles in the project. Top managers also, when needed, protect the team from intrafirm politics (Barczak et al. 2009). Executives may also bolster an NPD project through their interactions with a team (Xie et al. 2003). For example, they may make encouraging remarks or compel employees to act (Nonaka & Takeuchi 2011). Related to this, top managers also play an important role in establishing an innovative climate (Owens 2007, Nicholas et al. 2011) because they are instrumental in establishing their firm's attitude towards risks and tolerance towards failures (Cooper & Kleinschmidt 2004, Cormican & O'Sullivan 2004, Rodríguez et al. 2008).

Another stream of literature takes a technical view of TMI, which relates to much more direct and formal involvements in NPD. In this stream, TMI is associated with strategic, administrative, and controlling roles. More specifically, these involvements are in the form of: strategic planning; overseeing the firm's new product portfolios (cf. Unger et al. 2012); selecting and professionally developing new product personnel; determining project priorities such as technological requirements (Rodriguez-Escudero et al. 2008); setting and articulating

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3 reasonable goals (cf. budget and schedules) and then making sure that the project is on track
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6 by reviewing and monitoring interim outcomes (cf. Bonner et al. 2002); disseminating project
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8 performance updates inside and outside of the firm; and ensuring that resources are deployed
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10 and then used effectively (Green 1995, Cooper & Kleinschmidt 2004, Poskela & Martinsuo
11
12 2009).

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15 In summary, there are two main facets to TMI: technical and social. Recognizing the
16
17 interrelatedness of technical aspects of firm structure and processes and the social needs of
18
19 employees, from a socio-technical perspective, management's primary role is to facilitate
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21 improvements in the balance between technical and social aspects of work, to attain
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23 optimization of both project performance and human well-being (Passmore 1988, Miller
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25 1992. Cormican & O'Sullivan 2004). However, extant literature mostly examines TMI from
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27 either a social or a technical point of view, and rarely combines the two. As a result,
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29 examinations of TMI do not provide a comprehensive insight into what motivates and
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31 constitutes effective TMI.
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36 Another limitation of extant literature is that TMI is mostly conceptualized as a single
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38 'idea', and is extremely rarely conceptualized as being a multi-faceted construct. However, it
39
40 is clear from the descriptions above that TMI involvement in NPD is complex and comprises
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42 many dimensions. Despite this complex nature of TMI, the majority of studies examining
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44 TMI take a comparatively narrow perspective of TMI (cf. Lee et al. 2000, Pujari et al. 2004;
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46 Unger et al. 2012; Nakata et. al 2017), depriving scholars and practitioners a granular
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48 understanding of the different involvement types top managers choose deliberately.
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52 When top managers are getting involved in NPD, they may do this as non-discursive
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54 action (Hardy et al. 1998). That said, since discourse and talk are central in firms (Alvesson,
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56 1994; Watson, 1995), top managers may choose to also communicate with the team, either
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58 verbally or in written form. For example, in bringing team members together to help
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3 overcome obstacles during development, top managers would converse with the team
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5 members or even send them some memos where they articulate their thoughts about how the
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7 team can collectively solve the problem they are facing, but in protecting the team from
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9 intrafirm politics, top managers may choose not to communicate directly with the team (or
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11 the team manager) about their actions of how they provided this protection. Even when top
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13 managers get involved in NPD by creating a tolerant climate for new product failures, they
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15 might do this without directly articulating this to the team, but in other ways, such as not
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17 punishing a team that worked on an NPD project with disastrous outcomes. Accordingly, top
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19 management's involvement (actions) and their communication with NPD teams must be
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21 examined separately.
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27 Top management communication can be defined as “the degree of clarity and
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29 completeness in the messages sent by top management to employees” (Mahajan et al., 2012,
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31 pg. 174). This communication can be in two different forms: first, top management can
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33 utilize formal, hierarchical, and intermittent communication, which is referred to as
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35 ‘mechanical communication’ (Burns and Stalker 1994). For senior managers, mechanical
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37 communication can be viewed as being determined by the formal processes (e.g., NPD
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39 process) and is often one-directional, utilizing formal documents such as the ‘product
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41 specification’, the ‘project plan’ and ‘milestone sign-off’ (Felekoglu et al. 2013b).
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46 The second type of top management communication is mostly informal, non-
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48 hierarchical, and highly dynamic. As such this type of communication is commonly referred
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50 to as ‘organic communication’ (Burns and Stalker 1994). More specifically, organic
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52 communication is the degree to which the communication between the NPD team and top
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54 management is bi-directional, informal, and continuous. Bi-directionality of communication
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56 refers to the extent to which the communication between the NPD team and top management
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58 is a two-way process. Informality of communication refers to the degree of open
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communication between the NPD team and top management where no formal rules and procedures need to be followed. These could be in the form of top managers “stopping by” the NPD team’s workspace to obtain impromptu progress updates and providing informal advice for the next steps. Continuity of communication refers to the extent to which the communication between the NPD team and top management is continuous throughout the NPD process. Thomas et al. (2009) finds that when employees perceive their communication with top management is open, these employees increase their level of engagement with their firm’s goals. Furthermore, Mahajan et al. (2012, pg. 191) shows that employees who provide more meaningful inputs into the decisions top managements make, feel that their opinions are listened to and valued, these employees are “inspired to work to the best of their ability”. Similarly, Chenhall and Morris (1995, pg. 487) argue that when top management employs participative, free flowing (i.e., informal) and open communication, “opportunities for identifying problems and developing ideas throughout the organization are enhanced.”

It is evident that communication between the top managers and NPD teams is important and can have different modes and aims. However, to date, the relationship between TMI and communication, especially between TMI and organic communication has not been closely examined in previous research.

HYPOTHESES DEVELOPMENT

In this study, we argue that there are underlying ‘technical and social drivers’ that provide the motivation for top managers to be involved in NPD activities and that these drivers will influence the ways in which they are involved.

Top managers play a key role in NPD to ensure that teams are supported with the necessary structures, processes, resources, and other organizational mechanisms (Barczak et al. 2009). Typically, as the strategic importance and the inherent level of product innovativeness or complexity of an NPD project increases, there is a higher demand on

resources and reliance upon processes. Furthermore, bigger challenges to functional frameworks and interests arise, leading to higher degrees of political activity (Frost and Egri 1991). Thus, the technical drivers that motivate top management involvement include the ‘strategic importance’ of the project and ‘product innovativeness’.

Involvement has been described as “a subjective psychological state, reflecting the importance and personal relevance of an object or event” (Barki & Hartwick 1989; Jarvenpaa and Ives 1991). This suggests that the motivation to get involved also arises from “personal relevance”, which can be triggered by both internal and external stimuli (Celsi & Olson 1988). Internal stimuli are internal sources of personal relevance, while external stimuli are the external sources of personal relevance (Celsi et al. 2016). Hence, to understand the social drivers of TMI, we examine the intrinsic and extrinsic sources of personal relevance.

Further, as seen in extant literature, different roles are undertaken by top management in their involvement in NPD projects. In most studies, these distinct modes of involvement are ignored and TMI is referred to as a broad single concept (cf. Nakata et al. 2017). Hence, we open the black box of TMI by unveiling how top managers communicate, guide, actively motivate, provide resources and cultivate a tolerant climate. When doing so, we also recognize that organic communication between top management and the NPD team has an influence on project outcomes.

Figure 1 below presents the research model used in this study, in which four technical and social drivers are suggested to positively influence TMI and organic communication. TMI in NPD and top managers’ organic communications with the NPD team are expected to positively affect the performance of the NPD project in terms of meeting the budget/schedule, product quality and market performance. Each of these elements and their bases in theory are explained in the following sections.

[Insert Figure 1 about here]

Drivers of TMI in NPD Projects

From a socio-technical systems perspective, improving project performance means optimizing both the social and technical aspects of TMI. Connecting this perspective with insights drawn from the TMI literature, the behavior of top managers to get involved in NPD projects can be conceptualized as being driven by two core sets of factors: The first, technical factors, emanate from the project situation (the external stimuli), while the second, personal factors, are relevant to the individual senior managers (the internal stimuli) and are social aspects.

Technical Drivers

Strategic importance: Top management has the primary responsibility for developing and implementing the overall strategy of the firm (Hambrick 1981) to improve the long-term outlook of the business. Firms sustain or improve their strategic position by adapting and responding to the changing needs of their environment through the new products they develop. Hence, new products are a critical part of the firm's overall strategy (Cooper et al. 1999). For example, portfolio management and prioritization of NPD projects entail important strategic decisions such as determining the markets, products, and technologies the firm should focus on (McNally et al 2013). Thus, top management needs to recognize and support projects that promise high strategic gains.

