



## New product development team intelligence: Antecedents and consequences

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### ABSTRACT

Our study investigated the effect of team knowledge on new product development (NPD). By investigating 207 NPD projects, we found that the declarative and procedural knowledge of the team and their use of IT had a positive influence on the team's knowledge base; and that the higher the functional diversity of the project team, the greater their overall knowledge. We also found that team knowledge positively impacted new product creativity and success in the market place.

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### 1. Introduction

The importance of new product development (NPD) teams has been emphasized in the last decade in the technology and innovation management literature [19]. Many papers have pointed out that most successful NPD projects were achieved through the collective efforts of individuals on the teams [1] and have suggested approaches for managers to form and manage NPD teams; cross-functional integration [13], team learning [15], knowledge management (KM), and collaborative technologies [31] are some of the ways. One factor discussed recently has been *team intelligence* [4]; it seemed important because it helped the team to promote effective knowledge creation, fuel the learning process, and develop an effective way to implement the product. However, NPD team intelligence has been narrowly defined and has received limited empirical attention. The current *conceptual* definition of NPD team intelligence was restricted to the cognitive view of intelligence omitting its behavioral dimension. In organizational behavior literature, an entity demonstrates knowledge when it responds to changing conditions, problems, etc. in a goal-directed adaptive manner by modifying its behavior [11]. Intelligence involves adaptive behavior or responsiveness. Also

related to the conceptual issues, the NPD team intelligence construct has been operationalized narrowly as the ability of the team to acquire, disseminate and implement/use information. However, team intelligence is a multi-dimensional construct involving a variety of capabilities and should be operationalized as a higher-order, multifaceted construct embodying both information processing and responsiveness capabilities to capture the complex nature of the process of product development. Akgün et al. [5] argued that, while information processing capabilities highlighted the internal structures and processes, it put the environment in a passive role. On the other hand, they noted that responsiveness capabilities suggested a potential reaction and sensitivity to the external environment though it omitted information processing capabilities. Thus, amalgamating the information processing and responsiveness perspectives as a higher-order construct could result in a more comprehensive view of NPD team intelligence. Further, from a managerial point of view, the antecedents and consequences of NPD team intelligence, such as factors that impact NPD team intelligence and how this influences the project outcomes, should be investigated empirically. Investigating the determinants of team intelligence could aid project managers in understanding how to elevate the team's capabilities, and how to leverage those capabilities to result a successful NPD project.

Thus our study elaborated on research on NPD team intelligence and its antecedents and consequences to provide a KM view

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of NPD teams and project management. In particular, we considered how cross-functional NPD project teams enhanced their information processing and responsiveness capabilities and the impact of them on NPD project outcomes.

## 2. Background

### 2.1. Team intelligence and NPD

The term *intelligence* is used in many areas and disciplines such as, individual and experimental psychology [29], group behavior [33], organizational theory, KM, organizational learning [3], and sociology [14]. Discussion of team intelligence has considered it to be a subset or subprocess of KM. Nonaka and Takeuchi [23] said that NPD teams demonstrate their intelligence by acquiring, interpreting, disseminating and using information and knowledge during the project. Chou et al. [9] stated that information-processing capabilities were the captured organizational intelligence. Thus KM overlaps with the team intelligence. However, studies on team intelligence improved the concept of KM by highlighting the value of information processing *ability* in a project. Specifically, NPD team intelligence denoted a team's capability to use information processes through project related activities that achieved a desired end or performed a particular function or value activity during the project. In the context of a KM process in an NPD project [22]; *information acquisition ability* was referred to the team's capability to collect primary or secondary information from customers, competitors, and other third parties. *Information dissemination ability* was the team's capacity to diffuse and transmit the information among relevant members of the team, involving formal and informal information transmission via interpersonal interactions, meetings, memos, etc. *Information utilization ability* was referred to the project team's ability to use of the information indirectly in strategy-related actions and to direct applications of information to influence marketing strategy-related actions. Such actions included giving meaning to data, interpreting and categorizing it, and applying the information/knowledge to solve product related problems during the NPD process. However, the information-processing capability/ability view of intelligence, which fits the cognitive scheme of the team KM process, explained one side of the NPD team intelligence. It was not sufficient to address issues that only related to the collective nature of work in project teams. In general, the behavioral perspective of intelligence shows the responsiveness of an entity. In an NPD project team, we contend that *responsiveness* refers to the actions taken in response to information and knowledge generated, transmitted, and utilized. Without responding to the environment, market information processes would provide little or no help to teams in achieving their goals.

