ANNOTATED BIBLIOGRAPHY

SELECT READINGS FOR TEAM SCIENCE

ANNOTATED BIBILIOGRAPHY

(links are active**)**

General Reviews, Effectiveness Studies, Meta-Analyses

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Abbott, J.B., Boyd, N.G., & Miles, G. (2006). Does type of team matter? An investigation of the relationships between job characteristics and outcomes within a team-based environment. *Journal of Social Psychology, 146*(4), 485-507.

This study was to enhance the understanding of how the use of different types of teams relates to employee attitudes. The relationship between team type and job content,was measured using the Job Characteristics Mode dimensions. The study found that job characteristics mediate the relationship between team type and team commitment and partially mediate the relationship between team type and satisfaction with team processes and activities.

Antoni, C., & Hertel, G. (2009). Team processes, their antecedents and consequences: Implications for different types of teamwork. *European Journal of Work & Organizational Psychology, 18(3),* 253-266.

This review discusses the four studies in this issue concerning mediation of team design and team context variables on team effectiveness by team process variables. The goal is to explain why certain groups are working successfully while others don't. Although four studies differ in their focus, they all describe self-regulation processes in or of teams, demonstrating that self-regulation is important for team effectiveness and team development at the individual and team level. These studies not only illustrate the variety of potential team process variables (e.g., communication between team members, team reflexivity and self-regulation, self-leadership of team members) but also different methodological strategies to explore them.

Barrick, M.R., Stewart, G.L., Neubert, M.J., & Mount, M.K. (1998). Relating members' ability and personality to work team processes and team effectiveness. *Journal of Applied Psychology, 83(3),* 377-391.

This study examines relationships among team composition, processes and outcomes in 51 work teams. Team extraversion and emotional stability were associated with team viability through social cohesion.

Beal, D.J., Cohen, R.R., Burke, M.J. & McLendon, C. L. (2003). Cohesion and performance in groups: A meta-analytic clarification of construct relations. *Journal of Applied Psychology, 88(6),* 989-1004.

The role of components of group cohesion was investigated. Stronger correlations were found between cohesion and performance than in previous studies when performance was defined as behavior, assessed with efficiency measures, and as patterns of team workflow.

Bell, S.T. (2007). Deep level composition variables as predictor of team performance: A meta-analysis. *Journal of Applied Psychology, 92,* 595-615.

Sixty-six studies of human firm-capital relationship were conducted. Human capital relates strongly to performance, especially when the human capital is not exchangeable and when operational performance measures are used.

Campion, M.A., Papper, E.M., & Medsker, G.J. (1996). Relations between work team characteristics and effectiveness: A replication and extension. *Personnel Psychology, 49(2),* 429-452.

This study evaluates work team characteristics and effectiveness measures. Relationships were strongest for process characteristics, followed by job design and context,interdependence . Work teams that score higher on single-team identity were also higher on team characteristics and effectiveness.

Cannon, M.D., & Edmundson, A.C. (2001). Confronting failure: Antecedents and consequences of shared beliefs about failure in organizational work groups. *Journal of Organizational Behavior, 22(2),* 161-177.

This study is an empirical field study that supports the hypothesis that people hold tacit beliefs about appropriate responses to mistakes and conflict, and that these are shared within organizational work groups. These shared beliefs vary in the extent to which they take a learning approach to failure. Effective coaching, clear direction and a supportive work context influence beliefs related to failure, and that beliefs about failure influence group performance. These

suggest a theoretical model of antecedents and consequences of shared beliefs about failure in work groups.

Chiocchio, F. (2009). Cohesion and performance: A meta-analytic review of disparities between project teams, production teams, and science teams. *Small Group Research, 40(4),* 382-470.

This study is a meta-analysis of 33 cohesion—performance correlations on psychosocial determinants of performance. The study suggests that project team type (project, production, or service teams in organizational or academic setting) is a moderator of performance. Project teams in organizational and academic settings show large effect sizes and differ from other teams. Five interrelated modifiers are identified: task uncertainty, task versus outcome performance, student samples' mental representation of the project outcome, and group heterogeneity.

Choi, J.N. (2002). External activity and team effectiveness: Review and practice development. *Small Group Research, 33(2),* 181-209.

This study provides a theoretical framework that indicates when external activities enhance team effectiveness and explains how team-design features influence external activities. A relationship is proposed between external activities and team effectiveness that is moderated by structural contingency factors, including environmental characteristics, external interdependence, temporal fluctuations in external demands, and task complexity. A set of team characteristics, including team composition, group development, and leadership, also influences the level of external activities.

Chou, L.F., Wang, A.C., Wang, T.YT., Huang, M.P., & Cheng, B. (2008).Shared work values and team member effectiveness: The mediation of trustfulness and trustworthiness. *Human Relations, 61(12),* 1713-1742

This cross-level study was on a sample of 72 corporate teams found three conclusions. First, teammates' shared work values were positively related to team member performance and satisfaction with cooperation;. Second, trustworthiness mediated the relationship between shared work values and team member performance. Third, trustfulness, or how a member trusted his or

her teammates, mediated the relationship between shared work values and satisfaction with cooperation. These results supported the directional nature of interpersonal trust in team performance and satisfaction.

Cohen, S.G., & Bailey, D.E. (1997). What makes teams work: Group effectiveness research from the shop floor to the executive level. *Journal of Management*, 23(3), 239-290.
This study summarizes and reviews research team studies concerned with effectiveness. A heuristic framework depicts team effectiveness as a function of task, group, and organization design factors, environmental factors, internal processes, external processes, and group psychosocial traits. Four types of teams are discussed: work, parallel, project, and management. organized by the categories in this framework.

Cohen, S.G., Ledford, G.E., & Spreitzer, G.M. (1996). A predictive model of self-managing work team effectiveness. *Human Relations, 49,* 643-676.
A model of self-managing work team effectiveness, including performance effectiveness, employee attitudes or behavior, is presented. Four categories of variables are theorized to forecast self-managing work team effectiveness- these include group task design, encouraging supervisor behaviors, group characteristics and employee involvement context. Each of these categories of variables is based on a theoretical perspective.

Connaughton, S.L., & Shuffler, M. (2007). Multinational and multicultural distributed teams – A review and future agenda. *Small Group Research, 38(3),* 387-412.
This article reviews and critiques multinational, multicultural (MNMC) distributed teams are teams that span multiple geographic, temporal, and cultural boundaries. The ways that scholars have conceptualized culture in this research are discussed as well as the role that distribution is found to play in these teams, and provides a research agenda.

DeChurch, L.A., & Messmer-Magnus, J.R. (2010). The cognitive underpinnings of effective teamwork: A meta-analysis. *Journal of Applied Psychology, 95(1),* 32-53.
This study reports a meta-analysis examining relationships among cognition, behavior, motivation, and performance, and reveals there is a cognitive foundation to teamwork.

Teamwork cognition has strong positive relationships with team behavioral process, motivational states, and performance.

Delarue, A., Hootegem, G.V., Proctor, S., & Burridge, M. (2008). Team working and organizational performance: A review of survey-based research. *International Journal of Management Reviews, 10(2),* 127-148.

This is a review of survey-based research examining the contribution of teamwork to organizational performance where both teamwork and performance are quantitatively measured. Attitudinal and behavioral teamwork effectiveness represent transmission mechanisms by which organizational performance can be improved. Operational and financial teamwork are direct measures of organizational outcomes. Team working has a positive impact on all four dimensions of performance. When teamwork is combined with structural change, performance is further enhanced.

DeVine, D.J., Clayton, L.D., Phillips, J.L., Dunford, B.P., & Meliner, S.B. (1999). Teams in organizations: Prevalence, characteristics, and effectiveness. *Small Group Research, 30(6),* 678-711.

This study is a survey of the typology of organizational team types. Teams were more prevalent in organizations with multiple departments, multiple divisions, higher sales, and more employees. Interpersonal conflict was the best predictor of perceived team effectiveness. Organizations using teams generally did not support them in terms of team-level performance feedback or compensation.

Gibson, C.B., Zellmer-Bruhn, M.E., & Schwab, D.P. (2003). Team effectiveness in multinational organizations: Evaluation across contexts. *Group & Organization Management, 28(4),* 444-474.

This article describes methods, techniques, and results obtained in developing a comprehensive team effectiveness survey across multinational organizations in different geographic regions. An inductive approach to deriving dimensions of effectiveness using interview data, translation procedures with innovative bilingual pilot testing, and multiple constituency validation is presented.

Gilson, L.L., Mathieu, J.E., Shalley, C.E.& Ruddy, T.M. (2005). Creativity and standardization: Complementary or conflicting drivers of team effectiveness? *Academy of Management Journal, 48(3),* 521-531.
The relationships between creativity, standardized work practices, and effectiveness (measured as both performance and customer satisfaction) was examined among 90 empowered teams. Despite apparent contradictions, creativity and standardized procedures can be complementary. Specifically, standardization was found to moderate the relationship between creativity and both team performance and customer satisfaction.

Gully, S.M. (2002). A meta-analysis of team efficacy, potency, and performance: Interdependence and levels of analysis as moderators of observed relationships. *Journal of Applied Psychology, 87(5),* 819-832.
This study is a meta-analysis of analysis and interdependence as moderators of observed relationships between task-specific team-efficacy, generalized potency, and performance. The study finds that relationships are moderated by level of analysis, with a stronger effect size at the team level. Both team-efficacy and potency had positive relationships with performance.

Guzzo, R.A., & Dickson, M.W. (1996). Teams in organizations: Recent research on performance and effectiveness. *Annual Review of Psychology, 47,* 307-338.
This study examines team research, giving special emphasis to factors that influence team effectiveness in organizations. Performance-relevant factors are examined including group composition, cohesiveness, and motivation. This study provide some of the strongest support for the value of teams to organizational effectiveness.

Hackman, J.R. (1987). The design of work teams. In J.W. Lorsch (Ed.), *Handbook of organizational behavior* (pp. 315-342). Englewood Cliffs, NJ: Prentice-Hall.
This chapter assesses what we do know about the design and management of workgroups, provides a conceptual model for integrating and extending that knowledge. It offers some action guidelines for structuring and supporting groups in contemporary organizations.

Hackman, J.R. (1990). *Groups that work (and those that don't): Creating conditions for effective teamwork.* San Francisco: Jossey-Bass.

This book explores the design and leadership of groups, providing detailed descriptions of twenty-seven diverse work groups--including task forces, top management groups, production teams, and customer service teams--to offer insights into what factors affect group productivity, and what leaders and group members can do to improve work group effectiveness.

Hackman, J.R., & Coutu, D. (2009). Why teams don't work. *Harvard Business Review, 87,* 99-105.

In this interview, Dr. Hackman points to research that consistently shows that teams underperform despite receiving extra resources. Leaders need to be ruthless about defining teams, keeping them small (fewer than 10 members), and forcing some individuals off (team destroyers). The leader also must set a compelling direction for the team. Research reveals that new teams make 50% more mistakes than established teams. To avoid complacency, every team needs a deviant--someone who is willing to make waves and open up the group to more ideas. Leaders must be disciplined about how a team is set up and managed, instituting the right support systems, and providing coaching in group processes, to increase the likelihood that a team will be great.

Hackman, R. (2002). *Leading teams: Setting the stage for great performances.* Boston, MA: Harvard Business School Press.

This book integrates much of Hackman's work on groups and examines those conditions that should lead to more effective teamwork in different organizations. Part I provides an introduction to his model of team effectiveness, including an insightful discussion of how one should define ''team effectiveness.'' Part II discusses five enabling conditions for team effectiveness. In Part III, Hackman explicitly deals with the role of leaders in attempting to facilitate effective teams.

Henttonenik. (2010). Exploring social networks on the team level: A review of the empirical literature. *Journal of Engineering and Technology Management, 27(1/2),* 74-109.

Academic understanding of the social networks as a determinant of team effectiveness is limited. This paper reviews the impact of the structural characteristics of social networks on team effectiveness. Research findings for student teams, innovation and R&D teams, and other organisational groups are presented and compared.

Higgs, M. (2006). What makes for top team success? A study to identify factors associated with successful performance of senior management teams. *Irish Journal of Management, 27(2),* 161-188.

This study presents the results of a research on senior management teams. The importance of the personality mixes in a team and the processes they employ in working together, in determining performance outcomes was identified. The results reinforce the benefits of successful team processes described in Higgs and Dulewicz's studies of board processes. This finding indicates the potential value of process intervention as a means of developing team performance.

Huub, J.M. (2000). Reconsidering our team effectiveness models: A call for an integrative paradigm. In D.A. Johnson & S.T. Beyerlein (Eds.), *Advances in interdisciplinary studies of work teams* (Vol. 7, pp. 179-185).Bingley, UK: Emerald Group Publishing, Ltd.

This chapter broaden the view of team effectiveness factors by describing approaches using an integrative approach from adaptive structuration theory.

Humphrey, S.E., Morgeson, F.P., & Mannor, M.J. (2009). Developing a theory of the strategic core of teams: A role composition model of team performance. *Journal of Applied Psychology, 94(1),* 48-61.

This study examines role composition, where the characteristics of a set of role holders impacts team effectiveness, to develop a theory of the strategic core of teams. Although experience and job skills are important predictors of team performance, the relationships are significantly stronger when the characteristics are possessed by core role holders. Teams that invest in these core roles are able to leverage significantly improved performance.

Hyatt, D.E., & Ruddy, T.M. (1997). An examination of the relationship between work group characteristics and performance: Once more into the breech. *Personnel Psychology, 50(3),* 553-585.

