Do Quality and Innovation Compete Against or Complement Each Other? The Moderating Role of an Information Exchange Climate

TALI-HADASA BLANK, TECHNION-ISRAEL INSTITUTE OF TECHNOLOGY
EITAN NAVEH, TECHNION-ISRAEL INSTITUTE OF TECHNOLOGY

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This study contributes to the authors' understanding of the relationship between quality and innovation by applying a climate theory approach. They explain the reasons why an innovation climate negatively influences quality performance and why a quality climate has a negative influence on radical innovative performance. The authors then show that within a high information exchange climate, the innovation climate improves quality performance and the quality climate improves radical innovative performance. In practical terms, their findings suggest that quality managers can improve their organizations' quality performance and radical innovative performance simultaneously by nurturing an information exchange climate in their corporate departments.

Key words: information exchange climate, innovation climate, quality climate, quality performance, radical innovative performance

INTRODUCTION

In today's fiercely competitive marketplace, companies need to provide products and services free of deficiencies, that is, high quality (at least in the technical use of the term) (ASQ 2013), in order to succeed. Companies must also come up with a radical innovation approach, in the sense of a meaningful deviation from existing products and services Miron-Spektor, Erez, and Naveh 2011). Though quality and radical innovation are both essential for an organization's survival, studies suggest they compete for scarce resources and thus emphasize organizational activities that lead one of them to harm the other (Benner and Tushman 2002; Gupta, Smith, and Shalley 2006; Lavie, Stettner, and Tushman 2010; March 1991).

Some scholars oppose the competing approach and suggest a complementing approach to quality and radical innovation (Bledow et al. 2009; Gibson and Birkinshaw 2004; Lin et al. 2013). Naveh and Erez (2004), and recently Miron-Spektor, Erez, and Naveh (2011), provide empirical support for the simultaneous coexistence of radical innovation and quality. Farjoun (2010) also suggests a complementary relationship and uses the term "duality" to denote the interdependency of innovation and quality rather than their contrast.

The aim of this paper is to reconcile the quality and radical innovation compete-complete disputation by identifying the conditions under which quality and innovation can coexist. The authors use climate

and information exchange theories (Gong et al. 2012; Katz-Navon, Naveh, and Stern 2005), which are good performance predictors, but, to the best of the authors' knowledge, have not been applied to this dispute up until today.

Reconciling the quality and radical innovation compete-complete disputation has important theoretical and practical applications on the field of quality. A recent paper on the future of quality management suggested there is considerable opportunity for the development of stronger linkages between quality and innovation, and that this area needs more research (Evans et al. 2013). Fredendall (in Evans et al. 2013) suggested investigating the quality manager's role, which has undergone significant changes in the field of business over the last 20 years. From a practical point of view, the balance between quality and innovation concerns many in the quality profession on a daily basis. A great number of quality professionals argue in favor of the joint and simultaneous existence of quality and innovation (Cole 1999); however, there is not enough research and academic work that supports this claim. Therefore, in this paper the authors attempt to find a positive connection between quality and radical innovation.

Applying a Climate Approach to Explain the Relationship Between Quality and Radical Innovation

The authors refer to the activities organizations promote for achieving quality and innovative performances through the use of the concept of climate (Katz-Navon, Naveh, and Stern 2005; Kozlowski and Klein 2000; Schneider 1990). Climate is defined as the shared perceptions of employees concerning the practices, procedures, and kinds of behavior that get rewarded, supported, and are expected in a workplace setting (Schneider 1990). In addition, different departments within the organization may have different levels of a specific climate as a result of characteristics of their work, interactions, work conditions, or managerial behaviors (Katz-Navon, Naveh, and Stern 2005; Schneider, White, and Paul 1998). Thus, in this paper the authors refer to the department level of analysis.

Given that multiple climates often exist simultaneously within a single organization or team, climate is best regarded as a specific construct having a referent—that is, a climate is a climate for something, such as a climate for quality or for innovation (Naveh, Katz-Navon, and Stern 2011; Schneider, White, and Paul 1998). Climate encourages the expression of behaviors that contribute to the related performance (Schneider, White, and Paul 1998). Recent literature reviews robustly support the claim that climate is a powerful predictor of organizational performance outcomes (Zohar and Polachek, forthcoming). Given such evidence regarding climate's predictive validity, the authors will use the concept of climate to explain radical innovative performance and quality performance.

