The moderating effects of job design on human capital and NPD performance
Evidence from high-technology MNCs in Thailand

Sujinda Popaitoon
Department of Management,
Mahasarakham University, Maha Sarakham, Thailand

Abstract
Purpose – In response to calls for the extension of job design research for the strategic team particularly in high-velocity environment, the purpose of this paper is to investigate the moderating roles of job design in the relationships between project team viewed as human capital resources and new product development (NPD) performance in the short and long run. Based on survey data from 117 NPD project teams in high-technology multinational companies (MNCs) in Thailand, this research finds that job design (i.e. autonomous, task identity and feedback) moderates the effects of human capital resources on NPD project success. In addition, job design works in concert with human capital resources to affect managing NPD project-to-project in the long run. Designing jobs by providing autonomy, identity and feedbacks could trigger the stronger contribution not only for fostering knowledge creation in the NPD project team, but also encouraging intrinsic motivation to commit extra effort to achieve NPD goals. This research contributes to the job design literature of how job design works for NPD project team to achieve short-and long-run NPD performance. Implications for these results are discussed.
Design/methodology/approach – Based on survey data from 117 NPD projects in high-technology MNCs in Thailand, this research uses hierarchical regression to do analyses.
Findings – This research finds that job design (i.e. autonomous, task identity and feedback) moderates the effects of human capital resources on the short-run project performance. In addition, job design works in concert with human capital resources to affect managing project-to-project in the long run.
Research limitations/implications – This research contributes to the job design literature of how job design works for NPD project team to achieve short-and long-run NPD performance.
Originality/value – Investigating the moderating roles of job design in the relationship between human capital resources and NPD performance in the short and long run.
Keywords NPD performance, Human resource management, Job design, High-technology MNCs, Short-and long-run performance
Paper type Research paper

1. Introduction
The success of new product development (NPD) projects is widely accepted as a crucial source of competitiveness of multinational companies (MNCs) particularly in the high-technology industry (Wheelwright and Clark, 1992). In the literature, many scholars have paid more attention to NPD success not only in the short run, referring to project completion, but also in the long run, referring to the potential created by the project for future projects (e.g. Popaitoon and Siengthai, 2014; Shenhar et al., 1997). Amabile and Pratt (2016, p. 160) explain that “the basic raw materials, the basis for any creative performance, are skills in the task domain, technical skills for doing work and advancing one’s knowledge in the domain.” In other words,
NPD project team’s skills and knowledge viewed as human capital resources are crucial to enhance project productivity and add value for both current NPD project and future services (e.g. Ployhart et al., 2014). However, scholars point out that two important factors impacting on NPD project performance comprise not only human capital resources reflecting on a project team’s skills and knowledge but also their internal mechanism (e.g. Subramaniam and Younutt, 2005; Wheelwright and Clark, 1992). Previous studies show that HRM practices facilitate the internal mechanism of sharing and integrating project team knowledge to related innovation outcomes (e.g. Minbaeva, 2008; Popaitoon and Popaitoon, 2016; Popaitoon and Siengthai, 2014). However, job design, one of the HRM practices, is scant particularly in the NPD context particularly in the strategic unit such as NPD team (e.g. Grant et al., 2010; Oldham and Hackman, 2010).

From the job design literature, research into team effectiveness has typically been concerned with the impact of the team’s overall task and performance, such as the extent of team autonomy, task identity, and feedback on the perception of team members (e.g. Foss et al., 2009, 2015). In the context of NPD, job design significantly matters to knowledge-sharing motivation (e.g. Foss et al., 2015). Particularly, the well-job design can trigger intrinsically motivated individuals to seek higher levels of challenge and to prefer novelty necessary for NPD success (Amabile and Pratt, 2016; Dewett, 2007). However, recently, Oldham and Hackman (2010) have pointed out that current theory of job design still do not reflect the impact of the dramatic work changes (e.g. self-managed team interdependence) and the long-run outcomes in the high-technology firms (Foss et al., 2015).

Taken together, this research responds to the call for research on job design in the dynamic context of the high-technology MNCs (Amabile and Pratt, 2016; Foss et al., 2015; Oldham and Hackman, 2010). The research objective is to investigate the moderating effects of job design in the relationship between human capital resources and NPD performance in the short- and long-run performance. This research contributes to the job design literature by: investigating the extent to which the NPD short- and long-run performance variance of human capital resources could be influenced by well job design for project team; and exploring the moderating roles of job design in these relationships. The following sections review the relevant literature and develop a set of hypotheses (as shown in Figure 1). After outlining the research methodology, the empirical findings are described and discussed by providing implications of these findings on both theory and practice.