This study investigates the relationship between a measure of work group characteristics and measures of group performance. The findings indicate that ensuring the group receives the support necessary to succeed as a group (information, resources, and rewards that encourage group performance instead of individual performance) may be more important than ensuring group members are cohesive. In addition, trust, process ownership, proactive behavior and organizational awareness all showed significant correlations with performance measures.

Ilgen, D.R., Hollenbeck, J.R., Johnson, M., & Jandt, D. (2005). Teams in organizations: From input-process-output model to IMDI models. *Annual Review of Psychology, 56,* 517-540.

This review examines organizational teams existing over time organized on time and the nature of mechanisms between team inputs and outcomes. Theoretical and methodological work is discussed advance understanding of teams as complex, multilevel systems that function over time, tasks, and contexts.

Janz, B.D., Colquitt, J.A., & Noe, R.A. (1997). Knowledge worker team effectiveness: The role of autonomy, interdependence, team development, and contextual support variables. *Personnel Psychology, 50(4),* 877-904.

Interactions among design, process, and contextual support factors have important implications for knowledge worker team effectiveness. The positive relationship between team autonomy and team job motivation was reduced as teams worked under more interdependent conditions. This interaction effect also varied across the types of autonomy the team was given. The relationship between job motivation and team process behaviors (helping, sharing, and innovating) was more positive in teams who were developmentalty mature. Process behaviors were positively related to effectiveness, but those relationships became more positive in the presence of high-quality goals and efficient information transmission.

Katzenbach, J.R., & Smith, D.K. (2003). *The wisdom of teams.* New York: Harper Collins Publishers.
This book considers what separates effective from ineffective teams, and how organizations can tap the effectiveness of teams. The authors emphasize teams as an important part of a three part cycle leading to a high-performance organization: a) shareholders who provide opportunities, b) employees who deliver value, and c) customers who generate returns. The performance targets in the high-performance organization are multidimensional, impacting all three cyclic contributors. The authors present a Team Performance Curve that correlates team effectiveness against the performance impact of the team, resulting in the organizational path from working group, to pseudo-team, to potential team, to real team, and ultimately to high-performance team

Kerr, N.L., & Tindale, S.R. (2004). Group performance and decision making. *Annual Review Psychology,* 623-655.
This paper focuses on research on group performance and decision making. Recent trends in group performance research have found that process gains as well as losses are possible, and both are frequently explained by situational and procedural contexts that affect motivation and resource coordination. Classical brainstorming, group goal setting, stress and group performance and relatively new collective induction areas are reviewed. Group decision making research has focused on preference combination for continuous response distributions and group information processing. New approaches (e.g., group-level signal detection) and traditional topics (e.g., groupthink) are discussed.

Kozlowski, S.W.J., & Ilgen, D.R. (2006). Enhancing the effectiveness of work groups and teams. *Psychological Science in the Public Interest, 7(3),* 77-124.
This study examines issues on how to improve team effectiveness. Concentration is placed on cognitive, motivational/affective, and behavioral team processes—processes that enable team members to combine their resources to resolve task demands. The authors identify interventions, that can shape team processes and thereby provide tools and applications that can improve team effectiveness.

Lawler, E.E. (2001). *Organizing for high performance.* San Francisco: Jossey Bass.

Practical information collected from the USC Center for Effective Organizations on how Fortune 1000 companies have implemented organizational effectiveness programs. These include employee involvement, total quality management, and reengineering. Also discussed is how improved knowledge management and information technology is incorporated into their organizations.

LePine, J.A., Picolo, R.F., Jackson, C.L., Mathie, J. E., Saul, J.R. (2008). A meta-analysis of teamwork processes: Tests of a multidimensional model and relationships with team effectiveness criteria. *Personnel Psychology, 61(2),* 273-307.
Teamwork processes have positive relationships with team performance and member satisfaction, and that the relationships are similar across the teamwork dimensions and levels of process specificity. Three intermediate-level teamwork processes are identified that positively relate to cohesion and potency. Relationships among teamwork processes and team performance are dependent on task interdependence and team size.

Lim, B.C., & Klein, K.J. (2006). Team mental models and team performance: A field study of the effects of team mental model similarity and accuracy. *Journal of Organizational Behavior, 27,* 403-413.
This is a field study of 71 action teams that examines the relationship between team mental model similarity, accuracy and performance. Team members' taskwork mental models (describing team procedures, tasks, and equipment) and teamwork mental models (describing team interaction processes) and team performance as evaluated by expert team assessment raters. Both taskwork mental model and teamwork mental model similarity predicted team performance.

Marks, M.A., Mathieu, J.E., & Zaccaro, S.J. (2001). A temporally based framework and taxonomy of team processes. *Academy of Management Review, 26(3),* 356-376.
Team processes are described in the context of a multiphase episodic framework related to goal accomplishment. Arguing that teams are multi-tasking units that accomplish multiple processes simultaneously and sequentially to accomplish goal related tasks. A taxonomy of time-based conceptual framework is proposed.

Mathieu, J.E., Maynard, M.T., Rapp, T., Gilson, L. (2008). Team effectiveness 1997-2007: A review of recent advancements and a glimpse into the future. *Journal of Management, 34(3),* 410-476.
This work reviews the past decade of work in enhanced input-process-outcome framework; this framework that has evolved into an inputs-mediators-outcome time-sensitive approach. The authors suggest that a reconsideration of the typical team research investigation is warranted and call that the complexity that surrounds modern team-based organizational designs should be embraced.

McGrath, J.E., Armor, H., & Berdahl, J.L. (2000). The study of groups: Past, present, and future. *Personality and Social Psychology Review, 4(1),* 95-105.
Recent research trends have evolved to consider groups as complex, adaptive, dynamic systems. A theory of groups as complex systems is offered and some methodological and conceptual issues raised by this theory are identified. A research strategy based on theory development, computational modeling, and empirical research holds promise for illuminating the dynamic processes underlying the emergence of complexity and the ongoing balance of continuity and group change.

Mohrman, S.A., Cohen, S.G., & Mohrman, A.M. *Designing team based organizations.* San Francisco: Jossey Bass.
This book presents how to design and implement knowledge team-based organizations with practical examples.

Oh, H.S., Chung, M.H., Labianca, G. (2004). Group social capital and group effectiveness: The role of informal socializing ties. *Academy of Management Journal, 47(6),* 860-875.
This study introduces the concept of group social capital, a term describing the configuration of group members' social relationships within a group and in the social structure of a broader organization, and tests the proposition that group effectiveness is maximized via optimal different conduit configurations. These conduits include intragroup closure relationships and bridging relationships that span vertical and horizontal intergroup boundaries.

Pince, M.I.P., Martinez, A.M.R., & Martinez, L.L. (2008). Teams in organizations: A review on team effectiveness. *Team Performance Management, 14(1/2),* 7-21.

This paper review the research on organizational teams to define effectiveness and determine team-level measurement strategies. Four team types are analyzed: work team, parallel team, project team and management team. The authors conclude that effectiveness includes dimensions of performance, attitudinal outcomes, and behavioural outcomes. Team-level measurement should include multiple data sources, consensus and aggregation methods, observation and use of key informants.

Salas, E., Rozelle, D., Mullen, B., & Driskell, J.E. (1999). The effects of team building on performance. *Small Group Research, 30(3),* 309-329.

This study examines the effects of team building on their performance. Overall, there was no net significant effect of team building on performance. Interventions emphasizing role clarification were more likely to increase performance, whereas interventions that emphasized goal setting, problem solving, or interpersonal relations were no more likely to render an increase or decrease in performance. The effects of team building decreased as a function of the size of the team.

Statkovic, A.D., Dongseop, L., & Nyberg, A.J. (2009). Collective efficacy, group potency, and group performance: Meta-analysis of their relationships and test of a mediation model. *Journal of Applied Psychology, 94(3),* 814-828.

This study is a large meta-analysis that found collective efficacy was significantly related to group performance. Moreover, group potency was related to group performance and to collective efficacy. When tested in a structural equation modeling analysis based on meta-analytic findings, collective efficacy fully mediated the relationship between group potency and group performance. A probability of success index was developed.

Stewart, G.L., & Barrick, M.R. (2000). Team structure and performance: Assessing the mediating role of intrateam process and the moderating role of task type. *Academy of Management Journal, 43(2),* 135-148.

This study uses production team data to test hypotheses related to team structure. For teams engaged primarily in conceptual tasks, interdependence exhibited a union-shaped relationship with team performance, whereas team self-leadership exhibited a positive, linear relationship with performance. This study illustrates how relationships between structural characteristics and a team's performance can be moderated by its task.

Sundstrom, E., DeMuse, K.P., & Futrall, D. (1990). Work teams: Applications and effectiveness. *American Psychologist*, 45(2), 120-133.
This article uses an ecological approach to analyze factors in the effectiveness of work teams—small groups of interdependent individuals who share responsibility for outcomes. Applications include advice and involvement; production and service; and action and negotiation. An analytic framework depicts team effectiveness as interdependent with organizational context, boundaries, and team development. Key context factors include (a) organizational culture, (b) technology and task design, (c) mission clarity, (d) autonomy, (e) rewards, (f) performance feedback, (g) training/consultation, and (h) physical environment. Team boundaries may mediate the impact of organizational context on team development. Effectiveness depends on organizational context and boundaries as much as on internal processes.

Sundstrom, E., McIntyre, M., Halfhill, T., & Richards, H. (2000). Work groups: From the Hawthorne studies to work teams of the 1990s and beyond. *Group Dynamics Theory, Research, and Practice, 4(1),* 44-67.
This article traces applications of work groups and related empirical research through the 1990s addressing: What identifying features have field researchers used in operationally defining work groups? What research strategies have been used, and to address what kinds of questions? What criteria of work group effectiveness has the field research measured, using what sources of data? What variables have researchers sought to link with measures of work group effectiveness?

Tesluk, P.E., Matthieu, I.E. (1999). Overcoming roadblocks to effectiveness: Incorporating management of performance barriers into models of work group effectiveness. *Journal of Applied Psychology, 84(2),* 200-217.

This study was an empiric investigation of how work groups manage performance barriers in their immediate environment to achieve effectiveness. Performance constraints were found to have a direct negative relationship with performance. Through problem-management strategies, groups were able to minimize these effects both directly and indirectly by maintaining cohesion under more frequent and severe performance problems. In turn, self-management, leadership, and teamwork processes were found to be related to group use of problem-management actions and strategies.

Van Knippenberg, D., DeDreu, C.K.W., & Homan, A.C. (2004). Workgroup diversity and group performance: An integrated model and research agenda. *Journal of Applied Psychology, 89(6),* 1008-1027.

This study proposes the categorization-elaboration model (CEM), a model that integrates information/decision making and social categorization perspectives on work-group diversity and performance. The CEM incorporates the view that information/decision making and social categorization interact such that intergroup biases flowing from social categorization disrupt the processing of task-relevant information.

Team Development, Evolution, Teamwork Behavior and Skills
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Arrow, H., Henry, K.B., Poole, M.S., Wheelan, S.A., & Moreland, R.L. (2005). Traces, trajectories, and timing: The temporal perspective of groups. In M.S. Poole & A.B. Hollingshead (Eds.), *Theories of small groups: Interdisciplinary perspectives* (pp. 313-368). Thousand Oaks, CA: Sage.

This chapter discusses temporal evolution of groups as systems that change across multiple time scales. The concept that groups change systematically over time, that group processess have temporal patterns, and that groups are complex systems characterized by nonlinear dynamics are developed.

Bresman, H. (2010). External learning activities and team performance: A multi-method field study. *Organization Science, 21(1),* 81-96.

This study examines the performance effects of external team learning activities. Two sets of external learning activities are examined those that allow a team to learn about its task (vicarious learning activities) and those that allow a team to learn about its context (contextual learning activities). The study finds that vicarious learning activities are more strongly associated with performance when teams engage in more internal learning activities. Vicarious learning activities in the absence of sufficient amounts of internal learning activities can hurt performance. The positive performance associated with contextual learning activities, by contrast, is unaffected by the level of internal learning activities.

Burke, C.S., Stagl, K.C., Salas, E., Pierce, L., & Kendall, D. (2006). Understanding team adaptation: A conceptual analysis and model. *Journal of Applied Psychology, 91(6),* 1189-1207.
Team adaptation and the emergent nature of team performance are defined from a multilevel, theoretical standpoint. An input-throughput-output model is advanced that illustrates phases unfolding over time that constitute the core processes and emergent states underlying team performance that contribute to team adaptation.

Buljac-Samarzic, M., Dekker-van Doorn, C.M., van Wijngaarden, J.D.H., & van Wijk, K.P. (2010). Interventions to improve team effectiveness: A systematic review. *Health Policy, 94(3),* 183-195.
This review focuses on interventions to improve team effectiveness. Three categories of interventions were identified: training, tools, and organizational interventions. Target groups were mostly multidisciplinary teams in acute care. The majority of the studies found a positive association between the intervention and non-technical team skills. Positive evidence-based results were found for Simulation training, Crew Resource Management training, Team-based training and projects on Continuous quality improvement. The study concludes that team training can improve the effectiveness of multidisciplinary teams in acute (hospital) care.

Chang, A., Duck, J., & Bordia, P. (2006). Understanding the multidimensionality of group development. *Small Group Research, 37(4),* 327-350.
Group development models differentiate on three dimensions: content, population, and path dependency. The utility of this definition space is demonstrated by using the relative positioning

of two seemingly competing group development models—the punctuated equilibrium model and the integrative model—to demonstrate their complementarity. An example of three-dimensional definition space is given to select an appropriate theoretical model for the working group.

Delavre, A., Hootegem, G.V., Proctor, S., & Burridge, M. (2008). Team working and organizational performance: A review of survey-based research. *International Journal of Management Reviews, 10(2),* 127-148.