The Influence of Innovation Climate on Quality Performance and of Quality Climate on Radical Innovative Performance

A quality climate emphasizes precision, accuracy, comprehensive fact-based problem solving, and focused-oriented processes (Garvin 1988; Prahalad and Krishnan 1999; Winter 1994). Quality climate involves adherence to routines and attention to detail through the adoption of standardized best practices (Hackman and Wageman 1995; Harrington and Mathers 1997). Thus, quality climate has a positive influence on quality performance (Naveh and Erez 2004).

Innovation climate refers to the employees' shared perception that they are expected to generate breakthrough new ideas (or new to their proposed application) designed to be useful and implement them into new products, processes, and procedures (Amabile 2000; West and Anderson 1996). Innovation climate is characterized by openness to different ways of thinking, autonomy, breaking existing paradigms, taking risks, experimenting, trial and error, and tolerating mistakes (Baldrige Quality Award 2013; Brown and Eisenhardt 1998; O'Reilly, Chatman, and Caldwell 1991; Scott and Bruce 1994; Van de Ven Polley

et al. 1999). Thus, innovation climate has a positive influence on radical innovative performance (Miron-Spektor, Erez, and Naveh 2011).

One traditional point of view emphasizes the tension between an innovation climate and quality performance. This is because innovation climate contradicts characteristics required in order to achieve high-quality performance, such as acting within organizational constraints, promoting an idea through accepted channels, testing, and integrating (Miron-Spektor, Erez, and Naveh 2011). The innovation climate generates variation, which is something the activities associated with quality, such as adherence to standards and routines, cannot accept. Moreover, an innovation climate encourages employees to explore their ideas even when these are not necessarily in line with existing quality guidelines (Amabile 2000). Thus, the authors hypothesize:

- *Hypothesis 1: An innovative climate is negatively associated with quality performance.*

Another traditional point of view is that there is tension between a quality climate and radical innovative performance. The quality climate promotes activities such as the use of existing technology and a focus on well-organized, well-planned, and systemic procedures and standardization (Naveh and Erez 2004). Thus, a quality climate that emphasizes stable routines and processes may interrupt the generation of creative ideas, thinking "outside the box," going beyond routines and common assumptions, and taking risks, which are the basis for radical innovative performance (Naveh 2007). The authors thus hypothesize that:

- *Hypothesis 2: A quality climate is negatively associated with radical innovative performance.*

Information Exchange as Moderator in the Tension Between Quality and Innovation

March (1991) suggests the origin of the innovation-quality tension stems from the fact that innovation and quality both require resources. Given that organizational resources are valuable and limited, tension develops between these conflicting activities. Recent literature emphasizes the powerful mechanism of information exchange for enriching existing resources (Argote and Miron-Spektor 2011; Lin et al. 2013; Yannopoulos, Auh, and Menguc 2012). The authors refer to an information exchange climate as the shared perceptions of employees about an existing emphasis on communication (e.g., Ancona and Caldwell 1992), knowledge sharing, and flow of information and knowledge (e.g., Cummings 2004; Gong et al. 2012). Since information exchange is accepted as an important factor in the achievement of both quality and innovation (Baldrige Quality Award 2013), the authors suggest an information exchange environment reduces the negative influence of an innovative climate on quality performance and of a quality climate on radical innovative performance.

The information exchange climate encourages behaviors that involve both giving and taking information that can be used as raw material for the generation of better and also new responses through synthesis or recombination (Amabile 2000; Gong et el. 2012). Different employees may have different information, knowledge, and perspectives regarding work issues. Through the exchange of information with others, employees accumulate informational resources, improve their knowledge bases, refine and test ideas for resolving problems or for tapping into opportunities, and go beyond their "regular work" to develop new ideas (Grant and Ashford 2008; Huber 1991).

The authors suggest when the information exchange climate is high, the innovation climate will be synergetic with quality performance, leading to a situation in which the innovation climate supports quality performance. This is because information exchange with other employees may identify problems that provide opportunities for quality outcomes. Information synergy broadens the innovation climate to include not only the search for new knowledge but also the elaboration and use of existing knowledge important for achieving quality performance. For example, employees who are focusing on innovation may apply acquired information to quality aspects of the elimination of variations.