Within the overall NPD program, each project has its own level of strategic importance. This may be related to the project's closeness to the overall NPD strategy, its potential to improve the firm's competitive advantage, its significance in the firm's future growth, and its importance in responding to external environmental changes. Strategically important projects usually carry high risk as they might involve important changes in assets, know-how, and core processes (Moenaert et al. 2010). All of these issues are major concerns to senior managers. Therefore, managers are expected to be more inclined to get involved in

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3 projects with high strategic importance. It is also expected that they pay more attention to the
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5 success of these projects and would therefore have closer relationships with the NPD teams
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7 of strategically important projects through continuous, informal, and interactive
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9 communication and to make sure that necessary resources are available, tasks are on track,
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11 and problems are solved. Hence:
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15 *H1a: An NPD project's strategic importance positively influences the level of TMI.*

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17 *H1b: An NPD project's strategic importance positively influences the level of organic*
18 *communication between top management and the NPD team.*

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21 **Product innovativeness:** Product innovativeness refers to the extent to which the
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23 new product is novel. NPD literature differentiates between radical and incremental product
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25 development projects (Lakemond & Berggren 2006). Radical new products offer high
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27 potential to influence and lead the market and bring supernormal returns to the firm. But,
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29 more radical projects are associated with high risk and high uncertainty (Day 1994, O'Connor
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31 & McDermott 2004) and provide significant challenges to NPD teams (Seidel 2007).
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33 Successful radical innovations have been characterized as having high levels of TMI (Green
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35 1995, Kessler & Chakrabarti 1999). Since developing highly innovative products requires
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37 more resources, more support from internal and external networks, it would be expected that
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39 senior managers feel the need to establish a closer relationship with their NPD teams. As a
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41 result, it would also be expected that there would be a higher amount of continuous, informal,
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43 and bi-directional communication between the top management and the new product teams
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45 (O'Connor & McDermott 2004). Therefore:
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51 *H2a: An NPD project's level of innovativeness positively influences the level of TMI.*

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53 *H2b: An NPD project's level of innovativeness positively influences the level of*
54 *organic communication between top management and the NPD team.*

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56 **Social drivers**
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Some prior work has suggested that involvement may also be influenced by ‘social’ drivers, which affect the degree to which the NPD project evokes the personal interest of top managers. Although some early studies investigated the relationship between human behavior and decision making in NPD, these were more limited to the new product selection process (e.g., Balachandra 1984). A comprehensive analysis of top management and innovation by Hsu and colleagues (2008) highlight that demographic, personality, and psychological characteristics influence NPD. For example, firm outcomes can be predicted by managerial ‘demographics’ such as age, tenure in firm, functional background, and education (Hambrick & Mason 1984). Manager dispositions (e.g., need for cognition) also influence NPD outcomes (e.g., McNally et al. 2013).

Unfortunately, the third characteristic type, psychological, is largely ignored in extant studies of TMI. Moreover, demographic and personality characteristics are independent of any specific NPD project. In contrast, psychological characteristics can change across different projects. When a project is closely associated with top manager’s personal interests, then they will feel a strong desire to be involved (Celsi & Olson 1988). Personal relevance or simply ‘relevance’ is defined as “a personally meaningful connection to the individual” (Priniski et al. 2018, pg. 11) and can be classified into two categories: intrinsic and extrinsic. We expect both personal relevance categories to have positive effects on TMI.

Intrinsic personal relevance: Personal relevance is considered as intrinsic when it is driven internally by the top manager’s own view of ‘self’ (Ryan & Deci 2000; Celsi et al 2016). For example, when the top manager thinks that his/her involvement in the NPD project would give him/her valuable new experiences in terms of professional growth and development, then he or she is more likely to get involved in it (Malek et al. 2020) and have a closer and interactive communication with the NPD team to learn more about the project’s progress and provide the necessary support. This leads to hypotheses 3a and 3b:

H3a: An NPD project's intrinsic personal relevance for the top management positively influences TMI.

H3b: An NPD project's intrinsic personal relevance for the top management positively influences the level of organic communication between top management and the NPD team.

Extrinsic personal relevance: Personal relevance is considered as extrinsic when it is driven externally by the other people's view of the 'self' (Celsi et al. 2016). This relevance is provoked by a variety of factors (e.g., expected reward, expected evaluation) (Amabile, 1996). For example, Atuahene-Gima and DeLuca (2008) highlight that during NPD, personal stakes in expected rewards such as the success or failure of the new product having major consequences for future role of those involved in that NPD (e.g., if the product did not succeed, deterioration of the status and reputation of those involved, including top managers overseeing this project, within the organization is expected). Similar to this, Engwall et al. (2003) also argue that "ideas about the post-project future" will influence management behavior during the process. This extrinsic motivation is more likely to increase involvement and communication between the top manager and the team. This leads to hypotheses 4a and 4b:

H4a: An NPD project's extrinsic personal relevance to top management positively influences the TMI.

H4b: An NPD project's extrinsic personal relevance to top management positively influences the level of organic communication between top management and the NPD team.

Effects of Organic Communication on TMI

TMI requires direct contact between top managers and project team members (Barczak & Wilemon 2003, Swink 2000). TMI in the project might be shaped by a range of modes of communication, including multi-functional senior management teams, steering committees, joint leadership, direct communication channels, and champions (e.g., Gomes et al. 2001). In their study of successful innovation projects, Jelinek & Schoonhoven (1990) find

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3 that when communicating with the team members, senior managers encourage, generate
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5 ideas, share information, and help integrate across different projects. All of these can be
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7 described as different modes of organic communication, each of which are characteristic of
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9 TMI. Among other things, Jørgen Vig Knudstorp started an informal internal blog soon after
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11 he was appointed as CEO of LEGO in 2004 (Akbari 2012), which is an excellent example of
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13 a top manager enhancing organic communication with NPD teams. With this increased line
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15 of communication, he was able to respond quickly to comments from employees and improve
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17 his guidance, active motivation of NPD teams, and foster a tolerant climate for enhanced
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19 innovation, which LEGO desperately needed at the time.
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24 Project goals can be articulated more clearly with organic communication because
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26 this type of communication allows NPD team members to informally ask questions until they
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28 more precisely comprehend the goals set for them. Cross-functional integration is the extent
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30 of interaction and communication, the level of sharing, and coordination across functions and
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32 projects (Song & Montoya-Weiss, 2001). Senior managers have a significant influence on
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34 cross-functional integration mechanisms across the firm (Lin 2007, Perks et al. 2010, Parry et
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36 al. 2010). They achieve this through promoting and sharing examples of effective teamwork
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38 (Barczak & Wilemon 2003), which provides active motivation to the team members.
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43 Through organic communication, senior management would have a deeper
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45 understanding of the team's resource needs and consequently be more willing to provide the
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47 right resources. Furthermore, while communicating informally with the team, top managers
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49 will feel more sympathetic toward the project and its members and create a more tolerant
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51 climate. Hence:
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55 *H5: Organic communication between the top management and the NPD team*
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57 *positively influences the TMI.*

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59 ***Effects of TMI and Organic Communication on NPD Project Performance***
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To determine the impact of TMI and organic communication on NPD project performance, as in many previous studies, we focus on the attainment of project targets such as budget and schedule, desired product quality, and expected market performance.

Budget and schedule performance: Lack of TMI is cited as one of the main reasons for product development delays (Owens 2007). In fact, NPD projects are quicker and more successful where there is TMI sponsorship and facilitation (Reilly et al. 2003). Scholars find a relatively strong relationship between TMI and project performance in terms of meeting time and cost targets (Gomes et al. 2001), especially when there is high technological turbulence (Carbonell & Rodriguez-Escudero 2009). Further, this relationship has been found to be significant, regardless of the level of technological innovativeness (Swink 2000). We thus expect that TMI will improve budget and schedule performance.

NPD project success is also enhanced by organic communication. Bonner et al. (2002) investigate the relationship between formal (e.g., process control, output control) and interactive (e.g., management intervention, team operational control influence) control mechanisms used by top management and meeting schedule, budget, and product performance objectives. They find a negative relationship between the degrees of process control imposed and project performance. A positive relationship was found between the amount of influence an NPD team has in shaping the operational controls to be applied to the project and project performance. Further, managerial output control improves NPD speed (Carbonell & Rodríguez-Escudero 2011). Hence, organic communication (i.e., both-ways, continuous and informal) between top management and NPD team is thus expected to increase the likelihood of completing the project on time and within budget.

H6a: *TMI positively influences budget and schedule performance.*

H6b: *Organic communication between top management and the NPD team positively influences budget and schedule performance.*

Product quality performance: In addition to meeting budget and time targets, firms strive to develop the highest quality products (Wheelwright & Clark 1992). With respect to specific TMI actions, literature finds a strong positive relationship between TMI and meeting the product design targets (Swink 2000). Senior managers who set clear directions based on robust strategic plans can help the team to have a good understanding of the expected product requirements (Barczak & Wilemon 2003). In addition, availability of both physical and financial resources can enable the team to work at their highest potential towards developing a high-quality product (Wheelwright & Clark 1995).