This paper reviews recent survey-based research looking at the contribution of teamwork to organizational performance focusing on studies where teamwork and performance are directly measured. Four interrelated dimensions of teamwork effectiveness are identified: attitudinal, behavioral, operational and financial. Attitudinal and behavioral effectiveness represent transmission mechanisms by which organizational performance can be improved. Operational and financial effectiveness aprovide direct measures of organizational outcomes. The review shows that teamworking has a positive impact on all four dimensions of performance. It also reveals that, when teamwork is combined with structural change, performance can be further enhanced.

Gersick, C.J. G. (1988). Time and transition in work teams: Toward a new model of group development. *Academy of Management Journal, 31(1),* 9-41.

This paper studies the complete life-spans of eight teams and makes the finding that several project groups did not accomplish their work by progressing gradually through a universal series of stages. Instead, teams progressed in a pattern of "punctuated equilibrium," through alternating inertia and revolution in the behaviors and themes through which they approached their work. The findings also suggested that groups' progress was triggered more by members' awareness of time and deadlines than by completion of an absolute amount of work in a specific developmental stage. The authors propose a new model of group development that encompasses the timing and mechanisms of change as well as groups' dynamic relations with their contexts.

Gersick, C.J.G. (1989). Marking time: Predictable transitions in task groups. *The Academy of Management Journal, 32(2),* 274-309.

A groups attention to time and pacing is an important catalyst of progress through creative projects. This study what differences exist between pacing at the beginning and end of the allotted time. The author concludes that groups tasked with creative projects made attitudinal shifts at their temporal midpoints and discusses what happens when these midpoint transitions fail.

Gersick, C.J.G. (1991). Revolutionary change theories: A multilevel exploration of the punctuated equilibrium paradigm. *The Academy of Management Review, 16(1),* 10-36.
Organizational change can be conceptualized as a punctuated equilibrium: long periods when stable infrastructures permit only incremental adaptations alternating with brief periods of revolutionary upheaval. This article compares models from six domains to illustrate the punctuated equilibrium paradigm and show its broad applicability. Models are juxtaposed to generate new research questions about revolutionary change in organizational settings: how it is triggered, how systems function during such periods, and how it concludes.

Gilley, J.W., Morris, M.L., Waite, A.M., Carter, T., & Veliquette, A. (2010). Integrated theoretical model for building effective teams. *Advances in Developing Human Resources, 12*(1), 7-28.
This article constructs an integrated theoretical model for building effective teams based on a literature review of team building, team member selection, team development, and theoretical constructs that affect the effective team development. The authors propose a relationship model grounded teams, teamwork, and team building literature.

Gino, F., Argote, L., Miron-Spektor, E., & Todorova, G. (2010). First, get your feet wet: The effects of learning from direct and indirect experience on team creativity. *Organizational Behavior & Human Decision Processes, 111*(2), 102-115. doi:10.1016/j.obhdp.2009.11.002
This study address how prior experience influences team creativity by examining the effects of task experience acquired directly and task experience acquired vicariously from others on team creativity in a product-development task. Direct task experience leads to higher levels of team creativity and more divergent products than indirect task experience. Moreover, the difference in team creativity between direct and indirect task experience persists over time. Finally, the

authors demonstrate that teams who acquired task experience directly are more creative because they develop better transactive memory systems than teams who acquired experience vicariously.

Guzzo, R.A., Jette, R.D., & Katzell, R.A. (1985). The effects of psychologically based intervention programs on worker productivity: A meta-analysis. *Personnel Psychology, 38(2),* 275-291.

This meta-analysis showed that psychologically based organizational interventions raised worker productivity. The strength of this effect varied by type of intervention, criteria of productivity, contextual factors in organization and features of research design.

Guzzo, R.A., & Shea, G.P. (1992). Group performance and intergroup relations. In M.D. Dunnette & L. Hough (Eds.), *Handbook of industrial and organizational psychology* (Vol. 3, 2nd ed., pp. 269-313). Palo Alto, CA: Consulting Psychologists Press.

This chapter analyzes the theory for the causes and correlates of group performance using sociotechno theory, interaction process, group development, composition, goals and effects of organizational context.

Harris, T.C., & Barnes-Farrell, J.L. (1997). Components of teamwork: Impact on evaluations of contributions to work team effectiveness. *Journal of Applied Social Psychology, 27(19),* 1694-1715.

This study examined the relationship between Dickinson's (1993) components of teamwork and ratings of team members' contributions to team success. With 1 exception, all of the teamwork components significantly affected appraisals of several aspects of worker effectiveness. Furthermore, teamwork behaviors that provided direct assistance or direction to team members were specially critical.

Hoegl, M., & Gemeunden, H.G. (2001). Teamwork quality and the success of innovative projects: A theoretical concepts and empirical evidence. *Organization Science, 12(4),* 435-449.

This article develops a comprehensive concept of collaboration in teams (Teamwork Quality). Six facets in this concept- communication, coordination, balance of member contributions,

mutual support, effort and cohesion - are tested in software teams.The findings show that Teamwork Quality is significantly related to team performance rated by members, leaders and external team leaders and also is associated with team members' personal success.

Humphrey, S.E., Hollenbeck, J.R., Meyer, C.J., & Ilgen, D.A. (2007). Trait configurations in self-managed teams: A conceptual examination of the use of seeding to maximize and minimize trait variance in teams. *Journal of Applied Psychology, 92(3),* 885-892.

This paper considers theories of supplementary and complementary fit to develop a conceptual model that suggests that (a) maximization principles should be applied to extroversion variance , (b) minimization principles should be applied to conscientiousness variance, and (c) extroversion variance and conscientiousness variance interact to influence team performance. The authors present an alternative method for seeding (making team placement decisions) that can be used to maximize or minimize variance in teams.

Klein, C. Diaz Granados, D, Salas, E., Le, H., Burke, S., Lyons, R., & Goodwin, G.F. (2009). Does team building work? *Small Group Research, 40(2),* 181-222.

The article extends previous team-building meta-analysis (Salas et al, 1999) by assessing a larger database and examining broader outcomes. The impact of goal setting, interpersonal relations, problem solving, and role clarification was assessed on cognitive, affective, process, and performance outcomes. The authors conclude that team building has a positive moderate effect across all team outcomes. Team building was most strongly related to affective and process outcomes and influenced by team size.

Marks, M.A., DeChurch, L.A., Mathieu, J.E., Panzer, F.J., & Alonzo, A. (2005). Teamwork in multiteam systems. *Journal of Applied Psychology, 90(5),* 964-971.

The authors examine how networks of teams integrate their efforts to succeed collectively. Integration processes used to align efforts among multiple teams are important predictors of multiteam performance. Using a multiteam system (MTS) simulation they find that cross-team processes predicted MTS performance beyond that accounted for by within-team processes. Further, cross-team processes were more important for MTS effectiveness when there were high

cross-team interdependence demands as compared with situations in which teams could work more independently.

Morgan, B.B., Salas, E., & Glickman, A.S. (1994). An analysis of team evolution and maturation. *The Journal of General Psychology, 120(3),* 277-291.
Teams develop through a variety of alternative paths rather than a single sequence of developmental phases. These lines of thinking are integrated into a Team Evolution And Maturation (TEAM) model, which helps to understand the development of team performance. The results of an experimental investigation are presented as a preliminary test of the model's suggestion that team development is characterized by the differential maturation of taskwork and teamwork skills. Results indicate that task- and team-related activities were distinguishable in the middle phases of training, but not at the beginning and end of training.

Peslak, A., & Stanton, M. (2007). Information technology team achievement: An analysis of success factors and development of a team success model (TSM). (2007). *Team Performance Management, 13(1/2),* 21-33.

This study examines how emotions, personal processes, and team processes influence IT team success. Significant relationships were found between many factors. GPA had a positive impact on team processes, while negative emotions showed a negative correlation with team processes. Team processes and trust had positive impacts on project success/grade.

Poole, M.S. (1983). Decision development in small groups II: A comparison of two models. *Communication Monographs, 50(3),* 206-232.

This study builds on the multiple sequence model of decision development, which assumes different groups may have different sequences of phases. This study analyzes multiple decision sequences in student groups performing a ranking task and groups of physicians performing a program planning task. The results support the workability of the Multiple Sequence Descriptive System and isolated several types of conflict and idea development patterns. Analysis of these patterns suggested revisions in Bales's hypothesis of the equilibrium problem in small groups.

Poole, M.S. (1983). Decision development in small groups III: A multiple sequence model of group decision development. *Communication Monographs, 50(4),* 321-341.

This paper advocates replacing the idea that traditional models of group decision making as a series of discrete, consecutive phases by a model of continuously-developing threads of group activity. This new model conceptualizes decision development as a set of continuously evolving tracks of activity, intertwining over time. Based on previous research, this model advances a new descriptive system, which specifies (a) three tracks of group activity, (b) several types of "breakpoints" which mark changes in the development of the strands, and (c) a structural model of task accomplishment. The interrelations among the three descriptive components give a more complex and accurate picture of decision development than the phasic model. This authors generate a series of propositions that form a framework of a contingency theory of decision development in small groups.

Poole, M.S., & Roth, J. (1989). Decision development in small groups V: Test of a contingency model. *Human Communication Research, 15(4),* 549-589.

This study tested a model of the factors that influence group decision paths. Three contingency tables that indexed the nature of the group's task and group structure were used to predict the group's developmental path. The decision path properties included type of decision path, the complexity of the path, the amount of disorganized behavior the group engaged in, and the relative emphasis on various types of decision activity. Group structure variables were stronger predictors than were task variables. Results suggested that groups appeared to be much more rational in adapting their paths to the contingencies than originally thought.

Poole, M.S., & Holmes, M.E. (1995). Decision development in computer-assisted group decision making. *Human Communication Research, 22(1),* 90-127.

This study analyzes how computer technology in the form of a group decision support system (GDSS), affected how group decisions develop. The study contrasted decision paths in groups using the GDSS with groups using the same procedural structures incorporated in the GDSS manually and with groups using no procedural structures. The study suggests that the nature of

decision paths varied across the three conditions and also within conditions. The decision path types were also related to consensus change, perceived decision quality, and decision scheme satisfaction as outcomes. Decision paths that were most similar to logical normative sequences had superior outcomes.

Rousseau, V., Aube, C., & Savoie, A. (2006). Teamwork behaviors and an integration of frameworks. *Small Group Research, 37(5),* 540-570.
This article reviews the frameworks of teamwork behaviors in the literature on work teams and integrates them. The behavioral dimensions are conceptually distinguished and arranged in a hierarchical structure and connected to the task conditions under which teamwork behaviors are most likely to facilitate collective accomplishment.

Salas, E., Cooke., & Rosen, M.A. (2008). On teams, teamwork and team performance: Discoveries and developments. *Human Factors, 50(3),* 540-547.
The key discoveries and developments in team performance are highlighted. Recent discoveries that have contributed significantly to the science and practice of teams pertain to the importance and measurement of shared cognition, advances in team training, the use of synthetic task environments for research, factors influencing team effectiveness, models of team effectiveness, a multidisciplinary perspective, and training and technological interventions to improve team effectiveness.

Smith, G. (2001). Group development: A review of the literature and a commentary on future research directions. *Group Facilitation, 3(Spring),* 14-45.
This review categorizes existing group development models including Linear Progressive Models, Cyclical & Pendular Models, and Non-phasic/Hybrid Models, focusing on their commonalities. Group development is defined, and a classification framework is proposed.

Smith-Jentsch, K.A., Cannon-Bowles, J.A., Tannenbaum, S.I., & Salas, E. (2008). Guided team self-correction: Impacts on team mental models, processes, and effectiveness. *Small Group Research, 39(3),* 303-327.

This study used an empirically derived expert model of teamwork to study the effects of guided team self-correction. Findings from two studies are reported that expert model-driven guided team self-correction approach developed more accurate mental models of teamwork and demonstrated greater teamwork processes and more effective outcomes than did teams debriefed using a less participative and chronologically organized approach.

Svyantek, D.J., Goodman, S.A., Benz, L.L. & Gard, J. A. (1999). The relationship between organizational characteristics and team building success. *Journal of Business and Psychology, 14(2),* 265-283.

This meta-analysis supports the contention that team building impacts positively on workgroup productivity. The general use of meta-analyses to understand the relationship between organizational characteristics and the effects of team building on productivity measures is discussed.

Tannenbaum, S.I., Beard, R.L., & Salas, E. (1992). Team building and its influence on team effectiveness: An examination of conceptual and empirical development. In K. Kelley (Ed.), *Issues, theory, and research in industrial/organizational psychology* (pp. 117-154). Amsterdam: Elsevier Science Publishers BV.

This chapter examines team building and its influence on team effectiveness, and provides an explanation of "teams" and "team building". An input-throughput-output model of team effectiveness is presented to provide a context for examining team building interventions.

Tuckman, B.W., &Jensen, M.A. (1977). Stages of small group development revisited. *Group Organizational Studies, 2(4),* 419-427.

Published research testing Tuckman's four-stage developmental model of "forming", "storming", "norming" and "performing" was reviewed. Based on the importance to the group of a life-cycle approach, a fifth stage, "adjourning" was added to the Tuckman developmental model.

Wheelan, S., Davidson, B., & Tilin, F. (2003). Group development across time: Reality or illusion? *Small Group Research, 34(2),* 223-245.

This study investigated the relationship between the length of time that work groups had been meeting and the verbal behavior patterns and member perceptions about their groups. Members of groups that had been meeting longer made significantly less dependency and fight statements and significantly more work statements. They also perceived their groups to be functioning at higher stages of group development. Verbal behavior patterns and member perceptions vary significantly in groups of different durations.