When the information exchange climate is low, the innovation climate will be less synergetic with quality performance, leading to a situation in which the innovation climate harms quality performance. In a low information exchange climate, employees understand that the use of discipline-specific information is encouraged and that there is no support for fertilization by other aspects of data and knowledge. Employees refer to their working domain's information and resources and lack additional input. The lack of information leads to a situation in which employees perceive that divergent approaches and disagreements based on different discipline perspectives are not supportive of their objectives and thus are not acceptable (Blank and Naveh 2012). Thus, the authors hypothesize:

- *Hypothesis 3: An information exchange climate moderates the relationship between the innovation climate and quality performance so a higher level of innovation climate is associated with higher quality performance when the information exchange climate is high; however, when the information exchange climate is low, a higher level of innovation climate is associated with lower quality performance.*

In addition, the authors hypothesize that a high information exchange climate converts the negative effect of the quality climate on radical innovative performance into a positive one. The information exchange climate allows the sharing of information and ideas, which is a viable source of divergent thinking and innovation (Hulsheger, Anderson, and Salgado 2009). Thus, an information exchange climate expands the quality climate to emphasize not only the use of existing knowledge but also to involve activities such as the search for new knowledge and novel approaches to problem solving, which are relevant to radical innovation performance. An exchange information climate may provide the team with inspiration with regard to quality problems or opportunities that otherwise are not recognized. Employees are exposed to different ideas and ways of thinking that trigger the use of broader categories and the generation of more divergent solutions (Kanter 1988).

When the information exchange climate is low, activities associated with the quality aspects of low risk taking and stable routines and processes would eliminate, rather than be transferred to, the synergy that goes beyond routines and common assumptions. Thus, the authors hypothesize:

- *Hypothesis 4: The information exchange climate moderates the relationship between a quality climate and radical innovative performance so a higher level of quality climate is associated with higher radical innovative performance when the information exchange climate is high; however, when the information exchange climate is low, a higher level of quality climate is associated with lower radical innovative performance.*

METHODS

Sample

The authors distributed independent- and control-variable questionnaires to team members of 35 departments in four large high-tech electronics companies involved in software programming research and development. There were a total of 105 team members. This constitutes a response rate of 89 percent: 22 departments (59 members) in one organization, three departments (12 members) in another organization, three departments (12 members) in the third organization, and seven departments (22 team members) in the fourth organization. The number of respondents in each department ranged from two to five. The proportion of men among the respondents was 67 percent. The mean age was 32.7 years (standard deviation [SD] = 7). In addition, 84 department managers replied to the dependent-variable questionnaire (two to three responders in each department). In order to verify the source of data for the independent- and dependent-variable questionnaire, and thus eliminate a common-source bias, the authors did not ask department managers to reply to the independent-variable questionnaires.

Measurements

All questions included responses in the form of a seven-point Likert scale ranging from 1 (to a very slight

extent) to 7 (to a very large extent). The questionnaires were sent to the respondents via an Internet link.

Independent variables Team members were asked to rate the extent to which the statements provided thereafter characterize their department's work. The *quality climate* was measured using three items drawn on the conceptualization suggested by Naveh and Erez (2004): "We get feedback on reaching quality goals," "We work according to rules and procedures," and "We receive rewards on quality work."

The *innovation climate* was measured using four items drawn on the conceptualization suggested by Miron, Erez, and Naveh (2004) and Miron-Spektor and colleagues (2011): "Innovation goals are set and clear," "We have free time to innovate," "There is budget for implementing new ideas," and "The reward system refers to innovation."

The *information exchange climat*e was assessed using four items drawn from Subramaniam and Youndt (2005). "Information is communicated," "We share information," "We exchange ideas with employees from different areas," and "We are encouraged to share our expertise."

Control variables Department size and employee's number of years in the organization were used as control variables.

Dependent variables *Quality performance* was assessed by a three-item questionnaire drawn on Naveh and Erez (2004) and Miron, Erez, and Naveh (2004): "In this department:" "Products meet the required quality," "Customers are satisfied with the quality level provided," and "Failures are detected after development completion" (in the analysis, this items was reverse scored).