When top management provides an organizational setting, which stimulates communication and teamwork between functional groups, the NPD team has less conflict and therefore have consensus over the expected product quality (Menon et al. 1997). Moreover, when the team is encouraged by top management to share their ideas and raise their concerns via organic communication, they are more likely to generate innovative solutions, which would contribute to a higher quality product (Kriegesmann et al. 2005). Furthermore, identification and procurement of the most appropriate external expertise via organic communication when needed is also expected to have positive effects on the quality of the product being developed. Thus:

H7a: TMI positively influences product quality performance.

H7b: Organic communication between top management and the NPD team positively influences product quality performance.

Market performance: NPD projects with high TMI have higher levels of financial success (e.g., Zirger & Madique 1990), regardless of the country the firm operates from (Lee et al. 2000). Swink (2000) found positive impact of TMI on the financial performance of new products with low technological innovativeness. This points to the expectation that supportive involvement of top management in an NPD project is expected to contribute to the commercial success of the project.

Author accepted/in press manuscript from 8.8.2022. Please cite article as:
Felekoglu, Burcu; Durmusoglu, Serdar; Maier, Anja; Moultrie, James (Accepted 2022): Walking the Managerial Tightrope: Executive Involvement in Product Innovation Projects. European Journal of Innovation Management.

Furthermore, NPD is a boundary spanning process, requiring both flows of information across firm boundaries and a range of managerial controls (Radnor & Robinson 2000). The best firms have continuous and open communication not only across team members, but also between the team and other stakeholders (Barczak et al. 2009). Hence, continuous and interactive communication between top management and the NPD team is essential for outstanding NPD performance. Therefore:

H8a: TMI positively influences market performance.

H8b: Organic communication between top management and the NPD team positively influences market performance.

METHOD

Sample and Data Collection

Data was collected via online surveys, from 85 firms in the UK, which represented a variety of industries. Potential respondents were contacted in one of the following three ways:

- First, companies listed on the database of the research institute where this work was performed. This list included senior contacts in 100 firms, which were randomly drawn from a list of manufacturing companies with more than 15 employees. Senior managers in this group were contacted via an e-mail including information about the project, an invitation to participate, instructions to participation, and the survey link.
- Second, academic researchers and professionals known to the research team and working in this field provided contacts for a further 42 firms. Senior managers in this group were first contacted via phone; the researchers provided information about the project, and those that were interested in participating were then sent an e-mail as above.
- Third, a database of senior managers in 1000 UK manufacturing firms with more than 15 employees was purchased from a private contact data supplier: IBM

MarketScan®. Senior managers in this group were also contacted directly via email, which included details about our study and a link to the survey.

As a result of these efforts, a total of 172 surveys were returned. These surveys provided dyadic data for 86 NPD projects from 85 companies (one firm provided data for two separate NPD projects), which corresponds to a 7.4% response rate, similar to extant literature (e.g., Pujari et al. 2004).

To obtain insights from both top management and the NPD team, data were collected from two respondents in each firm, using a two-part survey. The first part of the survey was completed by a senior manager who has decision making responsibilities over NPD activities in the firm or the strategic business unit (SBU). This might typically include the CEO, technical director, marketing director, production director, finance director, sales director, etc. In most cases, the first point of contact was the CEO or managing director of a firm. The contacted senior managers either completed the first part of the survey themselves or identified an appropriate senior executive. The responding senior manager responded as a representative of top management and based their answers on an NPD project that has been fully completed within the last three years. This enabled them to comment on the resulting market performance of the project.

After completing the first part of the survey, the senior managers, provided the contact details for the manager of the project they were considering when responding to their part of the survey. This information enabled us to directly contact the project manager, provide them with the name of the project the senior manager considered when filling out the survey, and request the project manager to answer questions about the same project in the second part of the survey. NPD project managers were considered to best represent the NPD team since they are the key people who develop, manage, and sustain the team's relationship

with senior management (Barczak & Wilemon 2003). Prior studies on NPD also relied on project managers to assess NPD team related issues (e.g., Akgün et al. 2007).

In conclusion, the responding senior manager represents the views of the senior management team while the responding project manager represents the views of the wider project team. More specifically, the values for strategic importance, product innovativeness, extrinsic and intrinsic personal relevance, budget/schedule performance, product quality performance, and market performance were obtained from senior managers and the values for guidance, active motivation, resources, tolerant climate, and organic communication constructs were obtained from NPD project managers.

Previous studies in the NPD field acknowledge that top managers are particularly difficult to access in research studies (cf. Yadav et al. 2007). In addition, there is evidence that asking multiple respondents to complete the same questionnaire is often problematic since the respondents may view such a procedure as implying a lack of trust in their individual responses (e.g., Atuahene-Gima & Murray 2007). However, we believe this ‘key informant’ approach is best suited to both collecting and processing data for this study.

Further, to ensure informant reliability (Phillips, 1981), each respondent was carefully ‘vetted’ to ensure that they fulfilled the designated role. Similar to Atuahene-Gima and Murray (2007) and others, informants rated their degree of their knowledge about NPD projects in their firm on an 11-point semantic differential scale (0=not at all knowledgeable; 10=extremely knowledgeable). The mean response was 8.71 (sd=1.40) indicating highly knowledgeable. In addition, the responding top manager rated their degree of involvement in the given project on an 11-point scale from 0 to 10 with the following anchors: 1=very little, 3=little, 5=moderate, 7=high, 9=very high. The mean response of 6.77 (sd=2.02) demonstrates respondents’ high involvement in these projects.

The key informants representing top management also reported their positions in the firm when the NPD project was underway. About 47.7% of the respondents were CEO or head of a Strategic Business Unit (SBU), 30.2% were technical directors or equivalent, 7% were marketing directors or equivalent, 5.8% were production directors or equivalent, 3.5% were sales directors or equivalent, and 5.8% were others (e.g., Product Director, Director of Project & Portfolio Office, Business Development Manager, Senior Projects Leader).

The respondents represent firms from a variety of industries (See Table 1): industrial equipment and machinery (32%), high-tech (29%), consumer products (14%), chemicals, pharmaceuticals, biotech and medical (13%), aerospace and automotive (8%), and others (4%). Firm size ranged from 15 to 5000 employees, with a mean of 287 (sd=694) and a mode of 100. Moreover, about 51% of the responding firms have fewer than 100 employees. Further, average annual sales from the responding firms were 508 million Euros.

[Insert Table 1 about here]

Measures

The model has three main components, as outlined in Figure 1 (i.e., Drivers of TMI, TMI and Organic Communication and NPD Project Performance), consisting of 12 latent variables with reflective multiple items. Where possible, existing validated measures were used to operationalize the constructs. Where no previously developed measures were available, then new measures were developed. Unless otherwise stated, all items comprised of five-point Likert scale and are given in Table 2.

[Insert Table 2 about here]

Product Innovativeness was measured with four items borrowed from Olson et al. (1995). However, with no available measures for 'strategic importance' and 'personal relevance', measures for these constructs were developed following the steps advocated by Churchill Jr (1979). First, the construct domain was specified and a sample list of items was

generated based on extant literature and the experience of the academic team who had previously held roles including technical director, product manager, and project manager positions in industry. Next, the items were sent to nine academic experts in the NPD field via e-mail to solicit their feedback on the domain coverage, clarity, and scaling of the proposed items. This step resulted in changes to the phrasing of some of the items, improvements in clarity and purification of items by discarding problematic ones. Finally, the scales were pretested with twelve top managers and twelve project managers who provided feedback on the clarity of the instructions, wording of the questions, easiness to answer, relevancy and their overall comments. This resulted in additional minor revisions to the phrasing of the questions and design of the survey. In conclusion, the strategic importance construct was measured with five items, intrinsic personal relevance and extrinsic personal relevance factors were measured with three items each.

Next, in an exploratory study, Felekoglu and Moultrie (2013b) identified four types of TMI using 14 items amalgamated from the existing literature. This structure of TMI activities (guidance, active motivation, resources, and tolerant climate) and their measurement items were used in this study. Furthermore, organic communication was measured with four items that were developed for this study, following the same steps outlined above for 'strategic importance' and 'personal relevance'. NPD project performance was captured with three constructs with measures adopted from Rodríguez-Escudero et al. (2010). 'Budget and schedule performance' refer to the degree to which the project meets budget and schedule targets (four items). Product quality performance refers to the degree to which the project meets quality targets (seven items). Market performance refers to the degree to which the project meets commercial targets (three items). Finally, as a proxy for organizational complexity and to capture the economies of scale that large firms can benefit, we controlled for firm size.

Controlling for Systematic Biases

To improve the response rate, informants were offered an executive summary of the findings. In addition, contacts were sent three follow-up e-mails with one-week intervals.

Using firm size as a proxy, no significant differences were found between respondents and non-respondents at the .05 level (Armstrong & Overton 1977). Further, responses of early respondents and late respondents on major study variables showed no significant differences except budget and schedule adherence construct. Subsequent tests indicated only a marginal difference in one item. Consequently, response bias is not considered to be a major concern.