Science of Team Science, Use of Teams in Science
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Aboelela, S.W., Merrill, J.A., Carley, K.M., & Larson, E. (2007). Social network analysis to evaluate an interdisciplinary research center. *Journal of Research Administration, 38(2),* 97-108. The growth of an interdisciplinary center was assessed using social network analysis. Specific aims were to examine the patterns of growth and interdisciplinary connectedness of the Center and to identify the social network characteristics of its productive members. Over time the social network increased in size, density, centralization, and complexity. The total degree centrality and the betweeness centrality of Center members were highly correlated to productivity. Social network techniques can be used to evaluate a center's progress, identify important indicators of leadership, identify areas of strength and need for improvement, and inform decisions on strategic direction.

Adams, J.D., Black, G.C., Clenimons, J.R., & Stephan, P.E. (2005). Scientific teams and institutional collaborations: Evidence from U.S. universities. *Research Policy, 34(3),* 259-285. This paper explores recent trends in the size of scientific teams and in institutional collaborations in 2.4 million scientific papers between 1981–1999. Team size increased by 50% over the 19-year period. An accelerating trend towards more geographically dispersed scientific teams is seen at the start of the 1990s. This acceleration suggests a sharp decline in the cost of collaboration. Scientists have earned prestigious awards participate in larger teams, as do departments that have larger amounts of federal funding. Scientific output and influence increase with team size and that influence rises along with institutional collaborations. Scientific productivity increases with the scientific division of labor.

Blansett, K. (2003). Creativity in science teams. In D.A. Johnson & S.T. Beyerlein (Eds.), *Advances in interdisciplinary studies of work teams* (Vol. 9, pp. 215-232). Bingley, UK: Emerald Group Publishing Ltd.

Generating scientific breakthrough discoveries is a creative process that can be helped or hindered by individual and contextual factors. Because of the complexity and scope of the work, much scientific investigation is done in teams; thus, team dynamics as well as individual characteristics help shape the quality of creative output. As teams do not operate in isolation within an organization, team leader behaviors and organizational factors also contribute to team creativity. This chapter describes the impact of organizations and managers to value, support, and reward creativity can produce a climate conducive to innovation.

Bordons, M., & Zulueta, M.A. (1997). Comparison of research team activity in two biomedical fields. *Scientometrics, 40(3),* 423-436.

This study sought to identify structural or dynamic features of teams associated with good scientific performance using productive research teams in two biomedical subfields. The teams were characterized according to their size, production, productivity, research level and expected impact factor of their output, collaboration pattern and interdisciplinarity. The main differences were explained by different clinical/basic characteristics in each subfield.

Börner, K., Contractor, N., Falk-Krzensunski, H.J., Fiore, S.M., Keyton, J., Spring, B., Stokols, D., Trochim, W., & Uzzi, B. (2010). A multi-level systems perspective for the science of team science. *Science Translational Medicine, 15(2),* 49cm24.

An area of inquiry termed the “science of team science” (SciTS) has emerged with perspective that incorporates a mixed-methods approach commensurate with the conceptual, methodological, and translational complexities of team science. The theoretically grounded and practically useful framework is intended to integrate existing and future lines of SciTS research to facilitate the field’s evolution as it addresses key challenges spanning macro, meso, and micro levels of analysis.

Bennett, L.M., Gadlin, H., Levine-Finley, S. (2010). *Collaboration & team science: A field guide.* Bethesda, MD: National Institutes of Health. Retrieval from NIH website: https://ccrod.cancer.gov/confluence/download/attachments/47284665/TeamScience_FieldGuide.pdf?version=1&modificationDate=1271730182423.
This field guide is a useful resource that provides relevant information about the characteristics, processes, and dynamics that contribute to a team's success, and provides tools for individuals planning to engage in team science. This guide contains relevant literature and illustrative case reports on team building, interpersonal and group dynamics, conflict resolution, and the functioning of scientific teams and labs. inally, there are strategies given for trouble-shooting problems in team performance.

Chiocchio, F. (2009). Cohesion and performance: A meta-analytic review of disparities between project teams, production teams, and science teams. *Small Group Research, 40(4),* 382-470.
This meta-analysis differentiates 33 cohesion—performance correlations for project, production, or service teams in organizational or academic settings. Project teams in organizational and academic settings show large effect sizes and differ from other teams. Theoretical considerations point to five interrelated modifiers: task uncertainty, task versus outcome performance, student samples' mental representation of the project outcome, and group heterogeneity

Disis, M., & Slattery, J. (2010). The road we must take: Multidisciplinary team science. *Science Translational Medicine, 2(22),* 22.
This article describes how translational research is complex and requires a diverse skill set. Many academic institutions, have invested in educational programs, facilities, and enhanced resources to encourage translational research. This article emphasizes the critical need to create and sustain multidisciplinary research teams.

Falk-Krzesunski, H.J., Börner, K., Contractor, N., Fiore, S. M., Hall, K. L., Keyton, J., Spring, B., Stokols, D., Trochim, W., & Uzzi, B. (2010). Advancing the science of team science. *Clinical and Translation Science Journal, 23(5),* 263-266.
This article presents a summary of the Science of Team Science (SciTS) Conference. SciTS is an emerging field that encompasses both conceptual and methodological strategies aimed at

understanding and enhancing the processes and outcomes of collaborative, team-based research. The 3-day conference brought thought leaders from translational research, evaluation, communications, social and behavioral sciences, complex systems, technology, and management. The goals of the conference were to serve as a point of convergence for team science practitioners and investigators studying science teams, to engage funding agency program staff to provide guidance on developing and managing team science initiatives, and to afford data providers and analytics developers insight into team tracking and analysis needs. The conference served as an important conduit for translating empirical findings about team science into evidence-based effective practices for scientific teams and funders of team science—a bridge between the praxis of team science and the science of team science.

Fiore, S.M. (2008). Interdisciplinarity as teamwork: How the science of teams can inform team science. *Small Group Research, 39(3),* 251-277.
Comparisons between interdisciplinary research and other forms of cross-disciplinary research are made, and a brief discussion of the development of the concept of interdisciplinarity is provided. The author emphasizes that that interdisciplinary research is team research, and that it may be possible to implement teamwork principles and team training to improve the practice of team science.

Guimera, R., Uzzi, B., Spiro, J., & Amaral, L.A.N. (2005). Team assembly mechanisms determine collaboration network structure and team performance. *Science, 308(5722),* 697-702.
This study investigate how the mechanisms by which creative teams self-assemble. The authors propose a model for the self-assembly of creative teams based three parameters: team size, the fraction of newcomers, and the tendency of incumbents to repeat previous collaborations. The model suggests that the emergence of a large connected community of practitioners can be described as a phase transition. The authors suggest that team assembly mechanisms determine both the structure of the collaboration network and team performance.

Hall, K.L., Feng, A.X., Moser, R.P., Stokols, D., & Taylor, B.K. (2009). Moving the science of team science forward: Collaboration and creativity. *American Journal of Preventive Medicine, 35(2S),* 243-249.

This summary article highlights key themes reflected in the supplemental issue and identifies directions for future research organized around the following broad challenges: (1) operationalizing cross-disciplinary team science; (2) conceptualizing readiness for team science; (3) ensuring the sustainability of transdisciplinary team science; (4) developing more effective strategies for training transdisciplinary scientists; (5) creating and validating improved models, methods, and measures for evaluating team science; and (6) fostering transdisciplinary cross-sector partnerships. A call to action is made to embrace strategies of creativity and innovation to move the SciTS field forward.

Harvey, J., Pettigrew, A., Fertile, E. (2002). The determination of research group performance: Towards mode 2? *Journal of Management Studies, 39(6*), 747-774.
This paper examines determinants of performance of research groups in the context of the emergence of knowledge as a key intangible asset. It explores the under-researched area of the organization and management of university research groups. Factors identified with high-achievement are: strong leadership; finding, motivating and retaining talent; strategies of related diversification; strongly linked theory and practice and network connectedness. Such groups exhibit an increasingly complex internal environment, facilitating a flexible response to an increasingly complex external environment. It finds evidence of Mode 2 working, with increasing use of collaborative strategies and some emerging thematic emphasis.

Isohanni, M., Isohanni, I., & Veijola. J. (2002). How should a scientific team be effectively formed and managed. *Nordic Journal of Psychiatry, 56(2),* 157-62.
Unplanned administration and human conflicts are the major causes of unsuccessful team research. Essential organizational and psychological aspects of the scientific team are described and discussed. Practical guidelines on forming, working and managing a research team are presented.

Jones, B., Wuchty, S., Uzzi, B. (2008). Multi-university research teams: Shifting impact, geography, and stratification in science. *Science, 322(5905),* 1259-1262.
This paper examines 4.2 M papers published over 3 decades and demonstrates that teamwork in science has dramatically shifted to span university boundaries. Multi-university collaborations

(i) are the fastest growing type of authorship structure, (ii) produce the highest-impact papers when they include a top-tier university, and (iii) are increasingly stratified by in-group university rank. The intensification of social stratification in multi-university collaborations suggests a concentration of the production of scientific knowledge in fewer-rather than more-research centers.

Khoury, M.J., Guinn, M., Yoon, P.W., Dowling, N., Moore, C.A., & Bradley, L. (2007). The continuum of translational research in genomic medicine: How can we accelerate the appropriate integration of human genome discoveries into healthcare and disease prevention? *Genetics in Medicine, 9(10),* 665-674.
This paper presents a framework for the continuum of multidisciplinary translation research from Phase 1 to Phase 4 translation. The authors estimate that little (less than 3%) of published genomic research focuses on T2-4, and that the full continuum of translation research needs adequate support to realize the promise of genomics for human health.

Masse, L.C., Moser, R.P., Stokols, D., Taylor, B.K., Marcus, S.E., Morgan, L.D., Hall, K.L., Croyle, R.T., & Trochim, W. (2008). Measuring collaboration and trans-disciplinary integration in team science. *American Journal of Preventive Medicine, 35(s2), s*151-s160.
This study provides valid tools that can be utilized to examine the underlying processes of team science. A survey of 216 researchers staff participating in the Transdisciplinary Tobacco Use Research Centers (TTURC) Initiative was conducted. Four scales were developed, three to assess collaborative processes (satisfaction with the collaboration, impact of collaboration, trust and respect) and one to assess transdisciplinary integration. All scales were positively associated with the perception of a center's making good progress in creating new methods, new science and models, and new interventions); and ability to detect group differences.

Rey-Rocha, J., Martin-Sempere, M.J., & Garzon, B. (2002). Research productivity of scientists in consolidated vs. non-consolidated teams: The case of Spanish university geologists. *Scientometrics, 55(1),* 137-156.
This study evaluates the extent to which individual research productivity is influenced by the level of consolidation of the team they belong to. The findings indicate that not belonging to a

research team handicaps publishing in top international journals. Researchers belonging to consolidated teams are more productive than their colleagues in non-consolidated teams, and these in turn more than individuals without a team. Team size does not appear to be as important for scientific productivity as the number of researchers within the team that reached a stable job position.

Stokols, D., Hall, K.L., Taylor, B.K. & Moser R.P. (2008). The science of team science: Overview of the field and introduction to the supplement. *American Journal of Preventive Medicine, 35(2),* S77-S89.
The SciTS encompasses an amalgam of conceptual and methodologic strategies aimed at understanding and enhancing the outcomes of large-scale collaborative research and training programs. This supplement identifies a major challenge for the SciTS field is to characterize its major theoretical, methodologic, and translational concerns. The introductory article summarizes and links the major goals and organizing themes of the supplement.

Stvilla, B., Hinnant, C.C., Schindler, K., Worrail, A., Burnett, G., Burnett, K., Kazmer, M.M., & Marty, P.F. (2011). Composition of scientific teams and publication productivity at a national science lab. *Journal of the American Society for Information Science & Technology, 62(2),* 270-283.
This study examines data from scientific teams at the National High Magnetic Field Laboratory (NHMFL) to examine how the diversity of science teams —including institutional diversity, disciplinary diversity, gender, seniority, and the network position—impacts overall team productivity as measured by peer reviewed journal publication. High productivity in teams is associated with high disciplinary diversity and low seniority diversity in team membership; team cohesion also positively related to productivity. Teams with members in central structural positions performed better than other teams.

Thomas, G. Reagan, M., Bettis, E.A., Cabrol, N. & Rathe, A. (2001). Analysis of science team activities during the 1999 Marsakhod Rover Field Experiment: Implications for automated planetary surface exploration. *Journal of Geophysical Research-Planets, 106(E4),* 7775-7783.

This study addresses the manner in which the geologists organized, allocated time, communicated scientific hypotheses, and requested different types of data. Hypothesis formation and evolution patterns show a meager flow of information from the distributed science team to the on-site team and a bias against reporting speculative hypotheses. The work suggests the need for alternative organizational structures that would expedite the flow of information within the team.

Disciplinarity, Collaboration
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Chase, S., Wright, J.H., & Ragade, R. (1981). Decision making in an interdisciplinary team. *Systems Research* and *Behavioral Science, 26(3),* 205-215.
Interdisciplinary teams attempt to identify the complex set of variables influencing their decisions and then utilize this knowledge to maximize efficiency in health care delivery. A university-affiliated psychiatric service in a private general hospital is studied, where (1) the flow of information and feedback loops into the team; (2) the location of decision nodes; (3) decision-making echelons are described. General systems theory concepts utilized in this analysis are proposed as pragmatic tools for improving interdisciplinary team function.