NPD team intelligence is imperative for the effective operation and performance of the team. However, for a systematic understanding of NPD team intelligence, the antecedent factors should also be investigated to understand how we can increase the team intelligence. Consistent with the study by Moorman and Miner [20], we focused on performance measures by selecting routinely studied items: new product creativity (NPC) and new product success (NPS); these are critical indicators for managers. In addition, the knowledge base (declarative and procedural knowledge), information technology usage, and cross-functional diversity have been identified as determinants of NPD team intelligence. Although these antecedents have been examined in the KM and organizational intelligence literature, there has been no empirical evidence to show how they influence NPD team intelligence.

## 3. Hypothesis development

### 3.1. Antecedents

The knowledge base is the basis of organizational intelligence [18]. In her study on organizational intelligence, Glynn [12] also emphasized its importance. In a similar fashion, NPD studies have emphasized its effect on the team's information processing and response ability. Madhavan and Grover [17] stated that ability to create and use knowledge was a function of the degree of prior knowledge. We believed that the *interpretation role* of declarative knowledge and the *guidance role* of procedural knowledge [21] impacted team intelligence during an NPD project. In an NPD team setting, *declarative knowledge* denoted the teams' prior knowledge about a product category, experience, and familiarity with a product while *procedural knowledge* indicated the teams' prior knowledge and experience about customer needs and how to satisfy them in product design and its implementation [16]. Information on customers, competitors, and other parties is retained as declarative knowledge, which helps teams know what extra information is required, and how and where to find it to exploit new advances. In particular, NPD team members who are experts on processes and methods of product innovation are expected to generate, disseminate, utilize and respond to information in NPD processes. This is the foundation of the first set of hypotheses:

**H1a.** Team procedural knowledge is positively related to NPD team intelligence in projects.

**H1b.** Team declarative knowledge is positively related to NPD team intelligence in projects.

IT usage is another antecedent factor. From a KM context, Alavi and Leidner [6] noted that IT usage can create an infrastructure and environment that contributes to organizational KM by supporting, augmenting, and reinforcing knowledge processes at a deeper level.

During the NPD process, teams use IT tools, such as the Internet, Intranet, e-mails, teleconferencing, and FTP to communicate or store information. As IT tools help teams acquire and diffuse the information needed in the NPD process project teams can transform knowledge into value to their customers, and optimize the NPD process to fit the context of the project [25]. Therefore:

**H2.** IT usage during the NPD process is positively related to NPD team intelligence in projects.

In addition to knowledge base and IT effects, cross-functional diversity acts as another antecedent of team intelligence. It refers to the number of functional areas represented by people on the team. A greater number of functional areas are likely to improve input needed when making important product-related decisions. The necessity of team diversity occurs because cross-functional teams can generate and disseminate market and technology information, and thus increase responsiveness [24]. However, beyond some point, diversity can lead to increased decision complexity and confusion due to alternatives [28]. Sethi [27] suggests that teams simplify the heuristics or avoid in-depth processing of alternatives. Accordingly, we hypothesize that:

**H3.** Cross-functional diversity of project team will have an inverted-U relationship with NPD team intelligence in projects.

### 3.2. Consequences

Being creative or producing creative solutions is an essential result of organizational intelligence. Like this, individual knowledge has been stated to be important to individual creativity [30].

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