2. Literature review

2.1 NPD performance of high-technology MNCs in Thailand

The target organizations are high-technology MNCs in both industries of service and electronic and electricity (E&E) in Thailand. According to the Thailand Board of Investment (2010), these MNC manufacturers have recently established regional research and
development (R&D) hubs and expanded production capacity through regional networks. When the advanced technology of MNC headquarters is influenced by global standards, the local subsidiaries need to adjust themselves in line with the policy of MNC headquarters, particularly in advancing production technology and innovation. As such, the target organizations have received an intensive transfer of knowledge from their MNC headquarters with a great deal in R&D for new product development (NPD) for both of industries – service (e.g. telecommunication, pharmaceutical, information technology, oil and gas, and other related service industry) and electronic and electricity (e.g. semiconductor, hard disk, etc.). In line with Makri et al. (2006) and Milkovich (1987), these MNCs in both selected industries are viewed as high-technology companies that use a significant percentage of their financial resources to R&D and employ advanced technology to developing new products.

In the context of high-technology MNCs in Thailand, NPD performance refers to the knowledge transfer effectiveness from MNC headquarters to their subsidiaries in Thailand, and be materialized in terms of NPD that MNCs often prepare a series of subsequent related NPD projects (Gupta and Govindarajan, 2000; Shenhar, 2001). Hence, many scholars have paid more attention to managing NPD project-to-projects, in which the knowledge earned from one project could be transferred successfully to the next relevant projects within the series of NPD projects (Keegan and Turner, 2001). Accordingly, Shenhar et al. (1997) have provided a meaningful distinction between NPD project performance in the short-and long run. Short-run NPD performance refers to NPD project completion measured using the time-cost-quality triangle at the desired level (e.g. Brueller and Carmeli, 2011). Long-run NPD performance refers to the potential created by the current project for future projects (Shenhar et al., 1997). In this research, these short-and long-run NPD measures are analogous to the nature of sequential NPD projects in which MNCs often retain core project team viewed as human capital resources from previous NPD successful project to serve on future successor projects (Keegan and Turner, 2001).

2.2 Human capital resources
The notion of human capital originated from economic theory (e.g. Parnes, 1984). Parnes (1984, p. 32) explains that human capital refers to the productive capabilities of human beings. More specifically, human capital embraces the abilities and know-how that have been acquired at some cost and that can command a price in the labor market because they are useful in the productive process. Clearly, skills and knowledge reflecting on people viewed as human capital not only provide firm productivity but also add firm value for performing assignments and future services. This concept has been applied in the HRM literature (e.g. Lepak and Snell, 1999). Recently, Ployhart et al. (2014, p. 374) coined the term “human capital” to refer to “human capital resources” that are “unit-level (team) capacities based on individual KASOCs, comprising Knowledge, Abilities, Skills, and Other related characteristics, that are accessible for unit-relevant purposes.” Taken together, in this study, human capital resources refer to a project team who perform significantly better than others in way that are meaningful for NPD outcomes, assigned to implement knowledge transferred from headquarters to local subsidiaries for developing sequential NPD projects (adapted from Ployhart et al., 2014).

In NPD team working, scholars such as Nonaka and Takeuchi (1995) have proposed the knowledge conversion process to explain how people’s tacit, indwelling knowledge can be transferable through the process of socialization or teamwork (Polanyi, 1966). Consistently, Grant (1996) has argued that the effectiveness of knowledge transfer depends on the potential for the knowledge to aggregate and involve both transmission and receipt. In other words, these discussions suggest that two important factors impacting NPD performance of knowledge transfer in MNCs comprise not only human capital resources reflecting their capability but also their internal mechanism reflecting their knowledge sharing and creation
Previous studies show that HRM practices facilitate the internal mechanism of sharing and integrating NPD team knowledge (Kase et al., 2009; Popaitoon and Siengthai, 2014). However, job design, one of the HRM practices, enhances not only NPD teamwork mechanism but also their intrinsic motivation that is scant in the literature (e.g. Grant et al., 2010; Oldham and Hackman, 2010). Accordingly, this research has paid more attention to the important role of job design for driving NPD success.