Choi, B.C.K., & Pak, A.W.P. (2007). Multidisciplinarity, interdisciplinarity, and transdisciplinarity in health research, services, education and policy: Promoters, barriers, and strategies of enhancement. *Clinical and Investigative Medicine, 30(6),* E224-E232.
This paper addresses the questions of discipline, inter-discipline distance, and where to look for multiple disciplinary collaboration. This study indicates that disciplines that are more disparate from one another epistemologically are more likely to achieve new insight for a complex problem. Application of a conceptual framework of inter-discipline distance can guide the selection appropriate disciplines for a multiple disciplinary team.

Cummings, J.N., & Kiesler, S. (2005). Collaborative research across disciplinary and organizational boundaries. *Social Studies of Science, 35(5),* 703-722.

This study investigated 62 NSF-supported scientific collaboration across disciplinary and university boundaries to understand the need for coordination in these collaborations and how different levels of coordination predicted success. Projects with principal investigators in more disciplines reported as many positive outcomes as did projects involving fewer disciplines. By contrast, multi-university projects were significantly less well coordinated and reported fewer positive outcomes . The implications on theory, practice, and policy are discussed.

Guimerà, R., Uzzi, B., Spiro, J., & Amaral, L.A. (2005). Team assembly mechanisms determine collaboration network structure and team performance. *Science, 308(5722),* 697-702.
The mechanisms by which creative teams self-assemble determine the structure of their collaboration networks is investigated in this paper. A model is proposed for the self-assembly of creative teams based on team size, the fraction of newcomers in new productions, and the tendency of incumbents to repeat previous collaborations. The model suggests that the emergence of a large connected community of practitioners can be described as a phase transition. The authors conclude that team assembly mechanisms determine both the structure of the collaboration network and team performance.

Hoegl, M., & Gemeunden, H.G. (2001). Teamwork quality and the success of innovative projects: A theoretical concept and empirical evidence. *Organization Science, 12(4),* 435-449.
A comprehensive concept of collaboration in teams, called Teamwork Quality (TWQ) is presented. The six facets of the TWQ construct, i.e., communication, coordination, balance of member contributions, mutual support, effort, and cohesion, are specified. Hypotheses regarding the relationship between TWQ and project success are tested using data from 145 German software teams. The results show that TWQ is significantly associated with team performance as rated by team members, team leaders, and team-external managers. However, the magnitude of the relationship between TWQ and team performance varies by the perspective of the performance rater and the team members' personal success (i.e., work satisfaction and learning).

Huber, G.P., & Lewis, K. (2010). Cross-understanding: Implications for group cognition and performance. *Academy of Management Review, 35(1),* 6-26.

This paper describes the construct of cross-understanding, a group-level compositional

construct having as its components each group member's understanding of each other member's mental model. This construct provides explanations for specific group outcomes and processes .

Huskins, W.C., Weavers, K.M., Gordon, J.F., & Gabriel, S.F. (2008). Creating the future: Training the next generation of translational science teams. *Clinical and Translational Science Journal, 1(2),* 94-98.
This article describes the structure of the Mayo Clinic Clinical Research Training Program (CRTP) and its efforts to establish a PhD program in CTS for post-baccalaureate and medical school students that is horizontall integrated across its own programs.

Linlin, J., & Haifa, S. (2011). The effect of researchers' interdisciplinary characteristics on team innovation performance: Evidence from university R&D team in China. *International Journal of Human Resource Management, 21(3),* 2488-2502.
This study examines the effect of researchers' characteristics on the performance of R&D teams. Based on the multi-perspective of organization behavior and knowledge management, the authors adopt the framework of 'Input-Process-Output' regarding the process of the R&D team as knowledge creation. The authors conclude that knowledge communication, sharing, and integration play very important mediated roles in the knowledge creation process of the R&D team.

Marrone, J.A. (2010). Team boundary spanning: A multilevel review of past research and proposals for the future. *Journal of Management, 36(4),* 911-940.
Organizational work teams must increasingly coordinate efforts across their boundaries and actively manage key relationships external to the team itself. Despite evidence of the importance of these processes—referred to as team boundary spanning—for both team and organizational success, significant gaps exist in our understanding of the nature of team boundary spanning, how and when these behaviors are carried out by teams, and the resulting impacts of team boundary spanning beyond that of enhanced team performance. This article offers a taxonomy of team boundary spanning actions, reviewing the existing stream of team boundary spanning literature across multiple levels of analysis, and integrating this body of work with findings and perspectives from other boundary spanning research areas.

Masse, L.C., Moser, R.P., Stokols, D., Taylor, B.K., Marcus, S.E., Morgan, L.D., Hall, K.L., Croyle, R.T., & Trochim, W. (2008). Measuring collaboration and trans-disciplinary integration in team science. *American Journal of Preventative Medicine, 35(2),* S151-S160.
This study develops and validates psychometric properties of scales measuring collaborative processes and transdisciplinary integration. Four scales were developed, three to assess collaborative processes (satisfaction with the collaboration, impact of collaboration, trust and respect) and one to assess transdisciplinary integration. All scales were found to be internally consistent, correlated with intermediate markers of collaborations and showed some ability to detect group differences.

McGuire, D.B. (1999). Building and maintaining a multidisciplinary research team. *Alzheimer Disease & Associated Disorders, 13(1),* S17-S21.
Building and maintaining multidisciplinary research teams is a complex and challenging process, but identification and proactive resolution of challenges is essential. Important elements of success include establishing common goals, using a democratic group process, maintaining open communication, developing mutually acceptable policies for disseminating research results, and facilitating achievement of team members' personal and professional goals.

Miller, K. (2008). Successful collaborations: Social scientists who study science have noticed a trend. *Biomedical Computation Review, Summer*, 7-15.
This paper discusses factors that affect the success of remote collaboration, known as the Theory of Remote Scientific Collaboration (TORSC). The effects of proximity, technical and collaboration readiness, site modularity and the effect of Web 2.0 are discussed in regards to their effects on collaboration success.

Morris, S.A., & Goldstein, M.L. (2007). Manifestation of research teams in journal literature: A growth model of papers, authors, collaboration, co-authorship, weak ties, and Lotka's law. *Journal of the American Society for Information Science & Technology, 58(12),* 1764-1782.
This article introduces a team-based model of researchers in a specialty and its manifestation in the specialty's literature. The proposed qualitative behavioral model, with its mathematical

expression as a nested growth model that simultaneously describes collaboration and author productivity (Lotka's law) in a specialty. The growth model mimics six network metrics of bipartite article-author networks and is demonstrated on three example from specialties that have a wide range of degree of collaboration.

Porac, J.F., Wade, J.B., Fischer, H.M., Brown, J., Kanfer, A., & Bowker, G. (2004). Human capital heterogeneity, collaborative relationships, and publication patterns in a multidisciplinary scientific alliance: A comparative case study of two scientific teams. *Research Policy, 33(4),* 661-678.
This study examines publication outcomes of two teams within a multi-university scientific alliance. Scientists in one team share similar scholarly backgrounds and work in a well established paradigm; scientists in the second team have different backgrounds and work in an emergent discipline. Although the alliance increased the productivity of both teams, the increase was highest for the heterogeneous team. Also, although the variety of knowledge concepts employed in their research was initially higher for the heterogeneous team, this gap narrowed over time.

Shrum, W., Chompalov, I., & Genuth, J. (2001). Trust, conflict, and performance in scientific collaboration. *Social Studies of Science, 31(5),* 681-730.
Trust plays a central role in the scientific process. This study consists of an examination of 53 collaborations in physics and comes to two unexpected findings: (1) trust is no higher in projects formed through pre-existing relationships than those without such ties; and (2) there is no relationship between trust and performance. Instead, trust is inversely associated with conflict. In the second part of this paper, three axes of conflict are described, as well as their sources in the interdependencies of collaborative projects. More important than trust is the organization of interaction between structural components such as research teams. In the third part, performance is examined. Collaborations that experience uncertainties in resource acquisition are more likely to be viewed as successful than those formed under more routine conditions. The authors conclude that segmentation of scientific collaborations can impose a work structure that is actually noncollaborative.

Zellmer-Bruhn, M.E., Maloney, M.M., Bhappu, A.D. & Salvador, R. (2008). When and how do differences matter? An exploration of perceived similarities of teams. *Organizational Behavior and Human Decision Processes, 107(1),* 41-59.

This investigation examines when teams notice diversity of various member characteristics and how they interpret it. Diversity was initially related to both social category similarity (SCS) and perceived work style similarity (WSS). SCS did not change over time whereas WSS decreased significantly. This change in perceived WSS can be explained by an information-processing/decision-making framework. Informational diversity was positively related to conflict in teams, and negatively related to WSS. On the other hand, informational diversity was positively related to information sharing, and estimates of WSS. These estimates of WSS affected subgroup formation and team process effectiveness.

Reviews, Critiques of Translational Research

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Abolelela, S.W., Larson, E., Bakken, S., Carrasquillo, O., Formicola, A., Glied, S.A., Haas, J.& Gebbie, K.M.(2007). Defining interdisciplinary research: Conclusions from a critical review of the literature. *Health Services Research, 42(1),* 329-346.

This study is a systematic literature review of literature, one-on-one interviews and field test to arrive at a preliminary definition of interdisciplinary research. This definition was then field tested. Three key definitional characteristics were identified: the qualitative mode of research (and its theoretical underpinnings), existence of a continuum of synthesis among disciplines, and the desired outcome of the interdisciplinary research. This definition may serve as a basis for competency-based formalized training to provide researchers with interdisciplinary skills

Dougherty, D., & Conway, P.H. (2008). The "3Ts" roadmap to transforming US healthcare. *Journal of the American Medical Association, 299(19),* 2319-2321.

This paper proposes a model to transform the US health care system, intended to accelerate the pace at which innovations are implemented in clinical settings. Three major translational steps (T1,T2,T3) are proposed; each is based on prior research activities in progressively broader settings to advance discoveries originating in basic science research through clinical research and implementation in health care delivery.

Huskins, W.C., Weavers, K.M., Gordon, J.F., & Gabriel, S.F. (2008). Creating the future: Training the next generation of translational science teams. *Clinical and Translational Science Journal, 1(2),* 94-98.

This article focuses on the structure and accomplishments of the Education Resources of the Mayo Clinic Center for Translational Science. The clinic will organize the General Clinical Research Center (GCRC) and core labs, Service Center that provides centralized administrative and research study support, Community Engagement arm, which seeks to broaden the diversity of investigators, funders, and research participants, and the Education Resources, which provides education, training, and career developments for study team members.

Prober, J.S., Newhauser, C.S., & Prober, J.M. (2001). Obstacles facing translational research in academic medical centers. *The FASEB Journal, 15*, 2303-2313.
Reasons why biomedical research discoveries have not been successfully exploited for improving medical therapy are presented. The chief factor is that translation is rarely straightforward and requires continuing research in both the clinic and the laboratory. Translational research is hindered by insufficient targeted resources, a shortage of qualified investigators, an academic culture that hinders collaboration between clinical and laboratory-based investigators, a traditional structure of the AMC that favors departmental efforts over interdisciplinary programs, an increasing regulatory burden, and a lack of specific mechanisms within the AMC for facilitating solutions to these problems.

Rubio, D.M., Schoenbaum, E.E., Lee, L.S., Schteingart, D.E., Marantz, P.R., Anderson, K.E., Platt, L.D., Baez, A., & Esposito, K. (2010). Defining translational research: Implications for training. *Academic Medicine, 85(3),* 470-475.
This paper from the Evaluation Committee of the Association for Clinical Research Training (ACRT) reviewed current definitions of translational research and proposed an operational definition to use in the educational framework. The authors propose that the approach to designing and evaluating the success of translational training programs must be flexible to accommodate the needs of individual institutions and trainees but that it must also be rigorous to document that the program is meeting its objectives and preestablished competency requirements. A logic model is proposed for the evaluation of translational research programs.

Sung, N.S., Crowley, W.F.J., Genel, M., Salber, P., Sandy, L., Sherwood, L.M., et al. (2003). Control challenge facing the national clinical research enterprise. *Journal of the American Medical Association, 289(10),* 1278-1287.
This article from the Institute of Medicine's Clinical Research Roundtable identifies two roadblocks in the clinical research enterprise. The first roadblock (T1) was described by as “the transfer of new understandings of disease mechanisms gained in the laboratory into the development of new methods for diagnosis, therapy, and prevention and their first testing in humans.” The roundtable described the second roadblock (T2) as “the translation of results from clinical studies into everyday clinical practice and health decision making.” The article

identifies four central challenges—public participation, information systems, workforce training, and funding; to make recommendations about how they might be addressed by particular stakeholders. The authors invite a broader, participatory dialogue with a view to improving the overall performance of the US clinical research enterprise.

Westfall, J.M., Mold, J, & Fagan, L. (2007). Practice-based research: "Blue highways" on the NIH roadmap. *Journal of the American Medical Association, 297(4),* 403-406.
A new initiative, the NIH Roadmap, has focused increased attention on the need to "translate" basic research more quickly into human studies and into tools that can improve clinical practice for the benefit of patients. The proposed expansion of the NIH Roadmap includes an additional research laboratory (Practice-based Research) and translational step (T3) to improve incorporation of research discoveries into day-to-day clinical care. The research roadmap is a continuum, with overlap between sites of research and translational steps.

Woolf, S.H. (2008). The meaning of translational research and why it matters. *JAMA,* 299, 211-213.
This article discusses important distinctions in the 2 "translational blocks" in the clinical research enterprise (T1 and T2 research). The goals, settings, study designs, and investigators differ between the two spheres. T1 research requires mastery of molecular biology, genetics, and other basic sciences; appropriately trained clinical scientists working in strong laboratories and with cutting-edge technology; and a supportive infrastructure within the institution. By contrast, T2 requires mastery of "implementation science", evaluating interventions in real-world settings employing disciplines such as clinical epidemiology and evidence synthesis, communication theory, behavioral science, public policy, financing, organizational theory, system redesign, informatics, and mixed methods/qualitative research. The article argues that adequate investment in T2 research is vital to fully leverage T1 research investments.