Radical innovative performance was measured by a four-item questionnaire based on Gatignon et al. (2002) and Subramaniam and Youndt (2005). "To what extent do the following statements characterize your department?" "Products include new concepts and principles," "Products are fundamentally different from that which exists in the market," "Products include new technologies," "Products present a unique solution," and "Products provide an upscale performance."

In order to demonstrate inter-rater reliability regarding the dependent variables, the authors calculated the correlation between the managers' scores for the dependent variables of quality performance and radical innovative performance that were satisfied ($r = 0.89$, $r = 0.80$, respectively).

RESULTS

Construct Validation

To test the structure of the independent and dependent variables, the authors conducted a confirmatory factor analysis (CFA) using SAS's 9.3 CALIS procedure on the individual level of analysis. The analysis was performed on variance-covariance matrices with pairwise deletion of missing values. The authors employed a maximum-likelihood estimation method with robust standard errors together with the Satorra-Bentler rescaled chi-square statistic (Satorra and Bentler 1994).

Independent variables The quality, innovation, and information exchange climates' CFA yielded an acceptable fit level (Hu and Bentler 1999): $\chi^2(10, N = 105) = 87.1$, $p = 0.01$, non-normal fit index (NNFI) = 0.95, CFI = 0.95, and root mean square error of approximation (RMSEA) = 0.07. All the standardized factor loadings in the model were greater than 0.65 (the majority of the loadings were between 0.75 and 0.85).

Dependent variables The quality performance's and radical innovative performance's CFA also yielded an acceptable fit level (Hu and Bentler 1999): $\chi^2(7, N = 84) = 34.7$, $p = 0.01$, NNFI = 0.99, CFI = 0.99, and RMSEA = 0.06. All the standardized factor loadings in the model were greater than 0.75 (the majority of the loadings were between 0.80 and 0.97).

The Alpha-Cronbach coefficients were as follows: quality climate $\alpha = 0.74$, innovation climate $\alpha = 0.85$, information exchange climate $\alpha = 0.88$, quality performance $\alpha = 0.94$, and radical innovative performance $\alpha = 0.97$.

Level of Analysis

The independent variables of quality climate, innovation climate, and information exchange climate, and the two dependent variables of quality

performance and radical innovative performance, were considered to be group-level variables. That is, they reflect events occurring in the department that are shared or experienced by all individuals in the specific department (Kozlowski and Klein 2000). In order to justify the aggregation of the individual responses to the average department level, one must justify a within-department agreement (i.e., the r_{wg} agreement index; James, Demaree, and Wolf 1993). In addition, intraclass correlations (ICCs) indicate whether the measurements are sufficiently reliable to model effects at the department level (Bliese 2000). The quality climate, innovation climate, and information exchange climate scales exhibited a sufficiently high average agreement coefficient (mean $r_{wg} = 0.69$, 0.73, 0.67, respectively). The between-department effects based on the results of one-way analyses of variance (ANOVA) were significant at $p < 0.05$ for the three climates measured, demonstrating that a significant proportion of the variance in individual responses can be accounted for by department membership (James, Demaree, and Wolf 1984). ICCs were adequate: ICC(1) = 0.26, 0.59, 0.32, and ICC(2) = 0.51, 0.85, and 0.58 respectively, $p < 0.05$. These statistics justified aggregation of the three independent variables to the departmental level (Bliese 2000). Therefore, the authors calculated the mean score of each scale for each department by averaging the corresponding employees' ratings and assigning each department its mean score.

The scales of the dependent variables, quality performance, and radical innovative performance exhibited a high agreement coefficient ($r_{wg} = 0.81$, 0.63, respectively). ICCs indicated that the dependent-variable measurements were sufficiently reliable to model effects at the team level (ICC(1) = 0.20, 0.22; ICC(2) = 0.39, 0.42, respectively, $p < 0.05$).