2.3 Job design

The concept of job design has emerged in response to the extension of scientific management (SM). The key principle of SM is job simplification, whereby workers perform only routine and repetitive work. However, the negative results of job simplification, such as job dissatisfaction and turnover, have raised scholars’ interest in redesigning work to motivate workers (Herzberg, 1966). In the literature of organizational behavior (OB), Hackman and Oldham (1976) developed the idea of job design regarding the job characteristics model that work should be designed to have core job characteristics such as task identity, autonomy and feedbacks which engender three critical psychological states in employees in terms of comprehending work meaningfulness, feeling responsible for outcomes and understanding the results of their efforts. Particularly, these psychological states can enhance employees’ intrinsic motivation, referring to the motivational state in which individuals are attracted to their work itself, for their desired outcomes (e.g. Deci and Ryan, 1985; Dewett, 2007). Based on Humphrey et al.’s (2007) meta-analysis, the positive link between job design and performance is well established particularly in the context of manufacturing labors.

However, by the 1980s, when Oldham and Hackman were doing research on job design, organizational work was organized as a linked set of fixed jobs performed by individuals who worked mostly independently. Additionally, it was supposed to be run from the top down assuming that many employees have neither the competence nor the commitment for carrying out the work on their own (Hackman and Oldham, 1980, pp. 268-269). It can be seen clearly that recently organization has been altered to flexible jobs in response to high-velocity environments performed by line managers who make better ways of serving clients and creating innovation. Hence, Oldham and Hackman (2010) have pointed out that the current theory of job design (1976) still does not reflect the impact of dramatic changes of work environment over a few decades. This leads to key scholars in OB and HRM (Becker and Huselid, 2010; Grant et al., 2010; Oldham and Hackman, 2010) to revise the job design concept in new theoretical directions for new contexts of study that highlight the importance of changes in the nature of work from manufacturing to service (e.g. high-tech firms), the extension to strategic teams/units (e.g. NPD teams, knowledge teams) and the explanation of how job design plays a critical role of enhancing sustained competition.

Based on previous studies in the related NPD context, Foss et al. (2009) find that job design (i.e. autonomy, task identity and feedback) significantly matters to knowledge-sharing motivation, particularly for knowledge workers. In this study, adapted from Foss et al. (2009), autonomy concerns whether the assigned project gives the project team the opportunity to decide when and how to carry out specific tasks. Task identity refers to the degree to which the assigned project gives the project team the opportunity to undertake project tasks from beginning to end. Feedback refers to the degree to which the project team receives direct and clear information about team performance as the person carries out the job tasks. These job design characteristics (i.e. autonomy, task identity and feedback) can stimulate knowledge-sharing behavior in the human capital team to affect knowledge transfer effectiveness (e.g. Cabrera and Cabrera, 2005; Foss et al., 2009). This explanation is relevant to the socio-technical systems theory that explains significant insights between technical perspectives of the project itself and the social networks in which the project is done.
(e.g. Emery and Trist, 1965); it develops the concept of the “autonomous work group,” in which project members share among themselves much of the decision-making from the beginning to the end (e.g. Huemann et al., 2007). However, previous studies still do not explain how job design plays a critical role in enhancing project team working and sustained competition (Foss et al., 2009, 2015). Taken together, in response to these calls, this research explains NPD performance (adapted from Shenhar et al., 1997) resulting from the level of human capital resources (adapted from Ployhart et al., 2014) and job design (adapted from Foss et al., 2009), particularly when job design plays a moderating role in strengthening the relationships between human capital resources and NPD performance in the short and long run.

2.4 Job design, human capital resources, and NPD performance

As discussed in previous sections, human capital resources refer to the skills and abilities of the NPD project team as the stock of knowledge particularly the tacit knowledge for developing new products. The tacit knowledge held by a project member must be passed along to others for fostering knowledge flows through the NPD team (Nonaka and Takeuchi, 1995). Accordingly, scholars point out that designing work/jobs (i.e. autonomy, task identity and feedbacks) around the project team gives project members the opportunity to work closely with others and encourage knowledge sharing; especially, given that higher levels of interaction are necessary to work together to achieve common goals (Cabrera and Cabrera, 2005; Humphrey et al., 2007; Lysova et al., 2019).

Moreover, to achieve NPD goals, the NPD team needs a high level of motivation particularly intrinsic motivation among its members to face a broad range of uncertainties and work pressure (Dewett, 2007; Zhao and Chadwick, 2014). The job characteristic model argues for the importance of high levels of autonomy, task identity and feedbacks for the individual experiences of work meaningfulness. These psychological states can enhance intrinsic motivation (Hackman and Oldham, 1976). Lysova et al. (2019) point out that having jobs designed to promote a sense of purpose and positive impact on others correlates with greater experiences of task significance and meaningful work. Consistently, Latham and Pinder (2005) suggest that a high degree of autonomy may stimulate team members toward learning and development. In addition, receiving feedback on the project’s performance is an important element of feeling competent within the project team (Deci et al., 1999). Hence, job design is an important tool not only for fostering knowledge creation in the NPD project team but also for providing autonomy, task identity and feedbacks through which management signals confidence in the team’s competence, encouraging intrinsic motivation and willingness to commit extra effort to achieve NPD goals during work under pressure (Dewett, 2007; Foss et al., 2015; Lysova et al., 2019).

