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Designing teams for speedy product development: The moderating effect of technological complexity

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Abstract

Findings from this study suggest that there is no one best team for speedy product development, especially not for projects of varying levels of technological complexity. Based on findings from 183 new product projects, this study indicates that managers tailor development teams to the degree of technological complexity of the project. Results show that technologically complex projects are sped up by development teams with individuals assigned full-time to the project, and working in close proximity. Alternatively, for technologically simple projects, findings suggest that managers assign part-time experienced members to projects, and maintain the same leader and members on the team throughout the development. Functional diversity has an inverted U-shaped relationship with innovation speed for both technologically complex and simple projects. Still, for the first part of the curve, functional diversity has a greater positive impact on the speed of technologically complex products.

Keywords: New product development teams; Team design factors; Technological complexity; Innovation speed

1. Introduction

Rapid development of new products is critical to the competitive advantage of most corporations. One factor to be associated with faster innovation speed is the use of cross-functional teams. Increasingly, organizations are using cross-functional teams to improve the speed of their new product development efforts (Griffin, 2002). Yet, despite their growing use, results of new product development teams' endeavors have been mixed (McDonough, 2000). One of the key reasons is that managing product development teams is not easy. In implementing development teams, managers face many challenges and questions.

A few researchers have begun to suggest that a universal approach to the design of new product development teams is not always effective (Clift and Vandenbosch, 1999; Kessler and Chakrabarti, 1999). As observed by McDonough (1993), the type of technological work that is being undertaken on a project affects what team members' characteristics are important in order to speed up the development process. Because only very few studies have been conducted, there is still much to be learned about how to build teams so as to have a positive impact on the speed of projects of varying levels of technological complexity (McDonough, 2000). The study presented here attempts to fill this research gap. Specifically, the study investigates the moderating influence of the technological complexity on the effect of several team design factors on innovation speed. The relevance of this study comes from the fact that it focuses on understanding factors that affect an important underlying explanation for new product success and profitability (i.e. speed to market). Moreover, because the study considers variables that can be influenced by managers, its findings provide useful recommendations for enhancing innovation speed and, in turn, improving success and profitability.

2. Theoretical model and propositions

The conceptual model presented in Fig. 1 outlines the moderating effect of technological complexity on the effect of various team design factors on innovation speed. Specifically, the current study focuses on two types of design factors: characteristics of the people assigned to the development team (staff-related factors), and decisions with regard to the way the

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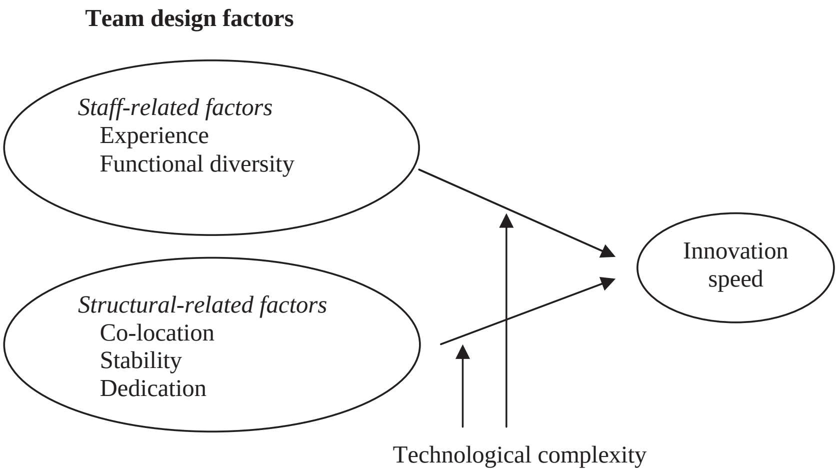

Fig. 1. Conceptual model.

team is put together or how it works together (structural-related factors). Staff-related factors comprise the degree of representativeness of internal and external interest groups on project teams, and the relative experience of members assigned to work on projects. Structural-related factors include team's co-location, team's dedication, and team's stability through the development process. We defined innovation speed as the pace of activities between idea conception and commercialization (Kessler and Bierly, 2002).