Table 1 Means, standard deviations, and correlations[a]

Variable	Mean	S.D.	1	2	3	4
1. Innovation climate	3.12	1.13				
2. Quality climate	4.32	0.97	0.45**			
3. Information exchange climate	4.34	1.05	0.41*	0.38*		
4. Quality performance	5.55	0.63	0.16	0.23*	0.32*	
5. Radical innovative performance	4.54	0.78	0.21^{+}	–0.11	0.14	0.21

[a] At the department level.
n = 35, $^{+}p < 0.1$, $^{*}p < 0.05$, $^{**}p < 0.01$

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Because of the data's multilevel nested structure (a department within an organization), the authors used a mixed-model data analysis method. Mixed models take into account departments within one organization may be more similar to one another than to departments in other organizations (Raudenbush and Bryk 2002). In order to test their hypotheses, the authors used the SAS MIXED procedure (Littell et al. 2006; SAS GLIMMIX Manual 2006) that suits statistical models with nonindependence of observations.

The analysis begins by fitting an unconditional null model to estimate the total systematic variance in the dependent variable (Raudenbush and Bryk 2002). This analysis clarifies how much variance resides within and between organizations and also serves as a foundation for later analyses. To effectively partial out these organizations' variances, thereby eliminating the potential lack of teams' independence, the authors dummy-coded for organizations (from 1 to 4). Using MIXED models, the authors regressed quality performance, and in a separate model, radical innovative performance on organizations.

To test their hypotheses, the authors regressed two models—one on quality performance and a second one on radical innovative performance—on the variables: quality climate, innovation climate, information exchange climate, and the three two-way interaction of quality climate by innovation climate, innovation climate by information exchange climate, and quality climate by information exchange climate, and the control variables. Since the control variables were not significant and had a near-zero magnitude, insignificant effect, the authors again regressed the two models

Hypothesis Testing

Table 1 summarizes means, standard deviations, and correlations among the variables.

Table 2 Results of hierarchical linear model analyses

Variable	Model 1: Quality performance	Model 2: Radical innovative performance
Intercept	3.54 (2.24)	7.57* (2.33)
Innovation climate	–1.85* (0.96)	–0.27 (0.91)
Quality climate	1.89* (0.90)	–0.30 (0.91)
Information exchange climate	0.39 (0.93)	–0.62 (0.86)
Innovation climate * Quality climate	–0.13 (0.15)	–0.19 (0.14)
Innovation climate * Information exchange climate	0.56^{+} (0.30)	–0.49^{+} (0.28)
Quality climate * Information exchange climate	–0.44 (0.31)	0.56* (0.29)

Notes: Coefficient estimate with standard error in parentheses. n =35, $^{+}p < 0.1$, $^{*}p < 0.05$, $^{**}p < 0.01$

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Figure 1 Quality performance as a function of the level of innovation climate and information exchange climate

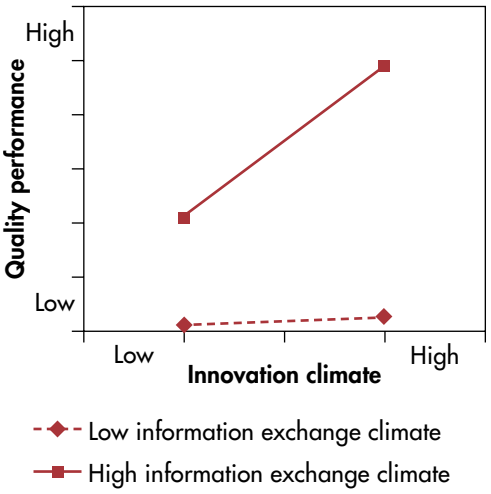

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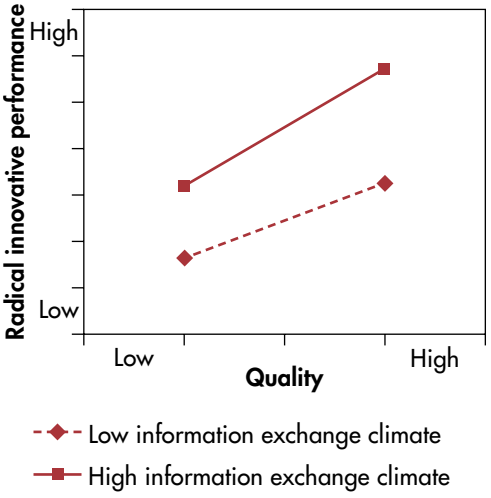
Figure 2 Radical innovative performance as a function of the level of quality climate and information exchange climate



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without the control variables (Cohen 1988; see Model 1 and Model 2, Table 2).