In other words, job design could trigger the stronger contribution of human capital resources to the achievement of the desired knowledge transfer or the short-run NPD performance in this context. Many empirical studies have shown that human capital resources can transform tacit knowledge into explicit knowledge through the outcomes of knowledge transfer effectiveness in terms of new products, new processes, or related innovative outcomes by aggregating the skills and expertise held by project team members and providing the project team with autonomy, identity, and feedback (e.g. Amabile, 1993; Zhao and Chadwick, 2014). Accordingly, I hypothesize the following:

H1. Job design moderates the relationship between human capital resources and short-run NPD performance.

As discussed many scholars have paid more attention to how to manage NPD project-to-project transitions as one of the key criteria for long-term project success (Keegan and Turner, 2001). In the literature, job design can enhance a project team’s knowledge creation by providing
feedback for human capital resources/project teams for their improvements and career development in line with the company’s long-term strategic plan (Keegan et al., 2012). These actions also lead to a higher likelihood of success in future potential projects. In addition, the project team’s autonomy can drive good decision-making by identifying possibilities for change (Cordery et al., 2010). Accordingly, I introduce one further hypothesis:

\[ H2. \text{Job design moderates the relationship between human capital resources and long-run NPD performance.} \]

3. Methods
The survey was based on existing scales in the literature. Experts in the sample companies (e.g. Product Managers, R&D Managers) validated the questions to check for meaning accuracy (Sinaiko and Brislin, 1973). First, the survey was prepared in English and then translated into Thai that a double-blind back-translation process was used (Sinaiko and Brislin, 1973). Then, a pretest with 30 project team leaders was conducted to validate the measures in terms of their clarity and appropriateness to the context of high-technology MNCs particularly in both industries of service and E&E. The reliabilities of all of the measures exceeded 0.70 following the rule of thumb for Cronbach’s \( \alpha \) (Nunnally, 1978).

3.1 Sample and data collection procedures
The population of this study consisted of high-technology MNCs in Thailand obtained a BOI list in both industries of service and E&E located in Bangkok’s peripheral area and eastern economic corridor of innovation. Three criteria were adopted for selecting the companies of the target population: they are multinational companies in services and EE in Thailand viewed as high-technology companies in line with Makri et al. (2006); they should possess an R&D department in Thailand; and they should transfer knowledge from MNC headquarters to their subsidiaries in Thailand that the knowledge transfer is materialized in terms of a series of NPD projects implemented by Thai/local project teams.

In this research, project is defined as a completed NPD project. The projects selected for this survey were implemented during the past three years, and those outcomes were new products or new processes in the market for at least a year (Clark and Fujimoto, 1991). The number of assignments implemented depends on many criteria (e.g. company size, company growth, and economy). As the experts recommended, the number of projects that a company had implemented during the past three years averaged approximately 10. Therefore, project leaders who are considered the best source of information and insights the assignments in this research include engineering managers, product managers and R&D managers.

As discussed about the criteria of high-technology MNCs, however, the unit of analysis is a project/team level. It would be an unmanageable task to identify the number of completed assignments in each MNC. Accordingly, the author sent a packet that includes five copies of the questionnaires. The author posted the survey packet addressed to HR managers to 200 MNCs that meet all three criteria as explained (i.e. 100 MNCs for Service Industry and 100 MNCs for Electronic and Electricity Industry equally). The packet includes a personalized cover letter outlining the nature of the study and its confidential nature. To follow company confidentiality policy, target respondents are identified by HR manager to fill in the questionnaire, particularly those respondents who have worked on a different assignment. Each questionnaire asks two questions to ensure each respondent worked as a project leader and on a different assignment from the same MNC: one is a close-ended question on the role assigned for the assignment (i.e. project leader and project member), and the other is an open-ended question to explain the nature of the selected assignment for this study.

The author distributed the survey packets to 200 MNCs, which yielded responses from 46 MNCs (i.e. 22 MNCs from Service Industry and 24 MNCs from Electronic and...
Electricity Industry) with 124 returned questionnaires. The returned questionnaires were all carefully cross-checked for accuracy of target respondents to clean the collected data. These resulted in 124 returned questionnaires. The author discarded seven anonymous questionnaires that have more than 50 percent incomplete information (Hair et al., 2006), resulting in a total of 117 usable questionnaires for the analysis. Using a sample of 117 knowledge transfer assignments from 46 MNCs, the number of assignments per MNC averaged 2.5. The effective responses and total response rate was 11.7 percent (117 returned to a total of 1,000 copies sent based on 200 MNCs with a packet of 5).