According to Wang and Tunzelmann (2000), complexity in organizations can be assessed in terms of the dimensions of 'depth' and 'breadth'. Complexity in 'depth' refers to the novelty and sophistication of a subject, whereas complexity in 'breadth' refers to the range of areas that has to be investigated to develop a particular subject. In the present article, technological complexity is defined in terms of depth, and relates to the technological newness and difficulty of the development project. We suggest that projects can be rather technologically simple or quite technologically complex. Technologically simple projects are those that apply mature technologies, and for which the understanding of the technology is high. Technologically complex projects are those that involve emerging or new technologies and for which the understanding of the technology is low. Because of the lower technological knowledge, technologically complex projects are likely to face more design challenges, and greater difficulties in production of the final design than technologically simple projects. Our term *technological complexity* is similar to what some authors have termed *type of work undertaken on a project* (McDonough, 1993), *technical content* (LaBahn et al., 1996), and *product complexity* (Sarin and McDermott, 2003).

2.1. Staff-related factors

2.1.1. Functional diversity

Team functional diversity refers to the number of functional areas as well as external stakeholders represented on the team. The literature suggests highly diverse teams decrease development time by increasing goal congruence among the functional groups, bringing more creative potential to problem solving, and ensuring the availability of crucial input (Karagozoglu and Brown, 1993; Sethi et al., 2001). Zirger and Hartley (1996) found that each additional function included on a product development team subtracted 0.4 months from development time. Functional diversity, however, may also increase cycle time. It has been suggested that highly diverse groups find it difficult to develop a shared purpose and an effective group process and hence, fall down on implementation. Ancona and Caldwell (1992) report a negative relationship between functional diversity and adherence to schedules. Other studies have found a lack of association between functional diversity and innovation speed (Kessler and Chakrabarti, 1999; Sarin and McDermott, 2003). To address and reconcile these perspectives, this study suggests an inverted U-shaped curvilinear relationship between functional diversity and innovation speed. As functional diversity increases from a low to a moderate level, it enhances speed. However, when functional diversity goes beyond a moderate level, it has a negative effect on innovation speed.

It is argued that increased technological complexity increases the need for functional diversity. When dealing with technological complex projects, because team members have fewer relevant experiences to draw upon, they perceive their tasks to be more challenging and depend more heavily on other functional specialists for the expertise, information and resources needed to arrive at a successful solution (Olson et al., 1995). Findings from Clift and Vandenbosch (1999) showed that the number of stakeholders contributing directly to the project was higher among short-cycle complex projects than among short-cycle simple projects. Short-cycle simple project teams were leaner, representing key functional areas only. The preceding discussion suggests that the positive effect of functional diversity on innovation speed will be stronger for technologically complex projects. Taken together, we propose:

H1a. The relationship between innovation speed and functional diversity is an inverted curvilinear U-shaped function.

H1b. Functional diversity's positive impact on innovation speed will be stronger for technologically complex projects than technologically simple projects.

2.1.2. Team experience

In this study, team experience is operationalized as team members' knowledge about past projects. Integrating knowledge from past projects has been shown to have a positive impact on cycle time reduction (Sherman et al., 2000). From an information-processing theory perspective, Emmanuelides (1993) contend that by relying on experience, teams develop effective operating procedures and information about cause–effect relationships that allow them to reduce cycle time. We argue that uncertainty reduces the value of team experience for innovation speed. Teams confronted with high uncertainty have to process additional technical and conceptual information and develop new ways of performing the tasks at hand. Gathering additional information and developing new operating methods lengthen the required development time. In line with this argument, we propose that:

H2. Team experience will have a more positive impact on the speed of technologically simple projects than technologically complex projects.

2.2. Structural-related factors

2.2.1. Team proximity

Locating project team members physically close together can speed development (Patti and Gilbert, 1997). Face-to-face communication that occurs when team members are located together helps to accelerate development by increasing mutual understanding of constraints, limitations and potential problems (Zirger and Hartley, 1996). Team proximity is expected to have a more positive impact on the speed of technologically complex project than technologically simple projects. Frequent, face-to-face communication enables more rapid feedback, decoding and synthesis of complex information (Katz and Tushman, 1979). This provides a better fit with the fuzzy, uncertain nature of technologically complex projects. Alternatively, for technologically simple projects, it might be a good idea to limit communication. For these projects, more frequent communication may introduce unnecessary complexity and cause distractions for the team (Donnellon, 1993). Findings from Kessler and Chakrabarti (1999) are in keeping with this argument. Their study shows that whereas for incremental projects, it is faster to spread out teams, for radical innovations, it is faster to co-locate teams. Thus:

H3. Team proximity will have a more positive impact on the speed of technologically complex project than technologically simple projects.