A number of remedies were used to minimize common method bias. The measurement instrument was constructed through a careful review and revision process incorporating feedback from academic experts and practitioners from industry. This process helped to eliminate ambiguous, unfamiliar and leading terms; ensured that questions were simple, specific and concise; identified concepts which needed brief explanations; and avoided double-barreled questions. Moreover, collecting data from two informants in each firm enabled mitigation of single-method bias (Crampton and Wagner 1994). Additionally, when testing the hypothesized relationships, values from different sources were used for predictor and criterion variables, namely, the measurement values of input and output constructs were from senior managers and the measurement values of realization constructs were from NPD project managers.

In an effort to mitigate the social desirability effect, respondents were assured that all individual responses will be treated as strictly confidential and only information summarized from an average of all responses received will be reported. This helped to encourage respondent cooperation without fear of potential reprisals. In addition, respondents were assured that there were no right or wrong answers and that they should answer questions as honestly and forthrightly as possible (Podsakoff et al. 2003).

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3 Lastly, in order to reduce the effects of recall/memory bias, respondents were asked to
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5 base their answers on an NPD project completed in the last three years. In addition to all
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7 these remedies taken to minimize and prevent systematic errors, the responses of senior
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9 managers from three data collection groups for the main study variables were also compared.
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11 No significant differences were found.
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14 **ANALYSIS AND RESULTS**

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16 We used PLS Structural Equation Modeling (SEM) to analyze the data (Chin 1998,
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18 Fornell & Cha 1994, Hair et al. 2013). In particular, we utilized SmartPLS (Ringle et al.
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20 2005). PLS-based SEM has an overall objective of obtaining determinate values of the latent
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22 variables for the purpose of exploration and prediction and is thus recommended at an early
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24 stage of theory development in order to test and validate exploratory models (Henseler et al.
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26 2009). In PLS-based SEM, there is no assumption for the distributional form of the data. It is
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28 also more tolerant of small sample size, places minimal demands on measurement scales
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30 (Hair, et al. 2011) and avoids factor indeterminacy issues (Chin 2000). It handles highly
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32 complex models without estimation problems.
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38 In order to obtain t-values, 500 random samples were generated using a bootstrap
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40 procedure (Henseler et al. 2009). As shown in Table 2, all standardized factor loadings were
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42 significant at the .001 level. The AVE of all the constructs met the .5 cut off value, which
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44 indicates sufficient convergent validity (Fornell and Larcker 1981). Cronbach's alpha (ranged
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46 between .68 and .87) and composite reliability (CR) (ranged between .79 and .91) values also
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48 indicate strong reliability on the construct level. Discriminant validity between the constructs
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50 is confirmed by the square root of AVE being greater than all corresponding correlations
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52 (Fornell & Larcker 1981), as seen in Table 3. These results ensured that the constructs were
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54 measured with sufficient precision.
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58 [Insert Table 3 about here]
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After assessing the construct reliability and validity, the hypotheses were tested by examining the structural model. In PLS-based SEM analysis, the test of the structural model includes assessing the value, sign, and significance of the path coefficients and the coefficient of determination (R^2) values for each criterion variable. In terms of interpretation of path coefficients, significance levels and multiple R^2 values are akin to a multiple regression (Hsu, Chen & Hsieh 2006). R^2 values represents the amount of variance explained for the given criterion variable by its predictor variables. In PLS, R^2 values provide some guidance about the goodness of fit of a model, where values of $\sim .19$ indicate weak model fit, $\sim .33$ indicate moderate model fit, and $\sim .67$ indicate substantial model fit (Chin 1998). However, "...no universally valid cut off point for a sufficient R^2 exists..." (Heinecke 2011, p.92).

Hypothesis Testing Results

The resulting R^2 values of the criterion variables in this study are as follows: guidance (.46), active motivation (.44), resources (.28), tolerant climate (.24), organic communication (.03), budget and schedule (.18), product quality (.21), market (.11). Comparable with the other studies in the NPD field, R^2 values indicate weak to moderate explanation of the criterion variables by their predictors, ranging between .03 and .46.

We hypothesized that higher level of strategic importance of the project would be associated with higher level of TMI in the project as the senior manager provides guidance, active motivation, resources, and a tolerant climate (H1a). The results partially supported this hypothesis, indicating that the strategic importance of the project has a highly significant and strong positive influence on active motivation from top management ($\beta=.40$, $p<.001$), a significant influence on TMI through creating a tolerant climate ($\beta=.21$, $p<.05$) and a marginally significant influence on resources ($\beta=.16$, $p<.10$). No significant influence of the strategic importance of the project to top management guidance was found.

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3 Next, we hypothesized that organic communication between top management and the
4 NPD team would positively affect TMI in the NPD project (H1b). The results revealed that
5 organic communication indeed has a strong positive effect on all of the four aspects of TMI
6 in the project, as seen by the significant and high coefficients, $\beta=.64, p<.001$; $\beta=0.38, p<.001$;
7 $\beta=.41, p<.001$; and $\beta=.39, p<.001$, respectively.
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12 In H2a, we hypothesized that top management would have greater involvement in
13 NPD projects when the project had a high level of product innovativeness. However, no
14 support is found for the positive influence of product innovativeness on TMI.
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18 Third, when the project has high intrinsic personal relevance, we hypothesized that
19 the senior manager would be more involved in the NPD project (H3a). These hypotheses are
20 partially supported with a marginally significant positive effect of intrinsic personal relevance
21 on TMI through active motivation ($\beta=.22, p<.10$) and resources ($\beta=.21, p<.10$). No support is
22 found for the positive effect of intrinsic personal relevance on top management's guidance
23 and effort to create a tolerant climate.
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27 We hypothesized that if the project has a higher level of extrinsic personal relevance
28 then there would be a higher level of TMI (H4a). However, the analysis revealed a surprising
29 partial negative effect of extrinsic personal relevance on TMI. More specifically, extrinsic
30 personal relevance is found to have a significant negative effect on TMI in the NPD project
31 through active motivation ($\beta -.17, p<.05$) and creating a tolerant climate ($\beta=-.21, p<.05$). The
32 effect of extrinsic personal relevance of the project on top management's guidance and their
33 resource provision was not significant.
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37 We predicted that strategic importance (H1b), product innovativeness (H2b), intrinsic
38 (H3b) and extrinsic (H4b) personal relevance of the NPD project would have a positive effect
39 on organic communication between top management and the NPD. Results, however, show
40 non-significant effects for all of these relationships.
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3 A positive association was predicted between TMI in the NPD project (through
4 guidance, active motivation, providing resources, creating a tolerant climate) and
5 performance in terms of meeting budget and schedule performance (H6a). While the results
6 confirm significant positive relationships between the two kinds of TMI, active motivation
7 ($\beta=.33, p<.05$) and resource provision ($\beta=.21, p<.10$), and the project performance in terms of
8 meeting schedule/budget targets, surprisingly, significant negative associations were found
9 between TMI through guidance ($\beta=-.37, p<.05$) and creating a tolerant climate ($\beta=-.34,$
10 $p<.05$) and project performance in terms of meeting schedule/budget targets.

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12 We predicted that TMI (guidance, active motivation, providing resources, and
13 creating a tolerant climate) would have a positive effect on project performance in terms of
14 meeting product quality targets (H7a). No support was found for the effect of guidance on
15 product quality. Active motivation provided by top management was found to have a
16 significant and strong influence on a product quality ($\beta=.45, p<.01$). Providing resources was
17 found to have a marginally significant effect on the new product's quality ($\beta=.21, p<.10$).
18 However, contrary to the hypothesized effect, a tolerant climate created by top management
19 was found to have an opposite effect on the quality of the new product ($\beta=-.34, p<.01$).

20
21 We also predicted that all four kinds of TMI would have a positive effect on the
22 market performance of the NPD project (H8a). A highly significant and strong positive
23 association is found between the active motivation provided by top management and market
24 success of the new product ($\beta=.51, p<.01$). Providing a tolerant climate was found to have a
25 negative, but marginally significant effect on the market performance ($\beta=-.23, p<.10$),
26 opposite of that hypothesized. No support was found for either guidance and providing
27 resources having an impact on market performance.

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29 We hypothesized that higher level of organic communication between top
30 management and NPD team would be associated with higher level of NPD project success in
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terms of meeting budget/schedule (H6b), product quality (H7b), and market targets (H8b).

We found that organic communication had a significant positive effect on project performance in terms of meeting schedule/budget targets ($\beta=.35, p<.05, H6b$), but not in meeting product quality (H7b) or market (H8b) performance.

In analyzing these results, we controlled for ‘firm size’ and no significant relationship is found between firm size and the project performance in terms of meeting schedule and budget, product quality, and market targets. However, firm size is found to have a marginally significant negative effect on the organic communication between top management and the NPD team ($\beta=-.12, p<.10, \text{two-tailed}$), suggesting that in small firms top management and the NPD team inherently have a more organic approach to communication. All hypothesized relationships are summarized in Table 4 and Figure 2.