3.2 Sample characteristics
As described in the previous section, the effective responses are 117 NPD projects from 46 MNCs. The characteristics of MNCs wherein the 117 respondents have worked in service industry (53 percent) and E&E industry (47 percent). Most of the organizations are US-owned (37.6 percent), Japanese-owned (24.8 percent), German-owned (11.1 percent), Canada-owned (11.1 percent) and the rest (around 15 percent), respectively. Their mode of entry into Thailand was through foreign direct investment (FDI) (FDI = 87.2 percent) and international joint ventures (IJVs = 12.8 percent). These results are in line with Mudambi et al.’s (2014) study. Mudambi et al. (2014) found that the main feature, particularly the mode of entry that MNCs in both industries adopted, is its FDI, and MNCs have invested in this industry not only as a regional R&D hub but also for an export-led development path. Nearly half of the respondents have had less than three years of experience in prior related assignments in terms of implementing knowledge transfer from headquarters through developing new products and processes in the local subsidiaries, with 23.1 percent (four to six years of prior related experience), with 12 percent (seven to nine years of prior related experience) and 27.4 percent (more than ten years of the experience), respectively. About 60 percent of the selected projects are high in project complexity in terms of developing a new product to deal with a radical change (e.g. medical devices, sensing innovation, biopharmaceutical, etc.), whereas the others focus on the incremental impacts of change or product and process adjustment (e.g. high performance battery). About 57 percent of them indicated that the project duration was around one year, about 35 percent were around one to three years and 7 percent of the sample respondents said their project lasted for more than three years.

3.3 Measures
This research used multi-item measurement scales from previous literature and sought practical views from experts to ensure content validity. Each item rates on a Likert-type scale from 1 (“strongly disagree”) to 7 (“strongly agree”). In line with Popaitoon and Siengthai’s (2014) study, the item scales were validated for a unidimensional construct by using principal component factor analysis, which indicates the Kaiser-Meyer-Olkin values of all measures above the recommend value of 0.60 (Kaiser, 1974), at the 1 percent level of Barlett’s test of Sphericity, which indicates that the data obtained for each construct are appropriate. As presented in Table I, the Cronbach’s $\alpha$ used to assess the internal consistency of all variables was found to be above the acceptable level of 0.70 (Nunnally, 1978).

3.3.1 Dependent variable. This study adopted Brueller and Carmeli’s (2011) measurement of the short-run NPD performance. There are four items – i.e. this project meets its overall performance goals; this project completes its assigned tasks on time; this project achieves high quality performance; and this project achieves its work goals. This study adjusted the wordings from “the team” to “the project” to suit the context of study. For the long-run NPD performance, this study adopted Shenhar et al.’s (1997) measurement with three items – i.e. opened a new market/opportunity; opened a new line of products/projects; and developed a new technology.
<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>3.17</td>
<td>2.95</td>
<td>1.13</td>
<td>2.84</td>
<td>0.47</td>
<td>2.53</td>
<td>1.70</td>
<td>5.45</td>
<td>4.75</td>
<td>5.16</td>
<td>5.18</td>
</tr>
<tr>
<td>SD</td>
<td>1.39</td>
<td>2.30</td>
<td>0.34</td>
<td>1.44</td>
<td>0.50</td>
<td>1.06</td>
<td>0.97</td>
<td>0.94</td>
<td>1.44</td>
<td>0.84</td>
<td>0.96</td>
</tr>
<tr>
<td>1. Prior-related knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. MNC home country</td>
<td>0.006</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Mode of entry</td>
<td>0.045</td>
<td>-0.009</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Project size</td>
<td>0.040</td>
<td>0.252**</td>
<td>-0.117</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Industry</td>
<td>0.119</td>
<td>-0.046</td>
<td>-0.105</td>
<td>0.083</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. NPD project complexity</td>
<td>-0.085</td>
<td>0.180</td>
<td>-0.095</td>
<td>0.029</td>
<td>0.127</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Project duration</td>
<td>0.122*</td>
<td>-0.150</td>
<td>0.038</td>
<td>0.318**</td>
<td>0.204*</td>
<td>-0.021</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Short-run NPD performance</td>
<td>-0.003</td>
<td>-0.183*</td>
<td>-0.067</td>
<td>-0.143</td>
<td>0.095</td>
<td>-0.094</td>
<td>-0.164</td>
<td>80.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Long-run NPD performance</td>
<td>0.123</td>
<td>-0.136</td>
<td>0.002</td>
<td>0.040</td>
<td>-0.088</td>
<td>-0.260**</td>
<td>0.133</td>
<td>0.401***</td>
<td>86.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Human capital resources</td>
<td>0.018</td>
<td>-0.078</td>
<td>0.057</td>
<td>0.025</td>
<td>-0.016</td>
<td>-0.146</td>
<td>0.099</td>
<td>0.388**</td>
<td>0.547**</td>
<td>70.7</td>
<td></td>
</tr>
<tr>
<td>11. Job design</td>
<td>0.102</td>
<td>-0.27**</td>
<td>0.033</td>
<td>-0.085</td>
<td>0.114</td>
<td>0.009</td>
<td>0.188</td>
<td>0.355**</td>
<td>0.379**</td>
<td>0.414**</td>
<td>89.8</td>
</tr>
</tbody>
</table>