2.2.2. Team dedication

Team dedication has been found to be positively related to faster development time (Mabert et al., 1992; Zirger and Hartley, 1996). Team members with full commitment to the project are not pressed by other matters, which results in their paying more attention to new product development activities and undertaking the project quickly (Gupta and Wilemon, 1990; Cooper, 1995). It has been suggested that assigning staff on a full-time basis is especially important for the speed of those projects representing a significant departure from the firm's existing business. As Kuczmarski (1996) pointed out, radically new products cannot be developed while simultaneously putting out fires on other business. The opposing responsibilities between radical products and the existing business will result in radical products playing second fiddle. With radical innovations, full-time commitment will give the development team the time, concentration, and motivation required to focus on, become immersed in, and develop the project fast. Thus,

H4. Full-time dedication will have a more positive impact on the speed of technologically complex projects than technologically simple projects.

2.2.3. Team stability

Team stability plays a positive role in accelerating new product development (Akgün and Lynn, 2002). When teams are stable from the early stage of product development to launch, they carry out their work with greater effectiveness and speed. Alternately, group turnover causes information or knowledge loss, disrupts progress and in turn, slows down the project (Guzzo and Dickson, 1996). Team stability may not be desirable for technologically complex projects. Because of their greater radicalness, teams working on technologically complex projects may require different perspectives and ways of thinking. Walker (1997) states that new team members, who have not been fully socialized with respect to the team's established routines and shared perceptions, are more likely to see and do things differently. A different argument is that the higher uncertainty inherent in a technologically complex project limits the ability of the organization to preplan and allocate needed resources ahead of time, which may result in moving people off the team and bringing focused skills on throughout the development process. Consistent with these arguments, we hypothesize:

H5. Team stability will have a more positive impact on the speed of technologically simple projects than technologically complex projects.

3. Methodology

3.1. Sample

The frame consisted of 1650 Spanish firms with 50 or more employees in various industries including food, chemical, plastic, mechanical equipment, electrical equipment, and transportation.

A questionnaire was mailed to the technical manager in each firm. Of the original 1650 surveys mailed, 60 were returned by the post office as undeliverable. From the remaining pool, a total of 188 completed questionnaires were received. Of these, five surveys were eliminated due to missing data, yielding a response rate of 11.5%. Although this response rate is not as high as one might wish, it is consistent with other studies on new product development (Swink, 2000; Calantone et al., 2003). Hunt (1990) maintains that it is possible to achieve valid generalizations from studies with low response rates unless there is a good reason to believe that the respondents do in fact differ from the non-respondents on the substantive issues in question and that these differences would make the results of the study unreliable. To test for nonresponse bias, we compared early with late respondents as suggested by Armstron and Overton (1977). No significant differences were found on the constructs of this study at the 0.05 level. Accordingly, nonresponse bias does not appear to be a significant problem. We also checked for sample representativeness. Chi-square analyses revealed no significant differences between our sample and the population it was drawn from in terms of industry distribution, employee number and, company sales. The median respondent firm had 200 employees and 33.35 million € annual revenue. Table 1 shows the sample characteristics.

Because projects were drawn from several companies from different industries, tests for between-group differences in any of the constructs included in this study were undertaken. Analysis of variance procedures and Tukey's post hoc multiple-comparison tests reveal that there were no significant between-group differences with the averages of innovation speed, team experience, team stability, team proximity, functional diversity, and technological complexity at 95% significance level. Between-industry differences were found with the average of team dedication ($F=2.958$, $p<0.05$). Thus, development teams from the food industry had on average fewer full-time members than teams from the machinery equipment industry.

3.2. Measures

The unit of analysis was the new product development project. This is because the project level is most directly relevant to innovation speed — projects are accelerated, not individuals or organizations (Kessler and Chakrabarti, 1999). Respondents were asked to base their answers on a new product project fully completed within the past 3 years.

A pool of items was generated for measuring each of the constructs based on the review of the literature and interviews with academics and practitioners. The questionnaire was pretested with seven technical managers. The operational definition, and scales items for each construct are provided in Appendix A. Innovation speed was measured through three items adapted from Cooper and Kleinschmidt (1994), Akgün and Lynn (2002) and Kessler and Bierly (2002). Technological complexity was operationalized using 2 items taken from Sarin and McDermott's (2003) product complexity scale. Team functional diversity was operationalized as the number of functional areas and external stakeholders represented on the team (Eisenhardt and Tabrizi, 1995; Sethi et al., 2001). These areas included top management, marketing, engineering, manufacturing, finance, suppliers and customers. Team experience was measured by three items selected from Emmanuelides (1993) and Akgün and Lynn (2002). Team stability was operationalized by two items borrowed from Akgün and Lynn (2002). Team proximity and team dedication were each measured with one item borrowed from Mabert et al. (1992) and Donnellon (1993), respectively.