[Insert Table 4 and Figure 2 about here]

DISCUSSION

In this study, we examine how technical drivers as well as social drivers influence organic communication and top management involvement (TMI) in new product development (NPD) projects. More specifically, technical drivers are strategic importance and product innovativeness and social drivers are intrinsic and extrinsic relevance. Further, organic communication is defined as continuous, bi-directional, and informal communication between top management and the NPD teams. We also argue that TMI must be studied as multi-faceted construct and therefore, TMI is conceptualized to occur as guidance, active motivation, providing resources, and creating a tolerant climate. Subsequently, how different TMI types and organic communication influence NPD performance is investigated.

The findings support our hypothesis that the strategic importance of the NPD project has a positive effect on three aspects of TMI. The strongest effect is on TMI by active motivation, which is followed by creating a tolerant climate and providing resources. In other

words, if an NPD project has high strategic importance for the firm, top management is more likely to provide active motivation to the team, make necessary resources available and show tolerance towards occasional mistakes and concerns. This result supports prior findings that the expected contribution of a project to the firm's needs increases the likelihood of top management support (e.g., Green 1995).

Previous research found a small, but significantly positive effect of product innovativeness on TMI (e.g., Green 1995). However, our study shows no clear association between the two. For attracting top management's attention, it may be that the novelty of the product is less important than the strategic importance of the project. This result might also be explained by the nature of this survey: if all of the projects in the sample had a similar level of innovativeness, then there would be little variance for TMI amongst these. To explore these explanations further, we conducted a post-visual-inspection of the measurement values for both product innovativeness and strategic importance. For both variables, similar distributions of values were observed. In spite of these similar distributions of values, strategic importance has shown significant effects on a number of dependent variables, but product innovativeness has not. This would indicate that the result is valid and that product innovativeness is *not* a pre-requisite for TMI.

The findings confirm that when the project has high intrinsic personal relevance to senior managers, they are likely to be more involved, by providing active motivation and the necessary resources. Surprisingly, the findings reveal a negative effect of extrinsic personal relevance on TMI through providing active motivation and creating a tolerant climate. The latter finding is counterintuitive at first glance. However, a possible explanation is provided based on Maslow's hierarchy of needs, particularly the need for self-esteem (Maslow 1987). The desire for external appreciation, higher status and respect by others are all reflective of lower self-esteem in individuals and, in this context, extrinsic personal relevance refers to

such needs. Intrinsic personal relevance refers to higher self-esteem needs such as self-respect and self-confidence. Self-esteem affects managerial behavior and people are inclined to choose activities consistent with their self-esteem levels (Jones & George 2008). Managers with low self-esteem are known to have more problems with their workforces than managers with high self-esteem (Flaherty and Stark 1999). It is, therefore, possible that TMI triggered by the need for extrinsic personal relevance may not be as useful as the involvement triggered by the feeling of intrinsic personal relevance, or, it may be that, top managers are innately more likely to have higher self-esteem and are therefore more likely to be motivated by intrinsic personal relevance to be involved in an NPD project. In any case, it should be noted that the effects of the two aspects of personal relevance are low to moderate and, therefore, these impacts should be regarded as tentative. The stronger effect of the strategic importance of the project on TMI suggests that top managers' drive to be involved is more strongly influenced by the goals of the firm than by satisfying their personal needs.

Results show no clear association between the drivers of TMI (strategic importance, product innovativeness, extrinsic and intrinsic personal relevance) and organic communication between the NPD team and the top management. This suggests that the level of organic communication between top management and the team is not affected by the characteristics of the project or the motivation of the senior manager. Since these factors cannot directly explain changes in the level of organic communication, then we must assume that this is influenced by other factors.

The results revealed that organic communication between top management and the NPD team has a strong positive effect on all elements of TMI (providing guidance, actively motivating the NPD team, providing resources, and creating a tolerant climate). In other words, when top management communicates with the NPD team throughout the project in an

informal way and listens to them, top management is more likely to be seen by the team as being actively involved in the project.

Surprisingly, our results also show that the more top managers provide guidance, the less the NPD team is likely to meet their budget and schedule targets. In other words, increased guidance by top management (e.g., setting direction, setting critical milestones for evaluation, determining the flow of activities, identifying the timing of key events, deciding on the relative priority of the project, getting external help, and handling unforeseen contingencies) may be more detrimental than beneficial to the team. It is possible that the team may see high levels of guidance as being interfering and pushy rather than helpful. In fact, Bonner et al. (2002) find a negative relationship between the degree of management intervention during project implementation and project performance. So, guidance may be perceived as being more directive and interventionist and less empowering (e.g., they want the team to take only the actions they suggest). This finding supports the idea that an NPD team needs freedom to carry out the NPD project with autonomy, rather than being micro-managed by top management (Christiansen & Varnes 2009). It may also be that although this guidance is well-intentioned, it causes frequent changes in direction, which adversely affects budget and schedule performance (Bonner et al. 2002). Thus, despite their best of intentions, too much attention from top managers may ultimately decrease team motivation, as the team seeks feels unable to act autonomously. Excessive top management attention can also slow problem solving, consensus building, and decision-making processes (Reilly et al. 2003). Some active guidance every now and again can enhance NPD performance, but our findings suggest that this should be kept at a minimum so that it does not become overbearing. Finally, the meta-theoretical 'too-much-of-a-good-thing' principle can also be the cause for this effect (Pierce & Aguinis, 2013).

Our results indicate that the most helpful way by which top managers can be involved is through actively motivating the team (e.g., encouraging teamwork between functional groups, providing the organizational setting that energizes the team's communication, actively building internal support for the project and helping to take the necessary actions after the project reviews). This kind of involvement has a positive effect on the likelihood that the project is completed within budget and on schedule. It is also positively associated with the development of a high-quality product that is also commercially successful. This is consistent with extant literature that when top management creates an enthusiastic atmosphere, there is a positive effect on project completion time (Carbonell & Rodríguez-Escudero 2009). This motivational role might be compared with that of a "project champion" (e.g., Howell & Higgins 1990, Markham 2000). However, literature usually refers to individuals other than top managers (e.g., project managers) as champions and these champions therefore not only motivate the NPD team, but also strive to obtain top management support (e.g., Kelley & Lee 2010). The findings of this study suggest that if top management as a group carries out this motivational role, the outcome might be even more promising.

Some previous studies did not find any impact of the provision of resources on product quality (e.g., Gomes et al. 2001), while others did (e.g., Carbonel & Rodríguez-Escudero 2009, Swink 2000). Our results indicate top managers providing necessary resources (financial, human, and physical) would positively influence adherence to budget, schedule and product quality targets.

A very surprising finding was the negative effect of tolerant climate on project success in terms of meeting budget/schedule, product quality, and market targets. This is contrary to findings of some previous studies (e.g., Reilly et al. 2003). Rodríguez-Escudero et al. (2010), for example, found that moderate to high levels of pressure on the NPD team from

top management has a positive effect on the creation of a high quality product. They explain this effect by observing that the NPD team becomes more careful and eager to achieve high performance when there are high levels of expectancy by top management. Conversely, when top management tolerates mistakes and allows the team to feel free to raise questions or concerns, the team may become less likely to meet the targets as they may get relaxed or may be less careful. In other words, the NPD team needs a certain degree of authority and pressure from top management to be successful. This again resonates with the 'too-much-of-a-good-thing' principle (Pierce and Aguinis, 2013); when top management becomes overly relaxed in their approach, then this can manifest itself in a team that is also too relaxed, which eventually has detrimental effect on project success.

As predicted, results show a positive effect of organic communication between top management and the NPD team on meeting schedule/budget targets. On the other hand, no clear association was seen between organic communication and product quality and market success. This finding suggests that when top management communicates organically (e.g., is approachable, shares critical issues, is open to communication from the team etc.), critical issues are more likely to be shared as they arise and problems are more likely to be solved early and, hence the team is more likely to complete the project on time and on budget.

The findings show that organic communication between top management and NPD team is influenced by the size of the firm. Although the effect is small, it suggests that as the firm gets bigger, the level of continuous, bi-directional and informal communication decreases. This finding is reasonable, as in large companies there may be many other issues which also demand top management attention and a longer chain of hierarchy between the team and the top managers. Thus, the critical communication interface may well be with middle management levels.

Theoretical Implications

To better understand TMI and its effects on project success, both top management and team perspectives are needed. Therefore, with data from representatives of both top management and the NPD team, we provide evidence of how TMI might be both beneficial and detrimental at the project level. Further, measures of TMI in previous research usually revealed a narrow set of behaviors adopted by top management to support the NPD project. However, this study investigated four different aspects of TMI in NPD projects, consisting of interrelated social and technical activities. While two of them were found to be helpful for project success (i.e., providing active motivation and resources), two of them appeared to be less helpful and even potentially “meddling” (i.e., guidance) or over-indulgent (i.e., tolerant climate). These findings suggest that the most beneficial way in which top management might be involved in NPD projects is through providing motivational support to the NPD team.