Notes: \( n = 117 \). The value of the construct reliability (Cronbach’s \( \alpha \)) appear on cross-diagonal in italics. *, **Significant at 5 and 1 percent levels, respectively (two-tailed)
3.3.2 Independent variables. Human capital resources. Human capital theorists suggest that firms develop people internally when investments in their skills are justifiable in terms of future productivity (Lepak and Snell, 1999; Youndt and Snell, 2004). They are viewed as key persons to contribute to NPD success. Based on Youndt and Snell (2004), there are five items as generators of innovation behavior and closely link to the value of uniqueness of human capital. Human capital resources (five items) compose of: project team are highly skilled; project team are widely considered the best in the industry; project team are creative and bright; project team are experts in their particular jobs and functions; and project team develop new ideas and knowledge. In line with the study of Minbaeva et al. (2003, p. 592), this study adjusted the wordings from “our employees” to “project team” to correspond to the theoretical assumptions and cross-checked for meaning accuracy by experts in the sample companies.

Job design. This study adopted Foss et al.’s (2009) measurement of job design, the nine-item measure of job design examined the process of autonomy (three items) – i.e. the freedom to carry out the job the way project team want to; the opportunity for independent initiative; and high level of variety in jobs for the project. Task identity (three items) comprises of: the opportunity to complete work that project team started; the opportunity to do a project from the beginning to the end; and the opportunity to do the project independently of others. Feedbacks (three items) comprise: formal acknowledgment; performance evaluation; and feedback from my superior on my project performance. This study adjusted some wordings to suit the theoretical assumptions.

3.3.3 Control variables. In order to assess the impact of job design and human capital resources on NPD performance (short-and long-run), this study controlled for the effects of NPD performance. Based on the literature, several factors could be alternate explanations for variance in NPD performance (short-and long-run) comprising prior-related knowledge (e.g. Zahra and George, 2002), MNC home country (e.g. Myloni et al., 2007), mode of entry (e.g. Mudambi et al., 2014), industry (e.g. Gupta and Govindarajan, 2000), NPD project size and complexity (e.g. Chiu and Fogel, 2017; Zander and Kogut, 1995) and project duration (e.g. Bakker et al., 2013; Corderoy et al., 2010). They were dummy coded.

4. Results
This research explores the relationship between job design, human capital resources and NPD performance (short and long run). Table I displays the means, standard deviations, scale reliability estimates and correlations for all of the variables.

4.1 Preliminary analysis
Table II presents a preliminary analysis conducted before the hypotheses testing. I tested the association of job design by comparing the extent to which job design as a whole
Human capital and NPD performance

(see Model 1 and 3) with job design as separation dimensions of autonomy, task identity and feedback (see Model 2 and 4) on short- and long-run NPD performance. Model 1 indicated that job design as a whole is significance on short-run NPD performance, whereas Model 2 indicated that job design testing autonomy, task identity, and feedback are positive relationship but not significance on short-run NPD performance. Also, Model 3 indicated that job design as a whole is significance on long-run NPD performance, whereas Model 4 indicated that job design testing autonomy, task identity, and feedback are positive relationship but not significance on long-run NPD performance. A preliminary analysis is supported by Latham and Pinder’s (2005) argument to recommend testing the job design as a whole; since they point out that each dimension of job design (i.e. autonomy, task identity and feedback) has high correlation each other.