Table 1
Sample characteristics

SIC code		Number of employees		Sales in € ($\times 10^6$)	
20: Food	14.1%	50–75:	9.9%	<12.5:	9.4%
28: Chemical	22.4%	76–100:	13.2%	12.5–25.0:	24.5%
30: Plastic	10.9%	101–150:	17.0%	25.1–37.5:	21.1%
35: Machinery equipment	19.2%	151–200:	10.4%	37.6–50.0:	8.2%
36: Electrical equipment	22.4%	201–300:	17.1%	50.1–75.0:	11.7%
37: Transportation	10.9%	301–500:	11.5%	75.1–150:	10.5%
		>500:	20.9%	>150:	14.6%

The study includes three control variables to reduce the possibility of alternative explanations: team size, competitive intensity and speed rewards. The literature suggests a negative relationship between team size and innovation speed. Small development teams reach consensus and complete assignments faster than large cumbersome teams (Millson et al., 1992). Team size was measured by number of team members (Sarin and McDermott, 2003). Highly competitive markets drive the firm to innovate more quickly in order to seize the moment from a competitor, or to respond quickly to a competitor's new product (Cooper, 1995). Competitive intensity was operationalized through three items borrowed from Ali (2000). Reward systems have been shown to aid in directing R&D activities toward speed (Kessler and Chakrabarti, 1999). Speed reward was measured with a single question borrowed from Eisenhardt and Tabrizi (1995).

To obtain unidimensionality for multi-item variables, the item-to-total correlations were calculated for each item, taking one scale at a time. Items for which these correlations were lower than 0.35 were eliminated (Saxe and Weitz, 1982). Computing reliability coefficients explored the reliability of each purified, unidimensional scale. As shown in Appendix A, α coefficients values were equal or greater than 0.70, which indicates good reliability. Internal consistency and convergent validity were investigated by performing a confirmatory factor analysis using AMOS. The results indicated that the measurement model fit the data well ($\chi^2=62.2$, $p<0.05$; Normed fit index (NFI)$=0.99$; comparative fit index (CFI)$=0.99$; root mean square error of approximation (RMSEA)$=0.04$). Composite reliabilities estimates exceeded the standard of 0.6 suggested by Bagozzi and Yi (1988). Values of average variance extracted also provided satisfactory results with the exception of technological complexity, which had an average variance extracted slightly below 0.5. Standardized item loadings for all constructs were greater than 0.5 and significant at $p<0.05$ indicating good convergent validity (Bagozzi et al., 1991). Together the results of the tests suggest that the measures included in this study possess sufficient unidimensionality,

Table 2
Means, standard deviations and zero-order correlations

	Mean	S.D.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Innovation speed	4.4	1.1	1.0									
2. Team experience	5.3	1.2	0.22**	1.0								
3. Team stability	6.2	1.1	0.24**	0.17*	1.0							
4. Team proximity	5.6	1.5	0.17*	0.11	0.11	1.0						
5. Team dedication	0.4	0.3	0.07	0.20**	0.07	0.15*	1.0					
6. Functional diversity	5.6	1.4	−0.03	0.02	−0.01	−0.04	0.12	1.0				
7. Technological complexity	4.4	1.3	0.05	−0.05	0.07	0.15*	0.16*	0.14^{+}	1.0			
8. Team size	7.5	5.1	−0.13^{+}	0.08	−0.03	−0.17*	0.15*	0.18*	0.00	1.00		
9. Speed reward	2.9	1.8	0.14^{+}	0.19**	0.05	−0.04	0.25**	0.21**	0.19**	0.16*	1.0	
10. Competitive intensity	3.5	1.5	−0.11	−0.23**	0.02	0.05	−0.19*	0.03	0.13^{+}	0.00	−0.08	1.0

Significance levels: $^{**}p<0.01$, $^{*}p<0.05$, $^{+}p<0.10$.

reliability and validity. For hypotheses testing analysis, we developed summated composites. Table 2 shows the zero-order correlations along with means and standard deviations.

