
Building collaborative cross-functional new product teams

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Executive Overview

The emergence of cross-functional teams has outpaced our understanding of how and why they work the way they do. Although cross-functional teams have improved new product processes in many organizations, not all work equally well, nor are all equally collaborative. Our recent study of high technology-based industrial organizations shows that collaborative behaviors are difficult to learn, and seldom result from mere membership on teams. 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.

The past ten years of brouhaha over work teams have left managers and professionals in a quandary: we know we need teams (for at least certain organizational tasks), and we've learned a lot about them, but while the demands for high performance teams continue to increase, our ability to create and sustain them has plateaued. Where there should be enhanced capability, greater confidence in the process, and satisfaction with outcomes, there is a growing sense of disappointment, frustration, and cynicism.¹

Cross-functional teams have emerged as a popular structural mechanism for managing new product initiatives in high-technology firms. They promise improved integration of diverse skills that exist in R&D, production, marketing, and other functional groups, and acceleration of new product development processes.² However, our study³ of 10 mid-to-large sized high-technology industrial organizations⁴ highlights a common predicament of implementing cross-functional teams. Although they are formed with great optimism, few are managed for success—belying a prevalent view that people will collaborate when thrown into cross-functional teams.⁵ Either out of ignorance or a misplaced sense of

cost saving, few groups receive the training, coaching, and other support necessary for transformation into collaborative teams.⁶ Moreover, we find that poorly implemented cross-functional teams threaten to worsen morale, exacerbate divisiveness, and elevate cynicism among participants.⁷ Many managers are chagrined that not all well-intentioned teams are equally effective in integrating skills or equally collaborative. The wide adoption and substantial promise teams hold for new product processes raise the question: why do some groups transform into high performance, collaborative cross-functional teams when many others are engaged in an unrelenting struggle to function coherently?

Our study sheds light on several practical challenges that emerge once cross-functional teams are deployed to manage new product initiatives. We find that building collaborative teams, even among highly qualified and technically savvy people, is challenging because it requires participants to shed dated views, unlearn old habits, develop new theories of action, and adopt new behaviors. People thrown together into teams no more become collaborative in the short term than technology-driven firms become customer-focused overnight. It is no surprise, therefore, that while some cross-functional

teams transform and adopt collaborative behaviors, many struggle with issues of interpersonal interaction and fail to deliver much of what teamwork has promised.

Emergence of Cross-functional Teams

There is little dispute that cross-functional integration improves new product development processes.⁸ High-quality interactions and coordination of activities among R&D, production, marketing and other functional groups increase creativity, reduce costs, and accelerate product development cycle times.⁹ To achieve these results, managers have experimented with many structural arrangements, including liaison roles, product and project managers, matrix structures, and concurrent engineering teams.¹⁰ Yet ensuring that the collective capabilities of people across the organization are reflected in newly developed products continues to represent a principal challenge. Cross-functional teams have emerged as popular structural solutions for managing new product task environments¹¹ because they not only promise the highest level of interfunctional integration and cross-fertilization of ideas as yet, they are also relatively easy to institute.

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All 40 managers we interviewed from R&D, production, and marketing functions in 10 firms recount struggles with functional-hierarchical designs, rigid perceptual and spatial boundaries among functional groups, and differences in priorities and agendas resulting in turf-protection behaviors, errors and rework, chronic cost escalations, and missed deadlines. The managers have adapted to the contingencies of new product task environments in several different ways. Two firms have done little more than debate the merits of cross-functional integration. One firm has instituted a partnership team with representatives from marketing and R&D, and one has employed a concurrent engineering team with representatives from the technical functions of the firm, including R&D and production. Six firms have instituted cross-functional teams that include at least one representative from R&D, production, and marketing.

Cross-functional teams have produced two clearly advantageous results. First, new product teams have substantially improved the involvement of production and marketing groups in decision making, and increased their participation in new product-related task performance. Second, all teams have also transformed the mostly linear new product development processes into more organic ones. Instead of resembling a relay race of activities wherein one department finishes its part of new product decisions and tasks and hands its output to the departments next in line, cross-functional teamwork has helped organize many new product activities concurrently. But there the similarities end, and teams differ in the collaborative behaviors they display and the new product objectives they achieve.