4.2 Job design as a moderator of the relationship between human capital resources and NPD performance (short- and long-run)

To test hypotheses, this study adopt hierarchical regression analysis as suggested by Aiken and West (1991), Hair et al. (2014) and Frazier et al. (2004). According to Frazier et al. (2004), they suggest that researcher can use hierarchical regression analysis to examine moderator effects; particularly, when a moderator variable is continuous. While the use of structural equation modeling (SEM) can be used to examine this interaction, SEM techniques for testing this are complex that there is little consensus regarding which of several approaches is best. Similarly, Hair et al. (2014, p. 117) point out that “neither method is superior to the other overall.” In order to avoid multicollinearity, I follow the concept developed by Aiken and West (1991).

I identified NPD performance as the criteria (see Models 1–3 for short-run NPD performance, and Models 4–6 for long-run NPD performance). I ran a three-step analysis. In the first step, all of the controls were entered. Then, the main effects of job design and human capital resources were tested. Lastly, I analyzed the interaction effects. Following Aiken and West (1991), before creating the interaction terms, the independent variables and moderating variable were mean-centered to mitigate the potential problem of multicollinearity. The maximum VIF within the models was 1.436, well below the rule-of-thumb cut-off of 10, indicating that no serious concerns should be raised about multicollinearity (Hair et al., 2006) (Table III).

The hierarchical regression analyses revealed that job design moderates the relationship between human capital resources and the short-run NPD performance (see Model 3). The interaction coefficient is significant ($\beta = 0.234$ at the 5 percent level, supporting $H1$). However, the interaction coefficient for the relationship between human capital resources and the long-run NPD performance is not significantly different from zero (Model 6). Thus, $H2$ was rejected.

To better explain the interactions found in the hierarchical regression analysis, I provided supplementary analysis (see Table IV) and plotted the interaction effects (see Figures 2 and 3) using one standard deviation above and below the mean to capture high and low levels of job design (Aiken and West, 1991). Table IV explains that each dimension of job design (i.e. autonomy, task identity and feedback) also moderates the relationship between human capital resources and the short-run project performance (see Model 2, Model 4 and Model 6). Figure 2 illustrates this finding for the relative short-run project performance when considering job design as the moderating variable. This indicates that the effect of human capital resources on the short-run project performance is dependent on job design. Accordingly, job design strengthens the relationship between human capital resources and short-run project performance when job design is at a high level. Thus $H1$ is supported.
5. Discussion and conclusion

5.1 Discussion

This research investigates the moderating effect of job design in the relationship between human capital resources and NPD performance in the short- and long-run in the context of high-technology MNCs. Despite some important limitations, this research offers several
insights into the roles of job design for NPD teams in high-technology MNCs. This research contributes to the substantial body of knowledge on the literature of job design in three main ways.

First, this research responds to calls from scholars (Grant et al., 2010; Oldham and Hackman, 2010) for empirical research about job design in high-technology MNCs. These researchers encourage investigation into how job design affects not only short-run NPD performance but also long-run NPD performance; it specifically investigates how job design that strategically focuses on human capital resources, such as the project team, can contribute to NPD project performance. While previous studies such as Foss et al. (2015) find that a three-way interaction in job design, rewards, and work climate impacts knowledge-sharing motivation among knowledge workers, they have paid little attention to the moderating role that job design plays on the relationship between human capital resources and a project’s short- and long-term NPD performance; in this regard, this study has applied job design as a moderator in this relationship.

Second, the research provides insight into the moderating effects of job design (i.e. autonomy, task identity and feedback) to short- and long-term NPD management.
It finds that job design can strengthen the relationship between human capital resources and short-run NPD performance, supporting previous findings in relevant contexts (e.g. Foss et al., 2015). The results support earlier arguments by Subramaniam and Youndt (2005) that the interaction of human capital resources and social capital affects the related innovation performance. This research has also provided empirical support for each dimension of job design (i.e. autonomy, task identity and feedback), which can strengthen the relationship between human capital resources and short-term NPD performance. This echoes Oldham and Hackman (2010), who explain that these job characteristics of autonomy, task identity, and feedback positively influence the sense of meaningfulness. Specifically, the project team’s autonomy is significant for the sense of responsibility (e.g. Foss et al., 2015): task identity positively influences the project team’s opportunity to undertake project tasks from the beginning to the end (e.g. Cordery et al., 2010), and feedbacks affect their knowledge of results and progress of the self-managed team (e.g. Amabile and Pratt, 2016). These psychological states lead to the project team’s intrinsic motivation, which is a primary source of innovation and is critical to the success of NPD projects (e.g. Popaitoon and Popaitoon, 2016; Zhao and Chadwick, 2014).