3.3. Estimation procedure

Sampled projects were divided into two categories: technologically simple projects (84 projects) and technologically complex projects (99 projects) by using median split. A hierarchical regression analysis was performed for each subsample. In step one, innovation speed was regressed on the control variables along with team experience, team dedication, team stability, team proximity, and the linear term of functional diversity. To test for the presence of an inverted U-shaped relationship between functional diversity and innovation speed, the squared term of functional diversity was entered on the second step. To support the presence of an inverted U-shaped curvilinear relationship between functional diversity and innovation speed, two criteria must be fulfilled: (1) the quadratic term of functional diversity must be negative and significant and (2) the increase in variance explained by adding functional diversity squared must be statistically significant. Multicollinearity is an endemic problem in regression models that simultaneously contain linear and squared terms of the same variable. To minimize this problem, the functional diversity was mean centered prior to the creation of the squared term.

4. Results

Table 3 shows the hierarchical regression results. Model 2 for technologically simple projects explained 31% of the variance of innovation speed ($F=3.42$). As expected, team experience ($\beta=0.23$, $p<0.05$), and team stability ($\beta=0.20$, $p<0.10$) were found to have a significant positive impact on innovation speed. Contrary to our expectations, team dedication ($\beta=-0.28$, $p<0.05$) was negatively associated with innovation speed. As predicted (H1a), functional diversity has an inverted U-shaped relationship with innovation speed. Thus, the estimate for the quadratic term of functional diversity was negative and statistically significant ($\beta=-0.30$, $p<0.05$; respectively). Furthermore, adding functional diversity squared term in the second model resulted in a significant increase in variance explained (R^2 change$=0.057$, $p<0.05$). Model 2 for technologically complex projects explained 31% of the variance of innovation speed ($F=4.00$). As expected, team dedication ($\beta=0.23$, $p<0.05$) and team proximity ($\beta=0.23$, $p<0.05$) were positive and significant in explaining innovation speed. The incremental explained variance resulting from adding the quadratic term of functional diversity to the baseline model is statistically significant (R^2 change$=0.075$, $p<0.00$) and the quadratic term is negative and significant ($\beta=-0.33$, $p<0.01$), indicating an inverted U-shaped relationship between functional diversity and innovation speed.

To determine if regression coefficients for team-design characteristics from high-low technological complexity conditions are significantly different, a *t*-test was used. Results from the *t*-test reveal that team experience and team stability have a more positive impact on the speed of technologically simple projects than technologically complex projects ($t=8.59$, $p<0.01$; $t=9.59$, $p<0.01$, respectively). Hypotheses H2 and H5 are supported. Consistent with hypotheses H3 and H4, results from the *t*-test reveal that team proximity and team dedication have a more positive impact on the speed of technologically complex projects than technologically simple projects ($t=-7.41$, $p<0.01$; $t=-31.21$, $p<0.01$, respectively).

Fig. 2 graphically depicts the relationship between functional diversity and innovation speed for technologically complex and

Table 3
Hierarchical regression analysis (standardized coefficients)

	Technologically simple projects		Technologically complex projects	
	Model 1	Model 2	Model 1	Model 2
Control variables				
Team size	−0.01	−0.04	−0.22*	−0.23*
Speed reward	0.01	−0.02	0.15	0.18^{+}
Competitive intensity	−0.23*	−0.23*	0.10	0.12
Team design factors				
Team experience	0.25*	0.23*	0.08	0.10
Team proximity	0.12	0.13	0.17^{+}	0.23*
Team dedication	−0.31**	−0.28*	0.26*	0.23*
Team stability	0.23*	0.20^{+}	0.11	0.06
Functional diversity	−0.06	−0.22^{+}	−0.06	−0.21^{+}
(Functional diversity)^2		−0.30*		−0.33**
R^2 (F-value)	0.25 (2.93) $N=84$	0.31 (3.42)	0.24 (3.09) $N=99$	0.31 (4.00)

Significance levels: $^{**}p<0.01$, $^{*}p<0.05$, $^{+}p<0.10$.

simple projects based on the regression coefficients obtained from the split-sample regression analysis. It should be noted that the *X*-axis displays the degree of functional diversity on a standardized scale from minus two to plus two standard deviations (±2 S.D.) away from the mean. Fig. 2 shows a curvilinear inverted U-shaped relationship between functional diversity and innovation speed for both technologically complex and simple projects. Moreover, the graph shows that at a low degree of functional diversity (from minus two to one standard deviation from the mean), the positive slope of the curve is larger for technologically complex projects than for technologically simple projects. This suggests support for hypothesis H1b stating functional diversity's positive impact on innovation speed is stronger for technologically complex projects than technologically simple projects.