The Nature of Collaboration in Teams

Although many terms, including interaction, coordination, integration, and cooperation, have commonly referred to linkages among people and departments, and most have enjoyed their moments of popularity in the literature, collaboration has recently emerged as a popular metaphor for describing a more complex, more productive linkage. Originating in the conflict management literature, the term refers to a method by which competing interests reach win-win outcomes.¹² By some accounts, collaboration refers to a metacapability, i.e., the ability to renew skills and adapt to environmental challenges.¹³ In the new product development literature, the term is often used interchangeably with cooperation among functional groups. A more comprehensive view of collaborative new product teams emerges, however, when we compare and contrast the most collaborative ones in our sample (Teams A and B), with the least (Teams X and Y),¹⁴ and integrate the results with recent thinking in the literature.¹⁵ (See Exhibit A.) We find, for instance, that high-collaboration new product teams are uniquely identifiable by the high levels of at-stakeness, transparency, mindfulness, and synergy they display.

First, Teams A and B are distinguished from others by the high level of at-stakeness that members have achieved.¹⁶ High at-stake members enjoy equal stature and influence on decision making, and demonstrate high levels of energy and enthusiasm while speaking about their association with the team. Being part of the team matters, and matters equally to all. Members contribute equally to team decisions, share equally in the performance of new product tasks, and take equal ownership of the team's outcomes. Teams A and B include few

less interested participants, and even fewer uninterested participants.

Second, the high level of transparency that exists among members of Teams A and B differentiates them from others. By transparency, we refer to the high levels of clarity that members have achieved about each other's motivations and intents as a result of intense information sharing. In both teams, divergent and conflicting orientations and agendas are explicitly discussed, and misunderstandings and perceptual distortions are consciously overcome. Noting the impact of formal weekly meetings in which the team's progress, current obstacles, new ideas, and future agendas are discussed, the engineering manager described the emerging transparency in the following way:

I feel that we know so much about each other, there really isn't anything I need to know that I don't know. Yes, there needs to be, and there is, a shared understanding. I think marketing and engineering could be one group and function as well. I do a lot of marketing and the marketing manager does a lot of technology identification.

In both collaborative teams, we find that members can openly articulate the likes, dislikes, pet peeves, tendencies, biases, and key concerns of other participants. There is little hesitation in describing the high levels of comfort they have achieved in terms of educating others about their own backgrounds and interests, and disagreeing with others and opening discussions for identifying new alternatives. All participants appear to hold an informed sense of how others are likely to view and interpret emerging environmental contingencies, and what they are likely to view as more or less appropriate ways of responding. Hence, they are rarely confused or overwhelmed by inexplicable, unforeseen decisions or behavioral responses of other team members. In Teams X and Y, by contrast, although perceptions of others' agendas and motivations clearly exist, they are rarely discussed in open forums. Similarly, although attributions that seemingly explain others' behaviors are clearly held, they are rarely tested. Most communication among participants, particularly in Team Y, is formal, and has failed to generate the comfort level required for transparency to emerge. For instance, the marketing representative in Team Y provides a formal critique to the R&D representative's new product design ideas, even as each holds unarticulated, untested conjectures about the other's motivations.

Third, Teams A and B are distinguished by the

high levels of mindfulness they have achieved, i.e., their decisions and actions reflect the high levels of transparency that exists. Mindful decisions, made jointly as a team or unilaterally by a participant, reflect an integrated understanding of the divergent points of view that exist in the task environment. They tend to evoke such responses as: *This decision makes sense from my perspective and reflects (at least to an acceptable extent) my unique situation, interests, abilities, and constraints, and therefore I can support it.* Similarly, mindful actions that emerge either from joint decisions of the team, or from a participant's unilateral decisions, evoke such responses as: *This action makes sense and fits within the purview of what I believe the team is committed to accomplishing, and I can support it.* Mindfulness appears linked somewhat directly to effective implementation of new product decisions, because mindful decisions and actions receive committed support from participants, function to mobilize their energies, and foster goal-directed, purposeful action.