Our study specifically identifies the kinds of motivation that might have this positive impact. We make a distinct contribution regarding why top managers get involved in NPD projects, considering both technical (e.g., strategic importance) and social effects (e.g., extrinsic and intrinsic relevance). There have been very few studies in NPD literature that explicitly set out to investigate the factors related to the project setting which influence the TMI in NPD projects (cf. Green 1995 for an exception). This study has found that in addition to the task related factors (e.g., strategic importance), concepts borrowed from human behavior and involvement literature (e.g., intrinsic and extrinsic relevance) also help to explain the involvement of top management in NPD at a project level. Further, Benabou and Tirole (2003) show that external motivators such as project-level drivers improve performance with a weak effect and only in the short run and might have negative effect in the long run. Our study provides further evidence for this weak effect in the short run.

In the NPD literature, direct communication between top management and the NPD team has not been investigated in detail. Top management is usually seen as having indirect communication with NPD teams (e.g., via documents), especially in large firms. Contrary to this common belief, this study provides evidence that organic communication (i.e., both-ways, continuous, and informal) between top management and the NPD team increases the team's perception of TMI and contributes to completing the project on time and budget.

With regard to implications from a social-technical systems perspective, in terms of improving the balance between technical and social aspects of work, we find that top managers get involved in strategically important projects regardless of the newness of the new product. This is good news as teams working on minor product improvement projects are still likely to gain benefits from TMI if the projects they are working on are strategically important for the firm. With respect to social aspects, top managers get involved by actively motivating and providing resources to an NPD team if they believe that they will contribute positively, gain valuable experiences, and be proud of the product being developed. In fact, they shy away from getting involved due to the self-centered motivation of furthering their career within and outside the firm. It is very encouraging to see that top managers are not acting selfishly, but instead are putting firm strategy first.

Managerial Implications

Our findings demonstrate that when a project is important to the future of the firm, senior managers will become more involved and that this involvement is largely beneficial to project outcomes. Although projects which evoke internally-driven personal interest from senior managers may result in a degree of TMI, the strategic importance of the project has a greater influence. In other words, top management seem to be able to put aside the things they 'like' and focus instead on what is important to the firm. This highlights the importance strategic clarity, regarding the firm's project portfolio.

We also examined the important, but multi-faceted communication boundary between top management and NPD team. In particular, it is evident that when top management communicates in an open way with the NPD team, then critical issues are more likely to be shared as they arise and problems are more likely to be solved early. As a result, the team is more likely to complete the project on time and on budget.

For senior executives, this study has demonstrated that active involvement in NPD at the project level (and not just the program or portfolio level) is essential. For many senior managers, this might mean paying greater detail to the operational issues of NPD as well as the strategic ones (e.g., portfolio management, product strategy). To contribute to success (budget and schedule adherence, product quality), top managers must actively motivate and ensure that suitable resources are provided. Senior managers also play a critical role in building organizational support, stimulating communication, reviewing progress and encouraging teamwork.

However, it is possible for this involvement to become over-bearing and detrimental. Our data shows that too much involvement in planning, guiding, direction setting and securing help can have a negative impact on measures of project success. We interpret this as a strong message from the NPD team that ‘meddling’ or ‘interference’ is not always welcome. Too much attention from senior management might also have the negative consequence of changing project priorities and goals; or ‘moving the goalposts’. Additionally, if top management gives the NPD team too much freedom and provides too relaxed an atmosphere, then the team may be less driven to achieve. Instead of expressing explicit tolerance for mistakes, we suggest that top management maintain high performance expectations, but familiarize themselves with the project conditions so that they have lesser risk perception and demand for excessive documents.

Limitations and Future Research Directions

Complex concepts such as involvement are inherently difficult to measure directly; therefore, researchers usually measure them with multiple perceptual questions in the belief that the collective set of questions better represent the concept than any single question. In fact, the theoretical and practical value of using multiple questions to measure concepts is well acknowledged in literature (e.g., Hair et al. 2010). While this study also uses multiple perceptual questions to measure all the main constructs, in future research, using objective measures (e.g., archival data) for less complex constructs (e.g., project success) may also generate some interesting results. However, reluctance from firms to share confidential data of this type means that this is not always practicable (e.g., Olson et al. 1995).

Data for this study was collected from two key informants: a representative of top management and a representative of the NPD team. Great care was taken to identify the most relevant and knowledgeable informants and to control informant reliability. However, we acknowledge that in an ideal world, data would have been collected from *all* members of top management and *all* members of the core team. However, this was felt to be impractical. Indeed, the challenges of collecting data from two informants per firm meant that it was exceptionally difficult to recruit participating firms. This influenced the overall size of the data set and we acknowledge that an even larger sample (>200 firms) would be advantageous. Such a sample would then enable the use of a covariance-based SEM approach in addition to the PLS-based SEM approach used. It is worth noting that there may be a source of potential bias with respect to informants. The project managers responding were recommended by senior managers. As such, personal relationships and affinity between them might have played a role when the senior manager chose the project to draw upon for the study. That said, we expect this to be minimal for two reasons. First, the survey required the senior managers to choose an NPD project that has been fully completed within the last three years. This requirement restricted the number of projects senior managers could choose from.

Second, senior managers choosing the NPD project and the corresponding project manager would have not been aware of the specific questions comprising the second part of the survey. Lastly, to keep the study at reasonable length to avoid respondent fatigue, the survey did not ask for respondents' years of experience at the firm or biological age. This may have introduced bias linked to engagement, motivation, and perceptions of the firm's work climate.

All responding firms were sampled from UK-based manufacturing firms. This may limit the generalizability of the findings to other countries and industries (Cash et al., 2022). We thus acknowledge potential effects on external validity arising from this combination of random and non-random sampling. Future studies may replicate or modify this study in other countries or other industry sectors, such as service industries.

In this study, no clear association between product innovativeness and TMI was observed. In many previous studies, "innovativeness" has been found not to affect the dependent construct(s), but was a significant moderator (e.g., Schultz et al. 2013, Swink 2000). Hence, future research may investigate the moderating role of product innovativeness on the relationship between drivers and TMI or TMI and project success.

Furthermore, Carson et al. (2012) makes a distinction between two types of environmental uncertainty, namely, ambiguity (aka complexity) and volatility. Here, borrowing from Daft and Macintosh (1981), Carson et al (2012, pg. 1063) define ambiguity as the "extent to which environmental signals are open to multiple, seemingly accurate interpretations" and based on Glazer and Weiss (1993), volatility as "the frequency and magnitude of unanticipated changes in the task environment over time" (Carson et al 2012, pg. 1063). They show that ambiguity, not volatility, plays a significant role in determining the level of TMI. Accordingly, future research can examine the moderating effects of the two

types of environmental ambiguity on the relationship between the drivers and involvement of top management in NPD projects.

There is growing literature examining the role of top management and middle management similarity in professional characteristics (e.g., functional background and educational level) and bio-demographic characteristics (e.g., age and gender) on management of innovation (e.g., Heyden et al. 2018). In a similar vein, we encourage scholars to include these variables and calculate 'similarity' when examining the effect of social and technical drivers of TMI. For example, greater personal similarity between the top management team and the NPD team leader may increase organic communication and help mitigate the negative effect of extrinsic personal relevance on TMI.

We included product quality as a performance outcome of a new product project, specifically related to the product developed. Future studies can include other product-related performance variables in their studies of TMI's effects on NPD performance. For example, Nakata et al. (2017) find that TMI significantly influences new product creativity dimensions, namely, meaningfulness and novelty, which in turn influence market performance. Building on these results, scholars can examine the influence of guidance, active motivation, resources, and tolerant climate on new product creativity. Our results showed that top managers cultivating a tolerant climate hinders product quality, but future research can expect to find tolerant climate to enhance the novelty and meaningfulness of new products developed.

Finally, scholars can examine the effect of relevance in more detail. Priniski et al. (2018) describe three types of relevance: personal association, personal usefulness, and personal identification. We expect that stronger relationships can be found between relevance as 'personal usefulness' and 'personal identification' compared to 'personal association'. That way, scholars might be able to find positive associations between relevance and TMI

1
2
3 instead of our findings which were either marginally significant or significant in the opposite
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5 direction.

6 7 **CONCLUSION**

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10 This study examined top management involvement and its impact on project success.
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12 More specifically, it detailed the impact of technical and social drivers on project
13
14 performance as well as the impact of the nature or communication on top management
15
16 involvement. Using data from representatives of top management and the project team, we
17
18 examined why top managers might be involved in NPD and how this influences the different
19
20 types of TMI. We also examined how the different types of TMI influence project success.
21
22 By considering the technical and social drivers, the types, and the effects of TMI, we provide
23
24 a more complete picture about this complex phenomenon. For example, a technical driver,
25
26 strategic importance of the project, is the most significant driver of TMI, more so than the
27
28 social driver of 'personal interest'. Project success is more likely when senior management
29
30 communicates in an organic manner with the NPD project team. Of the four TMI types
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32 examined, only providing active motivation and resources enhance performance, while the
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34 other two, providing guidance and creating a tolerant atmosphere, have negative effects. In
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36 conclusion, the right type of TMI may contribute to success. On the contrary, the wrong type
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38 of involvement may have detrimental effect. As a result, it is evident that senior managers
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40 must walk a 'managerial tightrope' when it comes to involvement in NPD. They should
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42 provide support, motivation, and guidance whilst not interfering or controlling.
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Author accepted/in press manuscript from 8.8.2022. Please cite article as:
 Felekoglu, Burcu; Durmusoglu, Serdar; Maier, Anja; Moultrie, James (Accepted 2022): Walking the Managerial
 Tightrope: Executive Involvement in Product Innovation Projects. European Journal of Innovation Management.