The results of Model 1 demonstrated a significant negative main effect for innovation climate on quality performance, which supported Hypothesis 1. The results of Model 2 demonstrated quality climate did not have a significant main effect on radical innovative performance, and thus Hypothesis 2 was not supported.

The results of Model 1 demonstrated a significant interaction between innovation climate and information exchange climate on quality performance. To understand the nature of the significant interaction, the authors followed the graphing method outlined by Aiken and West (1991) (high and low are +/– 1 SD; see Figure 1).

Figure 1 shows higher levels of innovation climate were positively associated with higher quality performance when the information exchange climate was high rather than low. The innovation climate improved quality performance when the information exchange climate was high, while quality performance was significantly low when the information exchange climate was low. This confirmed Hypothesis 3.

The interaction between quality climate and information exchange climate on radical innovative performance was significant (Model 2). To understand the nature of the significant interaction, again, the authors followed the graphing method outlined by Aiken and West (1991) (high and low are +/– 1 SD; see Figure 2).

Figure 2 shows higher levels of quality climate were positively associated with higher radical innovative

performance when the information exchange climate was high rather than low. A quality climate improved radical innovative performance when the information exchange climate was high. This confirmed Hypothesis 4.

DISCUSSION

This study contributes to quality management theory, and more specifically, to the authors' understanding of the relationship between quality and innovation. This study deals with an existing challenge in the field of quality management—whether quality and innovation can be balanced, and how. Traditional quality management theory and quality practitioners focus on keeping rules and procedures and decreasing variations, but they are also committed to innovation, which is about breaking the rules, exploring, and experimenting. The authors' findings suggest that emphasis on an innovation climate indeed harmed quality performance, as hypothesized; however, when the information exchange climate was high, the innovation climate significantly improved quality performance. The authors found the quality climate, in contradiction with a line of traditional arguments, enhanced radical innovative performance. When the information exchange climate was high, the quality climate significantly improved radical innovative performance compared to a situation in which the information exchange climate was low.

The quality revolution started by challenging the commonly accepted perception that quantity and quality, or quality and economic efficiency, contradict each other and cannot be achieved together. By means of joint research and practical efforts, this dispute was resolved with a clear conclusion that quality has a positive influence on a business' economic efficiency and that quality and quantity go together (Naveh and Erez 2004). This conclusion put in motion quality initiatives in many organizations. Recently, radical innovation has been positioned at the heart of many successful businesses, and the emphasis on quality has again been called into question with regard to its contribution to the innovative performance of organizations. Thus, at this time quality management literature needs to suggest a theory that practitioners can apply and follow in order to improve their organizations' performances in today's business economy in which innovation is as important as quality.

A line of literature (mostly regarding business strategy) strongly suggests that quality harms radical innovation (Benner and Tushman 2002; Lavie, Stettner, and Tushman 2010). Adopting such a point of view may have an important impact on quality management since it suggests how organizations should manage their quality systems. For example, adapting an ambidextrous approach to the separation of activities supports innovation and quality, and the isolation of research and development units from quality engineering units (Miron-Spektor, Erez, and Naveh 2011). However, the authors suggest this line of literature came to its conclusion without taking into consideration three main aspects they investigated within the current study.

First, the literature on innovation relates mainly to innovative performance and neglects quality performance. In the current study the authors related to both types of performance, because the issue is not only that quality-oriented organizational activity may harm radical innovative performance, but also organizational activity that supports innovation may harm quality performance. Their results demonstrated the quality climate did not have a negative influence on radical innovation performance. Thus, the concern of earlier studies about the contradictory effects of quality and innovation is more related to quality performance than to radical innovative performance. This result was not identified in earlier studies because they did not relate to quality performance.

Second, earlier studies did not pay enough attention to possible moderators that may balance the tension between quality and innovation. In this study, the authors demonstrated the quality climate positively influences innovative performance when the information exchange climate is either low or high—a finding that was not suggested by much of the earlier research (Benner and Tushman 2002; Lavie, Stettner, and Tushman 2010). However, there is a major difference in the level of radical innovative performance when the level of information exchange is low

compared to high (see Figure 2). The positive effect of the quality climate on innovative performance is significantly higher when the information exchange climate is high rather than low. Thus, it may be assumed this major gap between the level of radical innovative performance when the level of information exchange is low as opposed to high led researchers to conclude the quality climate harms radical innovation performance. Also, in the current study the authors demonstrated the powerful influence of an information exchange climate that enabled the conversion of the innovation climate's negative influence on quality performance into a positive one when the level of information exchange was high. Thus, there is no reason for quality professionals to have concerns about the influence of innovation on quality as long as the information exchange climate is high.