Third, while job design favorably affects short-term NPD performance, the result also finds that job design does not significantly moderate the relationship between human capital resources and long-term NPD performance. This result suggests that job design can facilitate project-to-project management to work in concert with human capital resources for enhancing potential future projects and long-term NPD performance. This argument is consistent with Bakker et al. (2013) and Cordery et al. (2010), project teams with a short-term project duration focus more on the immediate task than on creating potential future projects and long-run performance. While these psychological states (i.e. autonomy, task identity and feedbacks) are significant to the project team’s intrinsic motivation, Amabile and Pratt (2016) point out that it can appear in a temporary state that needs to motivate a project team continuously over long periods of managing project-to-future projects. These challenges are crucial for implementing an effective job design for long-run NPD performance in project-based organizations such as high-technology companies (Keegan et al., 2018).

5.2 Managerial implications
This research raises important managerial implications for NPD project managers and practitioners. The results suggest that HR policies focusing at increasing the innovative behavior of the NPD project teams should first and foremost focus on enhancing well job design (i.e. autonomy, task identity and feedbacks) for self-managing NPD project teams. It should be aligned vertically with strategy and competitiveness and horizontally from the current NPD project to future projects and services. Accordingly, HR-line-NPD project managers should work together to support NPD teams/practitioners in terms of their attained competencies, career development plans and achievements that are aligned with future projects and services. Particularly, NPD project managers should focus on effective job design (i.e. autonomy, task identity and feedback) to maximize knowledge sharing and knowledge creation among NPD team members. Hence, NPD project managers should promote the project team’s KASOCs, referring to their prior knowledge and experience; this will ready them for their next assignments or future projects by enhancing their positive work climate while undertaking the current NPD project assignment. It will also help the NPD team to focus not only on the short-term but also the long-term NPD performance; moreover, it can help avoid a not-invented-here syndrome situation.
5.3 Limitations and future research

The scope of this study is primarily focused on investigating the impact of human capital resources and NPD performance (short-and long-run) in particular of the moderating roles of job design on this relationship. Apart from these aspects, there might be some other factors that may have an impact of human capital resources and project outcomes. Notwithstanding, this study has some limitations that should be addressed in future research.

First, the study is associated with the use of cross-sectional data. As such, cause–and-effect relationships cannot be definitively inferred from the results and causality can really be tested only with data collected at different points of time (e.g. Wright et al., 2005). Thus, future studies will benefit from the use of longitudinal data to test the effective job design for NPD teamworking in not only different stages of a NPD project but also project-to-future projects to observe how the relationships among these variables develop over time (e.g. Bakker et al., 2013). Also, to broaded cross-sectional data, Becker and Huselid (2010) encourage empirical work on case study research that would be more prescriptive and implications for these new roles of job design in NPD success in high-velocity industry. Second, the survey data is self-reported that may lead to common method bias (Podsakoff et al., 2003). While my tests suggest that no serious concern on the multicollinearity, the variance inflation factor obtained is below the cut-off point (Hair et al., 2006). Accordingly, future studies should attempt to obtain the data from multi-sources (e.g. both a leader and members) to triangulate the data for study results. Third, the data collected from the assignment related to the NPD projects in MNCs should be concerned with the policy of MNC headquarters to those into their subsidiaries (e.g. Myloni et al., 2007) and culture differences that are influenced on different ways of providing NPD team’s autonomy and feedback (Erez, 2010). Fourth, future research should consider that job design based on Hackman and Oldham’s (1980) job characteristic model includes five dimensions (i.e. autonomy, task identity, feedback, skill variety and task significance), while I selected three dimensions of job design to study based on previous studies (Foss et al., 2009), given the most impacts of job design for knowledge workers on related innovation contexts. Accordingly, future studies should include two additional dimensions of job design that could possibly strengthen in the relationship. Fifth, the generalizability of the findings may be limited because the sample was drawn from MNCs in both industries of service and electronic and electricity in Thailand. Future research should attempt to test the conceptual model in other industries’ context as well as in other countries. Finally, Humphrey et al. (2007) and Parker (2014) encourage to test work design rather than job design, since work design concerns with employees’ job design and their broader work environment that might impact not only upon research in practices but also the society in terms of quality of work life and public policy.

5.4 Conclusion

This research investigates the roles of job design (i.e. autonomy, task identity and feedback) for project team viewed as human capital resources and NPD performance (short-and long-run) in high-technology firms. This research contributes to the literature of job design in a new context of strategic NPD team in dynamic environment suggesting job design can strengthen the relationship between human capital resources and the short-run NPD performance. In addition, job design can facilitate project-to-project management that works in concert with human capital resources for long-run NPD performance in terms of the potential created future relevant NPD projects.
References


Further reading

Corresponding author
Sujinda Popaitoon can be contacted at: sujinda.p@acc.msu.ac.th