Figure 1. Social and Technical Drivers influencing Top Management Involvement (TMI) in New Product Development (NPD)

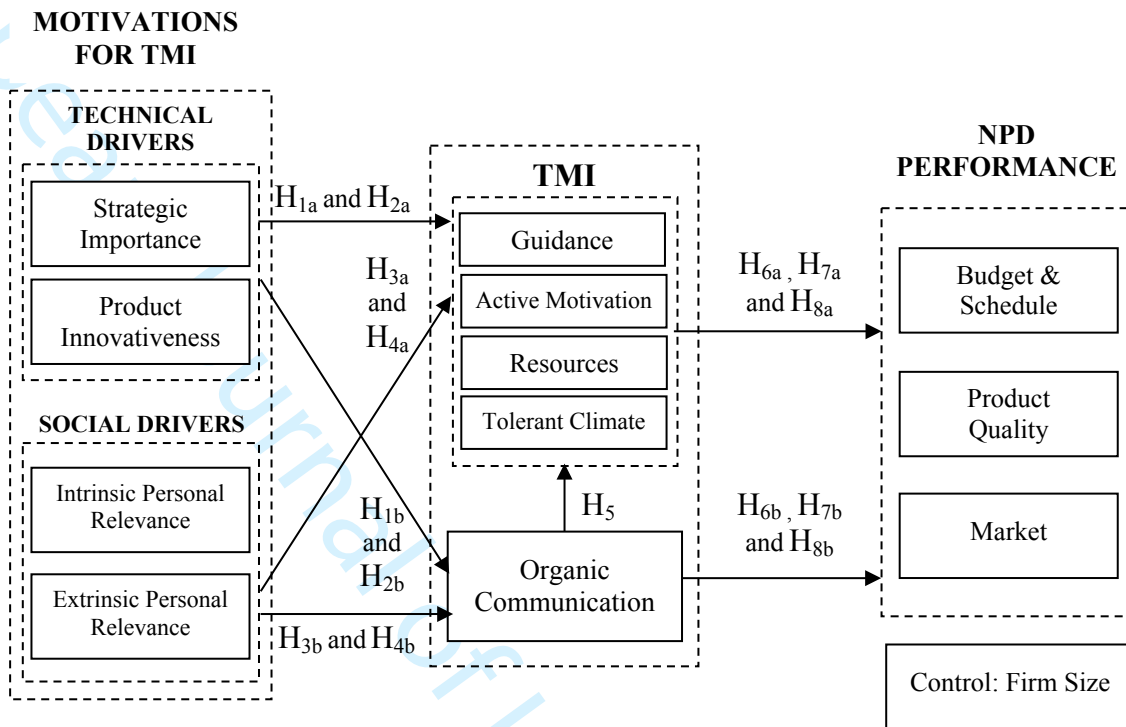
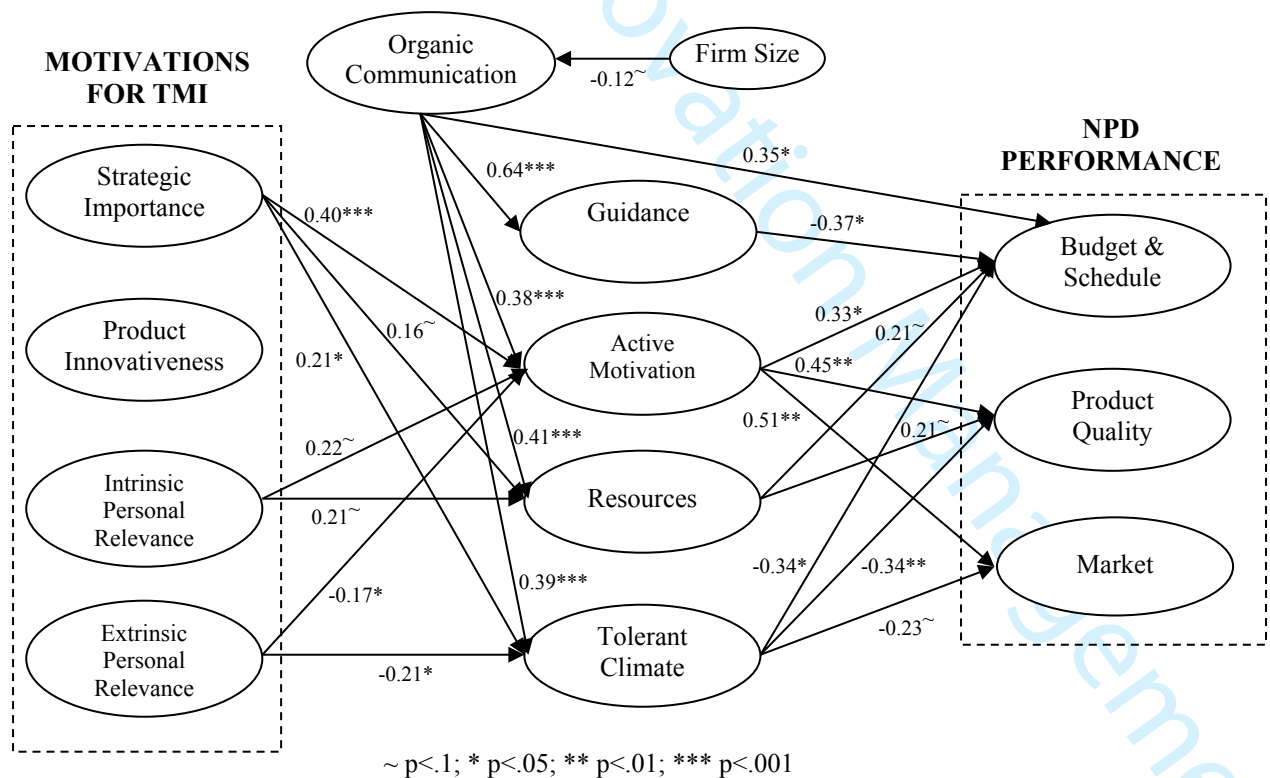


Figure 2. Estimated Model for TMI in NPD (only significant links are included)



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Table 1. Responding Firms' Characteristics

Characteristic	Categories	Number of Firms	%
Industry breakdown	• Industrial equipment and machinery	27	31.8
	• High-tech	25	29.4
	• Chemicals, pharmaceuticals, biotech and medical	11	12.9
	• Consumer products	12	14.1
	• Aerospace and automotive	7	8.3
	• Others	3	3.5
Firm type	• SME (< 250 full-time employees)	64	75
	• Large (≥ 250 full-time employees)	22	25
Annual firm sales	• < £10 million	38	45
	• ≥ £10 million	48	55

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Table 2. PLS-based SEM Results for the Measurement Model

Construct Name	Items	Std. Factor Loadings	t-value*	AVE	CR	C's Alpha
Strategic Importance (New scale) [Informants: Senior Managers]	This project was strategically important to our company	.71	5.51	.49	.79	.68
	This project was closely aligned with our new product strategy	.56	3.33			
	This project provided an important opportunity to improve our company's competitive advantage	.73	5.98			
	This project was critical for the future growth of our company	.78	5.82			
Product Innovativeness (from Olson et al. 1995) [Informants: Senior Managers]	High quality technical innovations were introduced during the development of this product	.82	5.64	.63	.87	.81
	Compared to similar products developed by our competitors, our product offered unique features/attributes/benefits to the customers	.87	6.39			
	Our product introduced many completely new features to this class of products	.87	5.93			
	Compared to similar products developed by our organization, our product offered unique features/attributes	.57	2.85			
Extrinsic Personal Relevance (New scale) [Informants: Senior Managers]	I knew that the success of this project was important for my progression within the company	.83	4.79	.74	.90	.83
	I believed that if this project was successful, it would raise my reputation within our company	.94	9.03			
	I believed that if this project was successful, it would raise my reputation outside our company	.80	4.77			
Intrinsic Personal Relevance (New scale) [Informants: Senior Managers]	I thought my previous experience would be useful in this project	.88	3.86	.61	.81	.73
	I thought this project would give me valuable new experiences	.42	1.34			
	I thought I would feel proud about being part of this project	.93	4.40			
Guidance (from Felekoglu and Moultrie 2013) [Informants: Project Managers]	Top management set a clear direction to the project team	.77	11.90	.54	.85	.79
	Top management determined the relative priority of this project	.76	12.15			
	Top management had an active role in <u>strategic planning</u> ¹ of the project	.66	7.17			
	Top management was available to secure help for the project from outside the company when needed	.69	9.72			
	Top management was available to guide the project team to respond to unexpected events or deal with <u>unforeseen contingencies</u> when needed	.79	21.00			
Active Motivation (from Felekoglu and Moultrie 2013) [Informants: Project Managers]	Top management <u>actively reviewed</u> ² the progress of the project in light of changes to plans, commitments or objectives	.78	14.03	.65	.88	.82
	Top management played an active role in building support for the project within the company	.82	21.19			
	TM provided an organizational setting for the project team which stimulated communication among team members	.80	15.45			