5. Discussion

The current study has offered new insights into the effect of several team design characteristics on the speed of projects of varying degrees of technological complexity. In accordance with our predictions, the study revealed an inverted U-shaped relationship between functional diversity and innovation speed. At a low level of functional diversity, an increase of functional diversity has a positive impact on innovation speed. However, when functional diversity becomes too high, increases of functional diversity diminish innovation speed. In addition, results show that functional diversity has a more positive effect on the speed of technologically complex products. The more complex and difficult the project, the greater the functional interdependence needed to speed up its execution. Functional diversity is less beneficial for simple projects requiring clear-cut solutions.

Team experience is shown to speed up technologically simple projects. This supports previously discussed literature suggesting that, because of the greater familiarity with and understanding of the technologies embodied in technologically simple projects, teams can draw on their prior knowledge to identify the project's technological needs and challenges with adequate precision and focus and hence, get things done more quickly. For technologically complex projects, the results indicate no significant impact of team experience on innovation speed. This might be a result of the escalating need for experimentation, invention and trial-and-error associated with the development of technologically complex projects. Studies in the area of organizational learning have reported that high levels of memory inhibit any actions outside preexisting action patterns (Moorman and Miner, 1997).

Consistent with our prediction, the findings show that team stability is positively correlated with the speed of technologically simple projects. For technologically complex projects, however, the results point to a lack of relationship between team stability and innovation speed. This finding might be explained by the association between team stability and team cohesiveness. The literature has suggested that the longer group members stay together, the more cohesive the group becomes. Highly cohesive teams tend to think and act so much alike that it is hard to introduce them to new and different ideas (Wagner et al., 1984). Perhaps with technologically complex projects, the downstream timesavings from team stability are overridden by its contribution to organizational inertia.

Team dedication and team proximity appear to speed up technologically complex projects. This is in general consistent with the previously discussed literature. Surprisingly, the usage of full-time dedicated members is shown to slow down the speed of technologically simple projects. A plausible explanation lies in the very nature of these projects. Technologically simple projects often require little more than a cookie-cutter application of knowledge. In the absence of distractions from other commitments, individuals working full-time on these projects

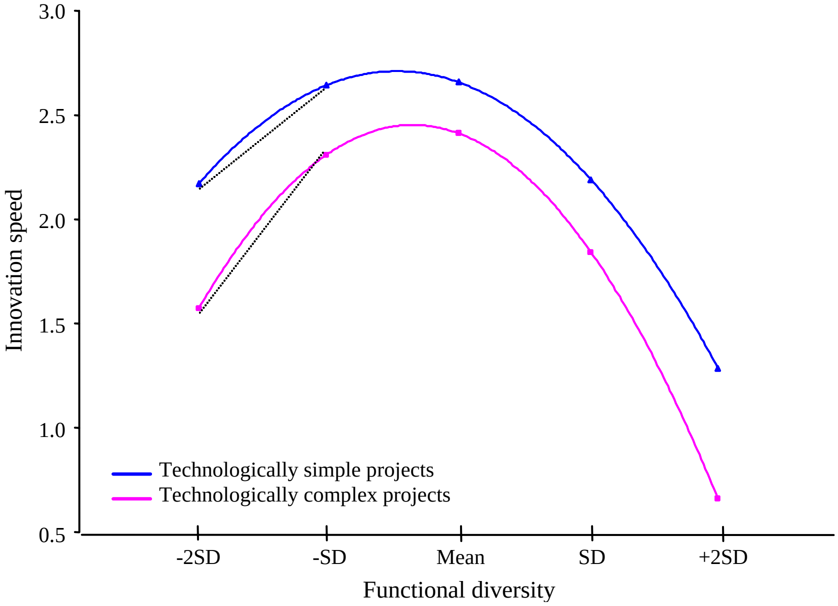

Fig. 2. Relationship between functional diversity and innovation speed for technologically complex projects and technologically simple projects.

rarely feel they are making a notable contribution, and, to compensate, spend extra time on providing nice-to-have deliverables. This superfluous effort is usually out of scope and not pursued after presentation, yet it adds time to the delivery of the project.