Fourth, the periods of synergy reported by members of Teams A and B also differentiate them from others. The high degree of comfort that members feel in voicing divergent opinions and challenging each other's ideas has helped stretch everyone's notion of what is achievable and how. Members of both teams can interact and produce outcomes that reflect much more than a simple sum of their individual talents. By contrast, signs of synergy are absent in Teams X and Y. The turf-protection behaviors, the unarticulated agendas, and the politicizing of decision making has led to a stream of new product decisions that placate the most powerful and often the most vocal interests.

Teams A and B are distinctive as well, in the new product outcomes they have delivered. They have infused high levels of creativity in new product development processes, and better harnessed the energies, talents, and creative potential of their cross-functionally-trained members. There are clear signs that collaborative teams bring effective new products to market faster and cheaper. For instance, Team B introduced its new product over a

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month ahead of schedule, created twice the estimated sales, and achieved significant reductions in costs. These outcomes are noteworthy given the situation inherited by the team and described in

the following way by the manufacturing manager:

We almost went bankrupt here. We had a product that we tried to launch that almost busted us. Because there was no team, it was throwing it over the wall, it was late, everybody had their own agenda, everybody had their own little domain. Everything was fragmented and nothing came together. And, the customer was about ready to say, "Hey, we'll go someplace else." It cost us just tons and tons of money to get that thing to come off right. And even with that, it grew very very late and our customer was getting really angry over it. We almost lost it.

tion exchange, emergence of a shared understanding and shared ownership, joint decision making, and realization of extraordinary goals, is seldom direct. The reasons some teams collaborate better than others lie in the process by which they transform and adopt new behaviors. Figure 1 shows the *generalized* view of the process by which the transformation occurred in Teams A and B, and presents our principal data-derived argument that collaborative behaviors are complex, and seldom result from the mere institution of teams.¹⁷ By *at-stakeness*, transparency, mindfulness, and synergy, we refer to successively linked, relatively simple behaviors that approximate and lead up to the more complex collaborative behaviors, and to a logical progression of cognitive, emotional, and social learning and developmental milestones linked by distinctive antecedents and effects. (See Table 1).

Process of Transformation and Developmental Milestones

For organizations that have experimented with product and project managers, matrix structures, and other structural arrangements, learning that cross-functional teamwork can accelerate new product processes represents a clear developmental milestone. But the path from institution of cross-functional teams to collaborative teamwork, i.e., the development of intense, productive informa-

At-stakeness

At-stakeness in teams represents an initiating development, and refers to a condition where participants commit equally to the team's decisions because they care equally and deeply about the team's outcomes.¹⁸ In the instances where R&D initiates new product activities, the origins of at-