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	Top management encouraged teamwork between functional groups (e.g., R&D and Marketing)	.82	16.69			
Resources (from Felekoglu and Moultrie 2013) [Informants: Project Managers]	Top management provided sufficient financial resources to the project	.67	7.10	.61	.82	.68
	Top management allocated appropriate physical resources (e.g., facilities, rooms, equipment) to the project	.86	14.96			
	Top management assigned appropriate people to the key roles of the project	.79	11.02			
Tolerant Climate (from Felekoglu and Moultrie 2013) [Informants: Project Managers]	Top management was prepared to accept occasional failures as a natural part of new product development	.87	16.84	.83	.91	.80
	Top management created an atmosphere where the project team was free to raise questions or concerns	.95	44.05			
Organic Communication (New scale) [Informants: Project Managers]	Continuity of communication	.82	16.17	.63	.84	.72
	Informality of communication	.73	6.81			
	Bidirectionality of communication	.83	20.80			
Budget/ Schedule Performance (from Rodríguez -Escudero et al. 2010) [Informants: Senior Managers]	The project team made efficient use of its time	.78	6.99	.65	.88	.83
	The product was launched on time	.77	6.87			
	The project team did a good job adhering to its budget	.84	14.36			
	The project team did a good job of meeting all of its schedule deadlines	.84	9.29			
Product Quality Performance (from Rodríguez -Escudero et al. 2010) [Informants: Senior Managers]	The product was more reliable than competing products available to the customer	.71	8.47	.56	.90	.87
	The product's performance met our expectations	.75	7.13			
	The product's quality met our expectations	.83	16.53			
	The product had a good post-purchase service	.75	9.61			
	The product was superior to competing products available to the customer	.67	5.30			
	Our clients/customers were satisfied with this product	.80	16.30			
	The product offered an important competitive advantage	.72	6.38			
Market Performance (from Rodríguez -Escudero et al. 2010) [Informants: Senior Managers]	The product met sales expectations	.91	11.44	.75	.90	.83
	The product met market share expectations	.90	9.66			
	The product met return on investment expectations	.77	6.00			

* These t-values were obtained with a bootstrapping of n=500 and they are all significant at the 0.001 significance level ($t_{critical} = 3.106645$, for $p=0.001$, $df=499$, one-tailed)

¹ Strategic planning entails setting the critical milestones for evaluation, determining the flow of activities and identifying the timing of key events

² 'Actively reviewed' means that they took actions as a result of reviewing

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Table 3. Descriptive Statistics, Correlation Matrix, and The Square Root of Average Variance Extracted (AVE) Values for the Study Constructs

	1	2	3	4	5	6	7	8	9	10	11	12
1. Strategic Importance	<i>.70</i>											
2. Product Innovativeness	<i>.35***</i>	<i>.79</i>										
3. Extrinsic Personal Relevance	<i>.22*</i>	<i>.13</i>	<i>.86</i>									
4. Intrinsic Personal Relevance	<i>.21~</i>	<i>.15</i>	<i>.47***</i>	<i>.78</i>								
5. Guidance	<i>.22*</i>	<i>.08</i>	<i>.18</i>	<i>.11</i>	<i>.74</i>							
6. Active Motivation	<i>.49***</i>	<i>.27*</i>	<i>.07</i>	<i>.26*</i>	<i>.50***</i>	<i>.81</i>						
7. Resources	<i>.26*</i>	<i>.19~</i>	<i>.09</i>	<i>.24*</i>	<i>.37***</i>	<i>.66***</i>	<i>.78</i>					
8. Tolerant Climate	<i>.25*</i>	<i>.16</i>	<i>-.09</i>	<i>.02</i>	<i>.25*</i>	<i>.65***</i>	<i>.52***</i>	<i>.91</i>				
9. Organic Communication	<i>.12</i>	<i>.04</i>	<i>.10</i>	<i>.06</i>	<i>.66***</i>	<i>.43***</i>	<i>.43***</i>	<i>.40***</i>	<i>.80</i>			
10. Budget/Schedule Performance	<i>-.07</i>	<i>.04</i>	<i>.22*</i>	<i>.36***</i>	<i>.02</i>	<i>.21*</i>	<i>.27*</i>	<i>.03</i>	<i>.20~</i>	<i>.81</i>		
11. Product Quality Performance	<i>.27*</i>	<i>.47***</i>	<i>.14</i>	<i>.26*</i>	<i>.15</i>	<i>.35***</i>	<i>.34**</i>	<i>.09</i>	<i>.20~</i>	<i>.45***</i>	<i>.75</i>	
12. Market Performance	<i>.39***</i>	<i>.37***</i>	<i>.29**</i>	<i>.19~</i>	<i>.07</i>	<i>.26*</i>	<i>.11</i>	<i>.03</i>	<i>.02</i>	<i>.33**</i>	<i>.54***</i>	<i>.86</i>
Mean	4.19	4.01	3.17	4.00	3.72	3.77	3.88	4.00	3.89	3.27	3.85	3.47
Standard Deviation	.58	.68	.94	.70	.65	.72	.64	.85	.46	.84	.68	.88

Note: *Italicized values are the square root of the AVE values for their respective constructs.*

~ p<.1

* p<.05

** p<.01

*** p<.001

Table 4. Estimated Coefficients for the Hypothesized Relationships

Hyp.	Hypothesized Relationships (all positive)	Coef. (β)	t-value	Sig.	Conclusion		
H_{1a}	Strategic Importance →	Guidance	.12	1.09	NS		
		Active Motivation	.40	4.02	***	Supported	
		Resources	.16	1.32	~	Supported	
		Tolerant Climate	.21	1.91	*	Supported	
H_{2a}	Product Innovativeness →	Guidance	.00	.00	NS		
		Active Motivation	.11	1.15	NS		
		Resources	.10	.89	NS		
		Tolerant Climate	.09	.88	NS		
H_{3a}	Intrinsic personal relevance →	Guidance	.01	.13	NS		
		Active Motivation	.22	1.49	~	Supported	
		Resources	.21	1.56	~	Supported	
		Tolerant Climate	.03	.27	NS		
H_{4a}	Extrinsic personal relevance →	Guidance	.08	.80	NS		
		Active Motivation	-.17	1.74	*	Opposite Effect	
		Resources	-.10	.80	NS		
		Tolerant Climate	-.21	1.67	*	Opposite Effect	
H₅	Organic Communication →	Guidance	.64	9.81	***	Supported	
		Active Motivation	.38	4.54	***	Supported	
		Resources	.41	4.47	***	Supported	
		Tolerant Climate	.39	4.49	***	Supported	
H_{1b}	Strategic Importance	→ Organic Communication	.10	.89	NS		
H_{2b}	Product Innovativeness		-.01	.05	NS		
H_{3b}	Intrinsic personal relevance		.02	.14	NS		
H_{4b}	Extrinsic personal relevance		.07	.56	NS		
H_{6a}	Guidance	→ Budget/Schedule Performance	Active Motivation	-.37	2.11	*	Opposite Effect
			Resources	.33	1.84	*	Supported
			Tolerant Climate	.21	1.30	~	Supported
			Active Motivation	-.34	2.12	*	Opposite Effect
H_{7a}	Guidance	→ Product Quality Performance	Active Motivation	-.18	.81	NS	
			Resources	.45	2.73	**	Supported
			Tolerant Climate	.21	1.45	~	Supported
			Active Motivation	-.34	2.49	**	Opposite Effect
H_{8a}	Guidance	→ Market Performance	Active Motivation	-.09	.48	NS	
			Resources	.51	2.52	**	Supported
			Tolerant Climate	-.06	.37	NS	
			Active Motivation	-.23	1.49	~	Opposite Effect
H_{6b}	Organic Communication →	Budget/Schedule Performance	.35	2.26	*	Supported	
H_{7b}		Product Quality Performance	.16	.89	NS		
H_{8b}		Market Performance	-.02	.12	NS		
Control Variable	Firm Size →	Organic Communication	-.12	1.85	^	Negative Effect	
		Budget/Schedule Performance	.05	.65	NS		
		Product Quality Performance	-.02	.17	NS		
		Market Performance	.04	.25	NS		

~ p < .1, one-tailed ^ p < .1, two-tailed ** p < .01, one-tailed NS: Not Significant
 * p < .05, one-tailed ^^ p < .05, two-tailed *** p < .001, one-tailed