Zerhouni, E.A. (2007). Translational research: Moving discovery to practice. *Clinical Pharmacology and Therapeutics,* 81(2), 126-128.

This article overviews development of the NCRR clinical and translational sciences award (CTSA) consortium to serve as discovery engines that will improve medical care by applying new scientific advances to real-world practice.

Innovation, Knowledge Management, R&D Team Management, Product Development, Cross-Functional Teams

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Akgün, A.E., Keskin, H., & Byrne, J.C. (2010). Procedural justice climate in new product development teams: Antecedents and consequences. *Journal of Product Innovation Management, 27*(7), 1096-1111.

This paper considers procedural justice (PJ) in 83 novel product teams to understand how a PJ climate influences a project's performance. Several conclusions were suggested: 1. The level of innovation and systematic management control had a positive impact on developing a PJ climate; 2. A PJ climate positively affects team learning and product development time (i.e., speed to market); and 3. team learning and speed to market mediate the relations between the PJ climate and new product success. Based on the findings, this paper suggests that managers should enhance the PJ climate and team culture in the project team to enhance team learning and to develop products faster by: 1. creating a dialogue for conflict resolution; 2. facilitate information searching to make decisions effectively, and 3. allow team members to challenge project-related ideas modify them by consensus. Methods for enhancing PJ are also presented.

Ancona, D.G., & Caldwell, D.F. (1992). Demography and design: predictors of new product team performance. *Organization Science, 3(3),* 321-341.

This study investigates the impact of functional and tenure diversity on product team performance. The greater the functional diversity, the more team members communicate outside the team's boundaries, producing higher managerial innovation rankings. Tenure diversity was associated with clarity of group goals and priorities, producing higher team overall performance ratings. Interestingly, the overall the effect of diversity on performance is negative because there is less capability for teamwork. These findings suggest that teams must find a way to garner the positive process effects of diversity and to reduce the negative direct effects. At the team level, greater negotiation and conflict resolution skills may be necessary. At the organization level, the team may need to be protected from external political pressures and rewarded for team, rather than functional, outcome.

Badinarayanan, V., & Arnett, D.B. (2008). Effective virtual new product development teams: An integrated framework. *Journal of Business & Industrial Marketing, 23(4),* 242-248.

This paper develops an integrative framework of key factors influencing the effectiveness of virtual new product development teams. Factors impacting effective virtual interactions (i.e. improved decision quality and decision speed) and new product development (i.e. increased levels of creativity, innovativeness, and product development speed) are proposed. Guidance is provided for managing virtual new product development teams.

Bain, P.G., Mann, L., & Pirola-Merlo, A. (2001). The innovation imperative: The relationship between team climate, innovation and performance in research and development teams. *Small Group Research, 32(1),* 55-73.

The relationship of team climate with project team innovation and performance is investigated in a sample of 193 scientists and technologists in 20 research teams and 18 development teams. Research and development teams showed similar ratings for team climate and for measures of innovation. However, the relationships between team climate and individual and team innovation were stronger for research teams than development teams.

Barczak, G. (1995). New product strategy, structure, process, and performance in the telecommunications industry. *Journal of Product Innovation Management, 12(3),* 224-234.

This paper studies the effects of product strategy, organizational structure, and new product development (NPD) in telecommunications teams. Project teams and R&D teams are the most effective means for organizing NPD efforts- R&D teams are more important for first-to-market firms because they provide the technical skills necessary for playing pioneering role. The study also indicates that the presence of a product champion is an important element in the success of new product efforts.

Barczak, G., Lassk, F., & Mulki, J. (2010). Antecedents of team creativity: An examination of team emotional intelligence, team trust, and collaboration culture. *Creativity and Innovation Management, 19(4),* 332-345.

This survey of student teams examines team emotional intelligence and team trust as antecedents of collaborative culture, a critical antecedent of team creativity. The findings suggest that team emotional intelligence promotes team trust. Trust, in turn, fosters a collaborative culture which enhances the creativity of the team. Cognitive trust also moderates the relationship between collaborative culture and team creativity.

Barioutia, J.M., & Echebarria, C. (2010). Social capital, research and development, and innovation: An empirical analysis of Spanish and Italian region. *European Urban and Regional Studies, 17(4),* 371-385.

This study empirically testing the role of social capital as a driver of the relationship between R&D expenditure and innovation outcomes. Social capital was measured using two different approaches: a rational choice-driven approach and a sociologically driven approach. The results of both approaches are different and in opposition.

Brockman, B.K., Rawlston, M.E., Jones, M.A., Halstead, D. (2010). An exploratory model of interpersonal cohesiveness in new product development teams. *Journal of Product Innovation Management, 27(2),* 201-219.

This study synthesizes literature and research in new product development (NPD) teams to propose a model for how interpersonal cohesiveness influences NPD. Antecedents of interpersonal cohesiveness include clan culture, formalization, integration, and political dominance of one department, while consequences are groupthink, superordinate identity, and, ultimately, external/internal NP performance. The relationships among interpersonal cohesiveness, groupthink, and superordinate identity appears to be influenced by team norms and goal support. Additionally, product type is identified as a moderator on the effects of both groupthink and superordinate identity on external NP performance.

Brown, S.L., & Eisenhardt, K.M. (1995). Product development: Past research, present findings, and future directions. *Academy of Management Review, 20(2), 343-378.*

This article organizes the product-development literature into three streams of research: product development as rational plan, communication web, and disciplined problem solving. A model of factors affecting the success of product development is presented that highlights the distinction

between process performance and product effectiveness and the importance of agents, including team members, project leaders, senior management, customers, and suppliers, whose behavior affects these outcomes.

Bullinger, H.J., Warshat, J., & Fisher, D. (2000). Rapid product development – An overview. *Computers in Industry, 42(2/3),* 99-108.
This paper details an Engineering Solution Center using tools and strategies to shorten the development process. These include physical and digital prototypes for the early and cost-efficient evaluation of different alternatives, knowledge representation by means of an Active Semantic Network for the integration of interdisciplinary teams, technical support of communication and cooperation within the team by adequate synchronous and asynchronous media.

Busche, J.R., & Coetzen, G.H. (2007). Group development and team effectiveness: Using cognitive representation to manage group development and product task performance and group viability. *Journal of Applied Behavioral Sciences, 43(7),* 184-212.
This paper reconceptualizes group development theory for application to task groups and proposes two key sequential phases: membership and competence. A system for computing group states based on structural connections among member cognitive representations is offered. Predicting effects of convergence and congruence in group state representations on team effectiveness are supported. The authors argue for the reapplication of group development theory in team research

Carbonell, P. & Rodriguez-Escudero, A. (2009). Relationships among team's organizational context, innovation speed, and technological uncertainty: An empirical analysis. *Journal of Engineering and Technology Management, 26(1-2),* 28-45.

This study examines uncertainty on the relationships between top management support, clarity of goals and speed-based rewards with innovation speed. The major findings are that top management support has a positive effect on innovation speed under conditions of high technology novelty and high technological turbulence. Clarity of goals is more important to innovation speed under conditions of medium technology novelty and low technological

turbulence. The results suggest a curvilinear, positive relationship between speed-based rewards and innovation speed.

Chen, J.Y., Damanpour, F., & Reilly, R.R. (2010). Understanding antecedents of new product development speed: A meta-analysis. *Journal of Operations Management, 28(1),* 17-33.

New product development (NPD) speed is a key component of time-based strategies. This meta-analysis assesses the generalizability of the relationships between NPD speed and 17 antecedent factors. Antecedents were grouped into four categories of strategy, project, process, and team, and found that process and team characteristics are more generalizable and cross-situationally consistent determinants of NPD speed than strategy and project characteristics.

Cross, R., Ehrlich, K., Dawson, R., Helferich, J. (2008). Managing collaboration: Improving team effectiveness through a network perspective. *California Management Review, 50(4),* 74-98.

Corporations are using teams as a way to organize professional work although there are hidden costs of collaboration, lengthy decision cycles, and diffusion of focus. The paper describes a network approach for studying team effectiveness using an established set of methods and statistics for eliciting and analyzing relationships between people in teams.

Dayan, M., & Basarir, A. (2010). Antecedents and consequences of team reflexivity in new product development projects. *Journal of Business and Industrial Marketing, 25(1),* 18-29.

This empiric study investigates the impact of team empowerment and contextual antecedents on reflexivity in cross-functional new product development teams. The authors conclude that a transactive memory system, goal clarity, team empowerment, and interactional justice are significantly related to team reflexivity. Moreover, the findings showed that team reflexivity is significantly related to product success if the conditions are turbulent.

Dayan, M., & Di Benedetto, C.A. (2010). The impact of structural and contextual factors on trust formation in product development teams. *Industrial Marketing Management, 39(4),* 691-703.

This study is a theoretical and empiric study that examines antecedents of trust formation in development and performance of new product development (NPD). The major findings were that demographic diversity, proximity of team members, team longevity (structural factors),

procedural and interactional justices (contextual factors) were positively related to interpersonal trust in NPD teams. Interpersonal trust had an impact on team learning and new product success, but not on speed-to-market. The impact of interpersonal trust on team learning and new product success was higher when there was higher task complexity.

Deeds, D.L., DeCarolis, D., & Coombs, J. (2000). Dynamic capabilities and new product development in high technology venture: An empirical analysis of new biotechnology firms. *Journal of Business Venturing, 15(3),* 211-229.

This study investigates the idea that new product development capabilities are a function of a firm's scientific, technological, and managerial skills. The authors conclude that: 1.the choice of geographic location as an important strategic decision which will impact their firm's access to the skilled technical personnel and the streams of knowledge; 2. the quality of the firm's scientific team is a critical ingredient in a firm's new product development capability; and 3.over reliance on technical personnel in the management of the organization detracts from the product development process.

Doolen, T.L., Hacker, M.E., & Van Aken, E. (2006). Managing organizational context for engineering team effectiveness. *Team Performance Management, 12(5/6),* 138-154.

This study investigates the role of organizational context on the effectiveness of engineering teams in a high-technology company. Direct relationships between eight organizational context variables and team member satisfaction and between two organizational context variables and team performance were found. Effects of five variables on team member satisfaction were mediated by team processes.

Dyer, B., Gupta, A.K., & Wilemon, D. (1999). What first-to-market companies do differently. *Research-Technology Management, 42(2),* 15-21.

This paper examines a series of questions related to speed-to-market in novel product development teams. They find that first-to-market firms were organized differently using the project coordinator, matrix system and dedicated team structures. Of these structures, the dedicated-team members felt that their structural format resulted in a high success rating, and that firms may benefit from using a product champion for NPD. The top 3 barriers identified

included top three barriers identified were "difficulty in product/market definition", "lack of strategic thinking" and "finalizing the design".

Ebahimi, B.P., McCowan, D.A., & Chung, T. (2006). Key success factors in new product development. *International Journal of Management and Decision Making, 7(2/3),* 313-327.
This paper studies new product development processes in a large US technology company, and presents keys to success in new product development using cross-functional teams. Product development teams that believe they have a monopoly on customer and technical knowledge are less likely to innovate. Soliciting and encouraging idea generation leads to increased innovation. The results also support prior research on the crucial role of champions and sponsors in the innovation process.

Edmundson, C., & Nembhard, I.M. (2009). Product development and learning in project teams: The challenges are the benefits. *Journal of Product Innovation Management, 26(2),* 123-138.

This paper identifies five attributes of new product development (NPD) teams that hinder attainment of their potential: (1) project complexity; (2) cross-functionality; (3) temporary membership; (4) fluid team boundaries; and (5) embeddedness in organizational structures. The critical roles of leadership and of communication and conflict management training are then highlighted as strategies for overcoming the challenges to team effectiveness in NPD as well as for realizing five team benefits: (1) project management skills; (2) broad perspective; (3) teaming skills; (4) expanded social network; and (5) boundary-spanning skills.

Feng, B., Jiang, Z.Z.,Fan, Z.P. & Fu, N. (2010). A method for member selection of cross-functional teams using the individual and collaborative performances. *European Journal of Operational Research, 203(3),* 652-661.

This paper describes a programming method for member selection of CFTs, where both the individual performance and collaborative performance are considered. The authors develop an nondominated sorting genetic algorithm and apply it to a real world example, where improved performance is seen served over another member selection genetic algorithm.

Gilson, L.L., Mathieu, J.E., Shalley, C.E.& Ruddy, T.M. (2005). Creativity and standardization: Complementary or conflicting drivers of team effectiveness? *Academy of Management Journal, 48(3),* 521-531.

The relationships between creativity, standardized work practices, and effectiveness (measured as both performance and customer satisfaction) was examined among 90 empowered teams. Despite apparent contradictions, creativity and standardized procedures can be complementary. Specifically, standardization was found to moderate the relationship between creativity and both team performance and customer satisfaction.

Glynn, M.A., Kazanjian, R., & Drazin, R. (2010). Fostering innovation in complex product development settings: The role of team member identity and itinerary interdependence. *Journal of Product Innovation Management, 27(7),* 1082-1095.

Little is known about how innovation generalizes to complex team settings. This paper examines an individuals' propensity to innovate as the product of individuals' relationship with their work team (team member identification) and their team's relationship to other teams within the organizational system (interteam interdependence). The study finds that individuals' strong team identification and their perceptions of high interteam interdependence each had positive main effects on individuals' intentions to innovate. However, these two variables also interacted negatively to significantly decrease innovation intentions. This study is the first to demonstrate the impact of interteam interdependence on innovation.