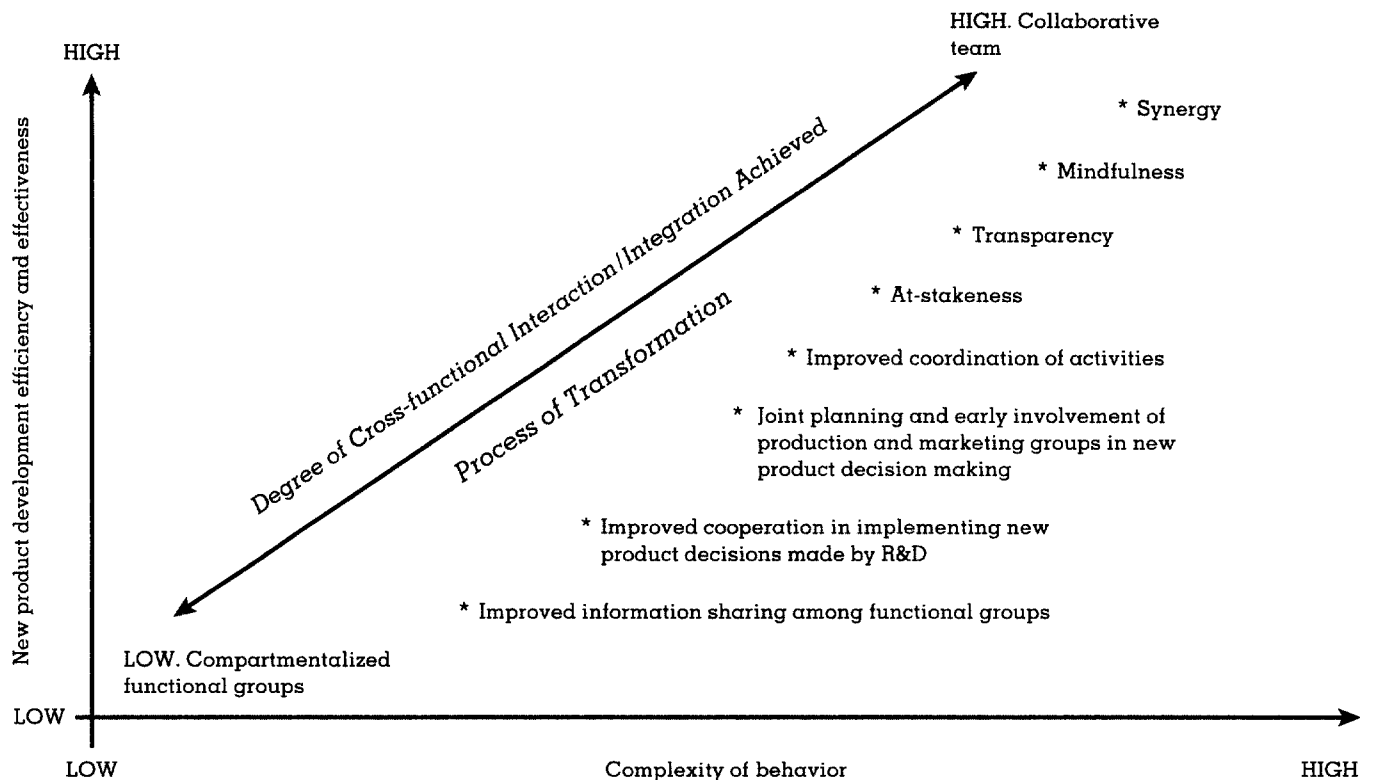


FIGURE 1
Transforming Behaviors into Collaborative Cross-functional Teams

Table 1
Antecedents and Learning for Each Stage in Team Transformation

| Antecedent Structure and Process | Stage in Transformation | Learning and Felt Need |
|---|-------------------------|--|
| Structurally divided organization, linear, relay race type new product development. Key managers play liaison roles, and function as linking pins between departments. Experiments with product managers, matrix structures, concurrent engineering teams, etc. | Low Collaboration | Relay-race type new product development negatively affects competitiveness. Felt need for increased interfunctional communication and interaction, and for higher levels of coordination among functional groups. |
| Institution of cross-functional teams. Increased inclusion of marketing and production groups, and equitable commitment to new product decisions and team outcomes. | At-stakeness | Equitable sharing of power is essential for gaining equitable commitment from participants. Felt need for explaining one's own, and understanding others' constraints, motivations, and interests. |
| Participants initially share information about their constraints, motivations, and interests to gain others' understanding. All participants eventually begin to rely on hard data in their communication so that everyone else functions from a shared frame of reference. | Transparency | Intense information sharing and reliance on hard data results in a transparent environment and promotes an integrative understanding of participants' constraints, motivations, and interests. Felt need for decisions and actions that reflect the transparency that has been achieved at all times. |
| Participants' behaviors show that high levels of transparency have been achieved. Actions of participants reflect an integrated understanding of everyone's constraints and interests; function to build trust; and elicit the support of other participants. | Mindfulness | Intense exchange of hard data, development of transparent teams, and mindful behaviors of participants fosters an environment of trust. Felt need for taking advantage of the diverse orientations and interests that exist within the teams, for generating creative solutions that stretch everyone's capabilities, and harnessing the creative talents of all participants. |
| High levels of trust within the team create an environment where creative, unusual options can be voiced and discussed without censure. Conflict is viewed as an opportunity to explore new scenarios that stretch everyone's thinking. | Synergy | Quantum leaps in innovation and new products occur when high levels of synergistic interactions utilize the breadth of skills that exist in teams. Felt need to harness serendipity, and create new products that gain the emotional involvement and commitment of customers. |

stakeness lie in its attempts to involve other functional groups to share in its new product tasks and burdens. The desire for accelerated, low-cost product-development cycles, coupled with the interest in ensuring that blueprints and designs are reproducible in the factory for large-scale production, and that the blame for delays, cost over-runs, and other problems are spread around, spurs two distinctive developments. First, representatives from marketing and production groups are increasingly consulted about new product decisions. Second, there is a marked increase in the extent to which marketing and production groups are asked to perform new product tasks.