In summary, the evidence presented in this study indicates a contingency approach to speeding up innovation, which is consistent with the findings of Kessler and Chakrabarti (1999), Clift and Vandenbosch (1999) and McDonough (1993). Specifically, our results indicate that depending upon the degree of technological complexity of the project, there appear to be different sets of team-design factors affecting innovation speed. To speed up technologically complex projects, the study suggests that managers have teams made of full-time members working in close proximity. To accelerate technologically simple projects, managers should put together part-time, stable teams formed of people with experience in new product development. Evidence of an inverted U-shaped relationship between functional diversity and innovation speed brings up a need to carefully identify the critical functions that need to be represented on the team and to balance those functional representation needs with the inefficiencies associated with high group diversity.

6. Limitations

This study is subject to several limitations. First, the study uses single-informant reports for the independent and dependent variables. Nevertheless, the risk of common method bias is believed to have been reduced by collecting data from key knowledgeable informants (Akgün and Lynn, 2002). Second, the response rate is relatively low. Still, we have some reasons to believe that the response rate did not jeopardize the representativeness of our sample. Armstron and Overton's (1977) test provided some indication of the absence of non-response error. We had representativeness of all major sectors and companies of different sizes. Variances in both dependence, independent and control variables seem to suggest we did not select specific types of companies. A third limitation is that the research is based on perceptual data. Fourth, the scales used to measure most of the constructs were single and double-item measures and could have been richer. Finally, while this study examines the effect of a range of team-design characteristics on innovation speed, there is clearly much more that can be learned from further exploration of these relationships. For example, future studies could examine this issue longitudinally to see if the effect of team design differs at various stages of the development process. Future research could also examine the effect of the size of the project on the team design–speed relationship.

Despite these limitations, this study makes several contributions to business theory. The study presents evidence from a large number of firms in a varied set of industries, which allows for the discovery of principles governing firms that generalize across markets. The study amplifies theory by demonstrating the inverted U-shaped relationship between functional diversity and innovation speed, and the moderating effect of technological complexity on the effect of team design on speed.

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Appendix A. Construct definition and measures

Construct name (Cronbach's α or correlation coefficient, composite reliability (CR), average variance extracted (AVE))	Construct measurement	Mean (S.D.)
Innovation speed[a] ($\alpha=0.70$, CR=0.74, AVE=0.58)	The project was completed in less time than what was considered normal and customary for our industry	4.16 (1.37)
	The project was launched on or ahead of schedule	4.13 (1.24)
	The project was done fast relative to how it could have been done	4.70 (1.45)
Team experience[a] ($\alpha=0.78$, CR=0.79, AVE=0.62)	Experience with the technology used in the product	5.14 (1.41)
	Experience with developing similar products	5.23 (1.50)
	Experience with marketing similar products	5.37 (1.47)
Team stability[a] ($\alpha=0.73$, CR=0.85, AVE=0.70)	Team members who were on the team remained on it through completion	5.94 (1.36)
	The project manager who started this project remained on through completion	6.41 (1.20)
Team proximity[b]	Proximity amongst the team members	5.61 (1.52)
Team dedication	Percentage of team members working full-time on the project	0.38 (0.31)
Functional diversity	Number of departments and external stakeholders represented on the team	5.60 (1.40)
Technological complexity ($r=0.43$, CR=0.61, AVE=0.44)	Newness of the technology embodied in the project[c]	3.61 (1.86)
	Technical difficulty involved in the development process[d]	5.17 (1.14)
Team size	Number of members on the project team	7.46 (5.11)
Speed reward[a]	Existence of rewards to speed up the new product development process	5.15 (1.30)
Competitive intensity[a] ($r=0.46$, CR=0.66, AVE=0.50)	There was not much aggressive competitive activity in the market	3.14 (1.67)
	There were few or no competitors in the marketplace	3.97 (1.87)
	Competitors were relatively small or weak companies[e]	2.44 (1.56)

[a] Seven-point Likert-type scale (1=strongly disagree to 7=strongly agree).

[b] Seven-point scale (1=members were far away from each other to 7=members were located very close to each other).

[c] Seven-point scale (1=application of in-house known technologies to 7=application of new technologies).

[d] Seven-point scale (1=very low to 7=very high).

[e] Suppressed item (item to total correlation lower than 0.35).

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