Gumus, B., Ertas, A., Tate, D., Cicek, I. (2008). The trans-disciplinary product development lifecycle model. *Journal of Engineering Design, 19(3),* 185-200.

This paper describes a Transdisciplinary Product Development Lifecycle (TPDL) model to improve the design quality, management and stakeholder communication to shorten new product development time and reduce cost. The TPDL model helps develop, capture, and present both a comprehensive (“big-picture”) and detailed view of the product development knowledge. The objectives of the TDPL model are to guide the designers, developers, and other members of a transdisciplinary product development team throughout the development effort as well as to help manage the knowledge produced during the product development process.

Gupta, A.K., & Wilemon, D.L. (1990). Accelerating the development of technology-based new products. *California Management Review, 32(2),* 24-44.

This study examines how to accelerate the time spent on new product development. Major areas are identified that include organizational (replacing matrix approaches with product champions), early integration of functional expertise, senior level management support, availability of NPD resources and management, and an organizational framework that supports teamwork.

Gurdon, M.A., & Samson, K.J. (2009). A longitudinal study of success and failure among scientist-started ventures. *Technovation, 30(3),* 207-214.

This study reports follow-up interviews of scientists who commercialized their inventions. An effective combination of management team processes and access to capital was observed among successful ventures. Additionally, personal motives, especially the single-minded focus on financial outcomes, appear correlated with ultimate success. Those who failed did not repeat the experience whereas many of their commercially successful peers pursued further ventures.

Harmanciogolu, N., McNally, R.C., Calantone, R.J., & Durmusoglu, S.S. (2007). Your new product development (NPD) is only as good as your process: An exploratory analysis of new NPD process design and implementation. *R&D Management, 37(5),* 399-422.

This paper examines how new product development (NPD) teams are designed in different companies and their consequences on innovation productivity. The design elements examined included strategic business unit (SBU) senior management involvement, business case content, customer interactions, and cross-functional integration. The authors conclude that industry competitive intensity is positively related to senior management involvement in NPD and use of formal stage gate processes, but negatively related to innovation productivity.

Henke, J.W., Krachenberg, A.R., Lyons, T.F. (1993). Cross-functional teams: Good concept, poor implementation. *Journal of Product Innovation Management, 10(3),* 216-229.

This paper discusses organizational implications of the product development team, including benefits linked to the use of teams; the current state of team design, where improvements can be made; and team-people issues, including communications, decision-making processes, and

leadership styles. Specific suggestions on how to improve team effectiveness and inadvertent barriers are also discussed.

Hoegl, M., & Parboteeah, K.P. (2006). Team reflexivity in innovative projects. *R&D Management, 36(2),* 113-125.

This paper examines determinants of team reflexivity in novel product (software development) teams. Team reflexivity is a measure of how group members react to current or anticipated circumstances and adapt them to the group's objectives, strategies. The authors find that team reflexivity is positively related to team effectiveness but not team efficiency, and that social skills and project management skills are positively related to team reflexivity.

Hoegl, M., Ernst, H., & Proserpio, L. (2007). How teamwork matters more as team member dispersion increases. *Journal of Product Innovation Management, 24(2),* 156-165.

This study examines how teamwork affects team performance as team member dispersion increases. The authors indicate that teamwork positively affects performance in this situation because jigh-quality teamwork leverages the increased knowledge potential of dispersed teams; and team leaders in more dispersed teams have little possibility to compensate low-quality teamwork through hands-on leadership. Moreover, teamwork quality is more difficult to achieve and more critical to team performance as team dispersion increases.

Holland, S., Gaston, K., & Gomes, J. (2000). Critical success factors for cross-functional teamwork in new product development. *International Journal of Management Review, 2(3),* 231-259.

This paper presents an analysis of cross-functional teamwork literature to identify success factors. These factors were categorized into six groups: task design, group composition, organizational context, internal processes, external processes and group psychosocial traits. Other key success factors identified included a supportive organizational context, strategic alignment between functions, and team-based accountability. Based on these findings a diagnostic model is formulated for practical use.

Hülsheger, V.R., Anderson, N., & Salgado, T.F. (2009). Team level predictors of innovation at work: A comprehensive meta-analysis spanning the three decades of research, *Journal of Applied Psychology, 94(5),* 1128-1145.

This report is a meta-analysis of antecedents of creativity and innovation in work teams. t 15 team-level variables researched in primary studies published over the last 30 years were examined. The results indicate that team process variables of support for innovation, vision, task orientation, and external communication displayed the strongest relationships with creativity and innovation, whereas input variables (composition and structure) showed weaker effects. Team variables displayed considerably stronger relationships with self-report measures of innovation compared with independent ratings and objective criteria. Team process variables were more strongly related to creativity and innovation measured at the team than the individual level.

Hull, F.M. (2004). A composite model of product development effectiveness: Application to services. *IEEE Transactions on Engineering Management, 51(2),* 162-172.

This paper examines whether the "composite" model of product development also applies to services in 62 service enterprises in NY. The core of the model includes the organization of cross-functional teams, discipline by structured development processes, and the use of enabling tools/technologies. Concurrent strategy focuses core operations on fast, reiterative cycles of product development. The model postulates that synergy among its constructs have an impact on product development effectiveness. All four components of the model had main effects on performance measured as time compression and cost reduction in product development, signature indicators of the effectiveness of concurrent methods of product development. Interaction effects were observed among the strategy, organization, and process, but not for tools/technologies. The authors conclude that the product development methods are robust and reliable for goods as well as services. Deploying the four building blocks in synergistic ways should be considered to speed time to market and achieve cost efficiencies.

Jassawalla, A.R., & Sashittal, H.C. (1999). Building collaborative cross-functional new product teams. *Academy of Management Executive, 13(3),* 50-63.

The emergence of cross-functional teams has improved new product processes in many organizations, not all work equally well, nor are all equally collaborative. This study of high technology-based industrial organizations shows that collaborative behaviors are difficult to learn, and seldom result from mere team membership. Some teams consisting of representatives from R&D, production, marketing, and other functional groups transform and adopt collaborative behaviors and accelerate new product development processes. Others are challenged by issues of interpersonal interaction and committing to a common agenda. This article highlights the nature of learning that occurs and the developmental milestones that characterize the process by which groups of individuals transform into collaborative new product teams.

Kim, B., & Kim, J. (2009). The structural factors of NPD (new product development) team for manufacturability. *International Journal of Project Management, 27(7),* 690-702.

This study examines new development projects at a global consumer electronics company to determine whether physical co-location and team composition are important in enhancing manufacturability. The authors conclude that whether the NPD members are physically co-located throughout the product development process and whether the team membership is balanced have profound effects on manufacturability.

Kleinschmidt, E.J., de Brentani, U., & Salomo, S. (2007). Performance of global new product development programs: A resource-based view. *Journal of Product Innovation Management, 24(5),* 419-441.

This paper describes a resource-based theory model emphasizing the resources and capabilities of the firm as primary determinants of competitive advantage to explain superior performances of companies involved in international new product development (NPD). The study evaluates (1) four organizational NPD resources (i.e., the firm's global innovation culture, attitude to resource commitment, top-management involvement, and NPD process formality); (2) NPD process capabilities or routines for identifying and exploiting new product opportunities (i.e., global knowledge integration, NPD homework activities, and launch preparation); and (3) global NPD program performance. The findings indicate that all four resources play a significant role. Specifically, a positive attitude toward resource commitment as well as NPD process formality is

essential for the effective deployment of the three NPD process routines; a strong global innovation culture is needed for ensuring effective global knowledge integration; and top-management involvement plays a key role in deploying both knowledge integration and launch preparation. Of the three NPD process capabilities, global knowledge integration is the most important, whereas homework and launch preparation also play a significant role. Too much process formality may be negative and that top-management involvement requires careful focus.

Lovelace, K., Shapiro, D.L., & Weingart, L.R. (2001). Maximizing cross-functional new product teams' innovativeness and constraint adherence: A complications perspective. *Academy of Management Journal, 44*, 779-793.

Increasing competition has heightened the need for businesses to rely on cross-functional new product teams to produce innovations; yet functionally diverse teams' inevitable disagreements often appear to prevent this. In a study of 43 such teams, the authors found that the effect of task disagreement on team outcomes depended on how free members felt to express task-related doubts and how collaboratively or contentiously these doubts were expressed.

Lynn, G.S. (1998). New product team learning: Developing and profiting from your knowledge capital. *California Management Review, 40(4),* 74-93.

This paper examines organizational learning, a process critical to new product team successes. Three different forms of learning were elucidated. The first is called Within-Team Learning, referring to learning that occurs within the context of the team itself. Cross-Team Learning, is the experience gained by one team within a company and then transplanted to another. The third form of learning, called Market Learning, is the knowledge gained external to the firm—from competitors, suppliers, and customers. Interestingly, a team does not have to be expert in all three forms of learning because the best strategy is tailored to a given innovation.

Lynn, G.S., Skov, R.B., & Abel, K.D. (1999). Practices that support team learning and their impact on speed to market and new product success. *Journal of Product Innovation Management, 16(5),* 439-454.

Businesses are pressured to innovate and do so quickly. One technique gaining popularity is establishing learning teams—teams that create and use knowledge rapidly and effectively. This

paper studies the learning practices of 95 new product teams. The factors that improve a new product team's ability to learn and innovate faster include thoroughly reviewing project information, having stable project goals, and following a rigorous new product development process.

MacCormack, A. (2001). Product-development practices that work: How internet companies build software. *MIT Sloan Management Review, 42(2),* 75.
This paper reviews how software development models have evolved. Gilb's iterative "evolutionary delivery model", is highlighted. This model is an approach where a project is broken down into many microprojects, each of which is designed to deliver a subset of the functionality in the overall product. Flexibility is build in, where the team can make changes in direction during development by altering the focus of subsequent microprojects. Furthermore, the number and length of the microprojects can be tailored to match the context of a project.

McComb, S.A., Kennedy, D.M., Green, S.G. & Compton, W.D. (2008). Project team effectiveness: The case for sufficient setup and top management involvement. *Production & Planning Control, 19(4),* 301-311.

This paper examines resource allocation, team leader authority, significant project objectives, and top management involvement on project success in industrial teams. The authors found a team's ability to function efficiently is positively related to resource allocation and significant project objectives and negatively related to team leader authority and top management involvement. A project team's ability to achieve its business goals was positively related to significant project objectives; this relationship was stronger when top management was involved. Top leadership enhanced the team leader authority-goal achievement relationship but negatively impacted the team leader authority-project efficiency relationship.

McDermott, C.M., & O'Connor, G.C. (2002). Managing radical innovation: An overview of emergent strategy issues. *Journal of Product Innovation Management, 19(6),* 424-438.
Radical innovation is very different from incremental innovation. It is often difficult to get support for radical projects where internal cultures and pressures push efforts toward more low risk, immediate reward, incremental projects. A multiple case study design was used to explore

the similarities and differences in management practices applied to twelve radical innovation projects. The findings are grouped into three high-level strategic themes: (1) market scope, associated with the pursuit of familiar versus unfamiliar markets for radical innovation; (2), competency management, challenges that emerge as firms stretch themselves into new territory; and (3) people, issues that emerge as both individuals and the project teams themselves try to move radical projects forward in organizations that are not necessarily designed to support such uncertainty. These observations reinforce the emerging literature that shows that project teams engaging in radical innovation encounter a much different set of challenges than those engaged in incremental innovation.

McDonough III, E.F. (2000). An investigation of factors contributing to the success of cross-functional teams. *Journal of Product Innovation Management, 17(3),* 221-235.
Although most firms have implemented cross-functional teams, they are still finding it hard to ensure that these teams are successful in completing the new product development task. This review article focuses on four factors that have previously been demonstrated to relate to cross-functional team success, and analyzes the responses of new product development professionals to determine which factors are more frequent. Of these, appropriate project goals is mentioned most often as being associated with success, followed by empowerment. Specific team behavior of cooperation is most associated with success, followed by commitment and ownership. Finally, team leadership is the most frequently mentioned enabler of team success, followed by senior management support.

Millson, M.R., & Wilemon, D. (2002). The impact of organizational integration and product development proficiency on market success. *Industrial Marketing Management, 31(1),* 1-23.

This study investigates the effect of organizational integration on market success and development proficiency in new product development (NPD) teams in US equipment industries. In this study, “organizational integration” is defined as the degree of cooperation between internal and external “support” groups and NPD teams. “NPD process proficiency” is defined as how well new product development stages and the new product development process is performed. Organizational integration was found to be significantly associated with new product market success. Internal integration was found to be significantly related to product market

success. A significant relationship between new product development proficiency during the NPD "post-launch stage" and the degree of integration between an NPD team and external NPD organizations, such as customers and suppliers, was also detected.

Moffat, L.K. (1998). Tools and teams: Competing models of integrated product development project performance. *Journal of Engineering and Technology Management, 15(1),* 55-85.
The relationship between the methods of integrated product development (concurrent engineering CE) and project task performance were tested on an multi-industry sample of CE project teams. Most of the benefits from the tools and methods of CE can be achieved by focusing implementation effort on increasing simultaneity in the development process and improving team decision-making effectiveness.

Nakata, C., & Im, S. (2010). Spurring cross-functional integration for higher new product performance: A group effectiveness perspective. *Journal of Product Innovation Management, 27(4),* 554-571.