The beliefs that drive equitable sharing of power emerge from the growing awareness that customers are interested in solutions that reflect an integration of the organization's skills and competencies. In cross-functional teams led by R&D representatives, at-stakeness improves consider-

ably when representatives of marketing and production groups begin to see direct links between their inputs and the decisions that the team eventually implements, and between their investment in task performance and the goals the team eventually achieves. The at-stakeness improves substantially, and more so, is sustained, when senior

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management selects a leader relatively free of functional affiliations and skilled at managing interpersonal relationships and interaction, and en-

asures that participants from R&D, marketing, and production are jointly involved from the initiating stages of new product development. Without strong team leadership committed to sharing power, we find that members fail to commit equally to their inputs, or share a stake in the outcomes.

The at-stakeness in Team A has resulted largely because the R&D, marketing, and production representatives were involved from the initial stages of the new product development process. The practice of rotating the team's leadership among R&D, production, and marketing representatives, depending on the stage of the new product development process, has helped considerably in gaining participants' commitment to collective intents. Similarly, in Team B, the competitive marketplace and the perceived threat to organizational survival have functioned as a cohesive force, and helped gain high levels of commitment to new product development from functional groups. Moreover, the commitment members have made to the team reflects both their organization's emphasis on developing integrative solutions for customers and the team leader's skill in selecting the right mix of participants. In contrast, the implied hierarchy of power and authority in Teams X and Y has failed to foster a sense of ownership among members. The R&D appointed leader of Team X, for instance, largely directs the activities of the production and marketing representatives, and occasionally consults with them. Noting how failure to involve the production group from the initial stages of new product development planning severely affected the process, a representative from the production group in Team Y notes:

Every week we get calls from the R&D representative saying, "Oh, here is one more part." So we'll go out and build it, and we'll find out—guess what—there is another part he missed. Now if we were involved a little bit more up front, it helps because if there was an assembly missing from R&D's plans and we knew it because we'd worked on it, we could say, "Now wait a minute, what about the xyz assembly? You never gave us anything for that."

Therefore, members of Team Y hold the leader and the senior management ultimately responsible for new product outcomes. Dissatisfied about their insignificant influence, they commonly refer to attempts to shift blame that follow delays or disappointments in the new product process.

Transparency

Teams become transparent and reach the next developmental milestone when participants achieve high levels of awareness, clarity, and understanding of the multiple orientations, motivations, and agendas that exist in the team. Team A's learning and acceptance of the notion that effective teamwork requires not just the inclusion of technical skills but the skills for managing interpersonal interactions as well signals the emergence of transparency. Describing the challenge of selecting members with these skills and of developing transparency, the leader of Team A notes:

If I was hiring an engineer and I looked at their technical credentials—I can do that. But I don't have anything to look at that talks about how well they function as a team member or a team leader. And they're as critical as those technical skills. A mechanical engineer who can't do a stress analysis is not worth much to me. Nor is one who can't function as a team member.

Participants' belief systems undergo fairly complex changes at this stage of cognitive, emotional, and social development. Two emergent changes are particularly worthy of note. First, team members begin to accept that a shared understanding is necessary among participants aiming to accomplish complex goals. Second, they begin to realize that issues arising from the unarticulated, internalized differences in orientations and interest impede decision making and implementation. A member of Team B describes the process by which his team struggled with interpersonal interaction issues in this way:

It's two people who are persistent in their pursuit of a common objective, and who are able to put personalities aside if necessary and confront each other over issues where there's disagreement in terms of what the priorities are and they can walk away from that session feeling the same high regard for each individual, the same respect and self-esteem. The people that want to shy away from that avoid issues hoping they'll go away, and that is where we have the most trouble.