Third, earlier studies relate to the level of implementation of management practices directly related to quality or innovation, for example, by asking quality managers about the practices the organization implements (for example, Naveh and Marcus 2005). In this study the authors benefit from the use of the notion of climate, which is a powerful concept for forecasting performance (Katz-Navon, Naveh, and Stern 2005). Moreover, climate refers to the perceptions of employees about the aspects that are important in their units, which may be a more accurate way to describe what is really going on in the unit and eliminate rhetoric related to management-implemented management practices.

Limitations and Future Research

Thirty-five departments participated in the study. There were several respondents in each department so the sources of the dependent and independent measurements were different, which improved the authors' trust in the results since the common-source bias was eliminated. While future studies can benefit from a larger number of teams, the quantity of departments included in this study is an acceptable sample size in the literature (for example, Naveh and Erez 2004). Moreover, this number of departments provided enough statistical power to test the hypotheses (i.e., the probability that the test will reject the null hypothesis when the alternative hypothesis is true). The authors met the most commonly used criteria of probabilities of 0.05 with a statistical power of about 75 percent. The authors supported their hypotheses using a relatively low number of departments (i.e., a more difficult condition to support hypotheses), which suggests that the evidence that their arguments really exist is good. Future studies can also benefit from testing their hypotheses in other sectors.

All the departments were from high-tech electronics companies involved in software programming research and development, which helped the authors avoid potential confounding factors. Nevertheless, further research in different industries is needed in order to strengthen the generalizability or reveal the boundary conditions of their findings.

Researchers in the field of quality management still have a great deal of work to do to advance the understanding of how to enhance both quality and radical innovations in organizations and how quality and innovation can mutually benefit from simultaneous implementation. This study opens a new theoretical direction that attempts to explain the balance between quality and innovation using climate theory and the notion of information exchange.

Practical Implementation

This study's results have important practical implications since managers are interested in improving their organizations' radical innovativeness; nevertheless, the current literature on how to balance innovation and quality may confuse them with its inconsistencies. They read that quality harms radical innovative performance and that innovation and quality activities should be separated in time and place. The authors' research approach offers an explanation for earlier contradictory results and shows practitioners that quality and innovation do not harm each other. Quality managers can bring top management better answers about how the quality system should be developed.

The authors' study supports Michael Dell's notion that "At Dell, innovation is about taking risks and

learning from failure" (Wynett et al. 2002). Also, Toyota's recent quality difficulties manifested in recalls were explained by their top management as originating in the unsuccessful management of the quality-innovation tension. Toyota's CEO also explained their difficulties concerning the flow of information, for example, that it may take a few months for field problems and customer complaints to reach Toyota's headquarters in Japan. The authors' study brings empirical evidence about the identification of such difficulty and suggests the important influence of the exchange of information. The study provides a clear and simple integrated message for managers: Managers should be less concerned with harming their organization's radical innovativeness rather than with damaging its quality performance. The authors found when the information exchange climate was low, the quality climate still had a positive influence on radical innovative performance; however, this was not the case with the influence of the innovative climate on quality performance. Encouraging an information exchange climate is a key factor in enhancing radical innovative performance and maintaining quality performance.

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BIOGRAPHIES

Tali Hadasa Blank is a postdoctoral student at the Faculty of Industrial Engineering and Management, Technion-Israel Institute of Technology, where she received her doctorate. Her research interests include radical innovation within teams, organizational and team learning, and technology entrepreneurship. She can be reached by email at hadasa@tx.technion.ac.il.

Eitan Naveh is an associate professor at the Faculty of Industrial Engineering and Management, Technion-Israel Institute of Technology, where he received his doctor of science degree. His research interests include integration between engineering and management aspects in quality assurance, innovation, and standardization in product development, and implementation of industrial engineering methods in healthcare. Naveh can be reached by email at naveh@ie.technion.ac.il.

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