This paper presents theory and validation study to examine whether cross-functional integration in new product development (NPD) teams improve new product performance; and if so, to identify ways to strengthen integration. A model developed from group effectiveness theory was tested in 206 NPD teams from U.S. high-technology companies. Cross-functional integration brings the skills, efforts, and knowledge of differing functions in an NPD team results in producing high-performing new products. The aukthors also find that both intra- (or internal) and extra- (or external) team factors contribute and codetermine cross-functional integration. Specifically, social cohesion and superordinate identity as internal team factors and market-oriented reward system, planning process formalization, and managerial encouragement to take risks as external team factors foster integration. These findings underscore that spurring integration requires addressing the conditions inside as well as outside NPD teams.

Olson, E.M., Walker, O.C., & Ruekert, R.W. (1995). Organizing for effective new product development: The moderating role of product innovativeness. *Journal of Marketing, 59(1),* 48-62.

This paper examines whether cross-functional teams shorten development times and improve project success rates. It presents a contingency model suggesting that more participative structures are likely to improve the development process when the product being developed is truly new and innovative. However, the model also predicts that bureaucratic structures may produce better outcomes on less innovative projects. The model was empirically tested and validated in industry teams. The findings indicate that new product concept matched with a participative coordination mechanism produced better developmental outcomes in terms of (1) objective measures of product and team performance, (2) the attitudes of team members toward the process, and (3) the efficiency and timeliness of the new product development process.

Osburn, J., Moran, L., Musselwhite, E., & Zenger, J.H. (1990). *Self-directed work teams*. Homewood, IL: Business One Irwin.

This book presents the Zenger-Miller approach for how to implement self-directed teams.

Pinto, M.B., Pinto, J.K., & Prescott, J.E. (1993). Antecedents and consequences of project team cross-functional cooperation. *Management Science, 39(10),* 1281-1297.
Cross-functional teams can greatly facilitate the successful implementation of projects. This study examined the influence of four antecedent constructs (superordinate goals, accessibility, physical proximity and formalized rules and procedures) on both cross-functional cooperation and project outcomes. The results indicated that superordinate goals, physical proximity and project team rules and procedures have significant effects on project outcomes through influencing cross-functional cooperation. Cross-functional cooperation was a significant predictor of both perceived task and psychosocial project outcomes.

Purdon, W.A.B. (1996). Increasing R&D effectiveness: Researchers as business people. *Research-Technology Management, 39(4),* 48-56.

This article discusses how interactions need to be designed in cross-functional market segment teams, focused on the business's key market segments, that allows the necessary strategic thinking to develop. The importance of R&D leadership that is committed to change, and will empower the R&D organization to act,.is emphasized.

Randel, A.E., & Jaussi, K.S. (2003). Function of background identity, diversity, and individual performance in cross functional teams. *Academy of Management Journal, 46(6),* 763-774.
This study examines individuals' performance in cross-functional teams. Both the interaction between identity and dissimilarity with other team members and the interaction between identity and membership in a team's minority or majority were considered. The most significant interaction was that of minority/majority membership with identity.

Reagans, R., & Zuckerman, E.W. (2001). Networks, diversity, and productivity: The social capital of corporate R&D teams. *Organization Science, 12(4),* 502-517.

This study of 224 corporate R&D teams addresses the roles of network density--the average strength of the relationship among team members—and network heterogeneity, on team performance and learning capability, respectively. The findings suggest that the diversity-performance debate needs to be restated in terms of the network processes that are more proximate to outcomes of interest.

Sarin, S., & O'Connor, G.C. (2009). First among equals: The effect of team leader characteristics on the internal dynamics of cross-functional product development teams. *Journal of Product Innovation Management, 26(2),* 188-205.

This paper applies the path-goal theory of leadership to examines the effect of team leader characteristics on conflict resolution behavior, collaboration, and communication patterns of new product development (NPD) teams. The authors suggest that a participative management style and initiation of goal structure by the team leader exert the strongest influence on internal team dynamics. Both these leadership characteristics had a positive effect on functional conflict resolution, collaboration, and communication quality within the NPD team while discouraging dysfunctional conflict resolution and formal communications. Comparatively, team leader's consideration, initiation of process structure, and position had a surprisingly weak effect on internal team dynamics.

Schmidt, J.B., Montoya-Weiss, M., Massey, A. (2001). New product development decision-making effectiveness: Comparing individuals, face-to-face teams, and virtual teams. *Decision Sciences, 32(4),* 575-601.
A total of 411 subjects participated in two decision-making experiments to examine the effectiveness of new product development project continuation decisions. This study concludes that teams make more effective decisions than individuals, and virtual teams make the most effective decisions.

Schmidt, J.B., Sarangee, K.R., & Montoya, M.M. (2009). Exploring new product development project review practices. *Journal of Product Innovation Management, 26(5),* 520-535.
The findings of a study on new product development (NPD) project review practices focusing on three common decision points: (1) initial screen, (2) prior to development and testing, and (3) prior to commercialization. More review points are used for radical NPD projects than incremental ones, and this is related to a relatively lower rate of survival for radical projects. The findings also show that the number of criteria used to evaluate NPD projects increases as NPD projects progress and that the number of review team members grows. Surprisingly, the results reveal that more criteria are used to evaluate incremental NPD projects than radical ones. Evaluation criteria is less proficiently applied during the development of radical projects where financial criteria were most commonly used. Importantly, only review proficiency is significantly associated with performance; the number of review points, review team size, and number of review criteria are not associated with new product performance.

Scott-Young, C., & Samson, D. (2008). Project success and project team management: Evidence from capital projects in the process industries. *Journal of Operations Management, 26(6),* 749-766.

This paper constructs and tests a five-dimensional model of organizational context, project team design, project team leadership, project team processes, and project outcome factors in project teams in process industries. The results indicate the value of disaggregating project outcomes for research purposes. Project team efficacy, cross-functional project teams, autonomous project team structure, and virtual office usage were the strongest predictors of project cost effectiveness. Continuity of project leadership, cross-functional project teams, and project

manager incentives were the strongest predictors of project construction schedule. In contrast, clear project goals and an office design to facilitate effective communication were the main predictors of plant operability. One practical implication of this study is that project managers need to clearly focus and prioritize their goals for each project so they can adopt the appropriate bundles of project team practices that will facilitate their goal achievement.

Scott-Young, C., & Samson, D. (2009). Team management for fast projects: An empirical study of process industries. *International Journal of Operations & Production Management, 29(6),* 3. This paper identifies key team factors associated with the fast implementation of capital projects. Only some of the variables predicted fast schedule outcomes; these included project manager continuity, cross-functional team integration, and project manager incentives.

Sethi, R., & Nicholson, C.Y. (2001). Structural and contextual correlates of charged behavior in product development teams. *Journal of Product Innovation Management, 18(3),* 154-168.

This paper introduces the concept of charged team behavior, the extent to which cross-functional product development teams are enthusiastically driven to develop superior new products. Charged team behavior captures drive, commitment, joy of team members, as well as their collaborative behaviors. This study shows that charged behavior is influenced by both team structural characteristics (physical proximity, team longevity, and outcome interdependence) and contextual factors (senior management encouragement to take risk, quality orientation, exposure to customer input, extent of competition, and interdepartmental connectedness). Highly charged teams are more likely to develop successful new products. Results also indicate that outcome interdependence, exposure to customer input, extent of competition, and interdepartmental connectedness are positively related to charged behavior. Charged team behavior: 1) fully mediates the effects of outcome interdependence and interdepartmental connectedness on performance, 2) partially mediates the influence of exposure to customer input and the extent of competition on performance and 3) does not mediate the effects of quality orientation and physical proximity on performances.

Smith, K.G., Collins, C.J., & Clark, K.D. (2005). Existing knowledge, knowledge creation capability, and the rate of new product introduction in high-technology firms. *Academy of Management Journal, 48(2),* 346-357.

A field study demonstrated that the rate of new product and service introduction was a function of knowledge exchange. We tested the following as bases of that ability: the existing knowledge of employees (their education levels and functional heterogeneity), knowledge from member ego networks (number of direct contacts and strength of ties), and organizational climates for risk taking and teamwork. This research highlights the relationship between static or existing knowledge in a firm and the more dynamic knowledge creation capability.

Staples, D.S., & Webster, J. (2008). Exploring the effects of trust, task interdependence and virtualness on knowledge sharing in teams. *Information Systems Journal, 18(6),* 617-640.
The sharing of knowledge within teams is critical to team functioning. However, working with team members who are in different locations may reduce opportunities for rich interactions. This study examined the potential effects of virtuality on a knowledge-sharing model. Social exchange theory was used to develop a model relating trust to knowledge sharing and knowledge sharing to team effectiveness. A strong positive relationship was found between trust and knowledge sharing for all types of teams, but the relationship was stronger when task interdependence was low, supporting the position that trust is more critical in weak structural situations. Knowledge sharing was positively associated with team effectiveness outcomes; however, this relationship was moderated by team imbalance, such that the relationship between sharing and effectiveness was weaker.

Susman, G.I., & Ray, J.M. (1999). Test of a model of organizational contributors to product development team effectiveness. *Journal of Engineering and Technology Management, 16(3-4),* 223-245.
This study tests two aspects of a product development team. One concerns the use of integrative mechanisms to counterbalance negative effects of function-based differentiation, through group process. The other concerns group process vs. codification computerization as alternative means to process information as risk increases. The results suggest that project focus is directly related to project outcomes, but group process does not mediate this relationship. Codification/

computerization is not related to project outcomes. Risk does not positively moderate the group process–project outcomes relationship, but does negatively moderate the codification/ computerization–project outcomes relationship.

Tatikonda, M.V., & Rosenthal, S.R. (2000). Successful execution of product development projects: Balancing firmness and flexibility in the innovation process. *Journal of Operations Management, 18(4),* 401-425.

This paper investigates the relationship between the effectiveness of the project execution methods of formality, project management autonomy and resource flexibility in new product development (NPD) teams. The study concludes that project execution methods are positively associated with project execution success. Further, these methods are effective singly and collectively, suggesting that firms can “balance firmness and flexibility” in product development. Method effectiveness is not contingent on the novelty inherent in a given development project. The findings suggest that firms should adopt high levels of these approaches, and that a variety of projects can be managed using broadly similar project execution methods.

Taylor, G.L., & Snyder, L.J. (1995). Self-directed R&D teams: What makes them effective? *Research Technology Management, 38(6),* 499-511.

This paper presents the results of a survey conducted by the Industrial Research Institute on experiences of member companies with the use of teams in research and development. The most important three items were clear goals, communication and customer involvement, and the team structure and selection. Also important were management support in terms of providing the necessary resources, and management behavior in terms of being able to "keep 'hands off." Other factors, such as facilitation, leadership style, training and recognition, or lack thereof, were far less significant.

Tessarolo, P. (2007). Is integration enough for fast product development? An empirical investigation of the contextual effects of product vision. *Journal of Product Innovation Management, 24(1),* 69-82.

This research study examines the effect of product vision on development efficiency in novel product development teams. The results confirm that external integration is important in achieving better time performance. The influence of external integration on cycle time can also be increased by the presence of a well-defined product vision. The relationship between internal integration and time performance is more complex. Though it seems to slow down the process as a single factor, its interaction effect with product vision is positive. These results suggest that externally integrated development can greatly improve time performance; however, the best results in terms of acceleration can be obtained when there is a well-defined product vision. Furthermore, product vision is essential in the case of internal integration: A cross-functional process is insufficient for development acceleration in the absence of product vision.

Van der Vegt, G.S., & Janssen, O. (2003). Joint impact of interdependence and group diversity on innovation. *Journal of Management, 29(3),* 729-751.
This study examined the effects of individual team members' perceived task interdependence and perceived goal interdependence on innovative behavior. The individual's perceived task and goal interdependence were not related to innovative behavior in homogeneous teams. In heterogeneous teams, however, task interdependence was strongly and positively related to innovative behavior for individuals who perceived high levels of goal interdependence, and unrelated to innovative behavior for those who perceived low levels of goal interdependence.

van Engelen, J.M.L., Kiewet, D.J., & Terlouw, P.(2001). Improving performance of product development teams through managing polarity. *International Studies of Management & Organization, 31(1),* 46.

This study examines the relationship between polarity, a measure of conflict, and performance in virtual new product development teams. Three sets of different factor polarity curves were found. One set shows a clearly positive effect of polarity on performance, although another set shows a clearly negative effect. A third set shows a more complicated relationship, which indicates that these factors can be further distilled.

Vera, D., & Crossan, M. (2005). Improvisation and innovate performance in teams. *Organization Science, 16(3),* 203-224.

This paper delineates how improvisational theater principles can be applied to work teams. Our findings support a contingent view of the impact of improvisation on innovative performance. Improvisation has a positive effect on team innovation when combined with team and contextual moderating factors. Evidence is also provided evidence suggesting that improvisational skill can be learned by organizational members through training.

Wang, S., & Noe, R.A. (2010). Knowledge sharing: A review and directions for future research. *Human Resource Management Review, 20(2),* 115-131.

This paper reviews qualitative and quantitative studies of individual-level knowledge sharing to understand knowledge sharing research. The paper discusses five areas of emphasis: organizational context, interpersonal and team characteristics, cultural characteristics, individual characteristics, and motivational factors.

Yeatts, D,E, & Schulz, E. (1998). Self-managed work teams: what works? *Clinical Laboratory Management Review, 12(1),* 16-25.

Self-managed work teams (SMWTs) produce more at work than employees organized in a traditional structure because they perform both technical and management skills. The primary factors affecting SMWTs success formed five groups. Work process factors include those that are needed when actually performing the work, such as the appropriate resources, talent, procedures, and effort. Interpersonal process factors include communication and both positive and negative conflict. Environmental factors include those within the SMWT'S organization, such as management support and the reward system, as well as factors outside the organization, such as suppliers and the market. Team design factors and team member characteristics were found to be equally important to the high performance of the SMWT.