Transparency often originates from participants' attempts to define their own boundaries and space, and from a self-serving need to have others become more cognizant of their own constraints and interests. Teams show signs of becoming more

transparent when participants begin to consciously and deliberately tell others what they want them to know, motivated by the need to gain empathy and ensure that others are making decisions and taking action based on this understanding. The level of transparency increases when team leaders encourage participants to know more about others, and to develop an understanding of their interests and constraints. Notable improvements also occur when teams adopt formal processes and ritualistic forums where participants have the opportunity to make explicit their motives and the reasons for their actions, supported by hard data. This includes information that people with opposing points of view accept as valid descriptions of events.

Several conditions created by team leaders and senior management appear to accelerate the development of transparency. First, reducing the distance among participants, and especially putting team members together, appears to help. For instance, company A's marketing, production, and R&D chiefs share adjacent offices. Moreover, none can recall the others' telephone extensions since it is common for them to walk into one another's offices and initiate discussions. By contrast, the formal communication and memo writing among members of Team Y has failed to bridge the conceptual distances that exist in their thought worlds. Second, a culture of inclusion and early involvement of multiple participants in the new product development helps as well. For instance, Team B includes representatives from the union and suppliers in the initial stages of the process to ensure that divergent perspectives are voiced. Customers are not only invited to participate, they are treated as insiders with whom concerns are openly shared. Third, cross-training and cross-functional experiences of managers also contribute to transparency. Team A's marketing and production representatives have functioned as design engineers, and intimately understand R&D's perspective. Leaders of Teams A and B stress the need for careful selection of members capable of overcoming conceptual boundaries, and for careful elimination of members who are unable to communicate or unwilling to overcome differences.

Mindfulness

The integrated awareness of the diverse orientations that exist in teams creates a shared cognitive, emotional, and social context from which mindful decisions and actions can emerge. We find that Teams A and B are mindful because, for the most part, their members can act in ways that

reflect an in-depth understanding of the breadth of concerns that exist in the team—and often the micro and macro environment of the organization. They also develop rational reasons, if mostly for their own benefit, that can explain why other members make decisions and act in ways they do. Then they emotionally commit to the implementation of any decision made by the team without an inhibiting, constricting concern for its impact on their own, personal power base.

In general, teams become mindful when participants' actions continually reflect a high degree of concern for others. The origins of mindfulness are rooted in the concern for avoiding errors, rework, or the associated cost escalations, and in the concern for getting it right the first time. Mindful teams represent, however, much more than a shared concern for economic utility of actions. Mindfulness emerges from the felt need to capitalize on the transparency that has emerged. A product engineer on a team responsible for developing pollution control equipment describes the emergence of mindfulness on his team in this way:

I would say what the organization has learned is a greater appreciation for what goes on in the other boxes. All representatives of functional groups on the team have a better appreciation now for what the others do. Now we need to go past awareness, develop detailed knowledge, and translate that knowledge into a way that we can all interact together more efficiently.

The emergence of mindfulness also signals emotional commitment to other participants, and signals a clear shift in the participants' beliefs about decision making and the effectiveness of their own behaviors. Old beliefs about turf and functional affiliations clash with and are replaced by the emerging sense of shared ownership and by an interest in ensuring that decisions and actions reflect the shared understanding the team has achieved at all times. Participants report a growing realization that, regardless of lofty intents, the implementation of new product decisions requires inordinately high levels of buy-in and support from all others, and the realization that this occurs when the team's decisions reflect everyone's concerns and elicit their support. For instance, although members of Team A note that conflicts and disagreements are common, they also recount the growing acceptance of the notion that all participants, including leading customers, suppliers, and market intermediaries, exist in reciprocally interdependent relationships. To foster mindfulness,

the leader of Team B reports that he continually quizzes key members from the production, engineering, and marketing departments, notes their emerging concerns, and tries to ensure that his team's day-to-day decision making and actions reflect this emerging awareness. The strong emphasis on ensuring that the day-to-day decisions made by the team fit not only with the realities of the core participants from marketing, engineering, and production, but also the realities of machine operators, suppliers, customers, and the labor union has helped gain their support during the implementation of his team's decisions. Moreover, in both Teams A and B, there is a clear emergence of the belief that their decisions and actions must at least reinforce, if not promote, the level of trust that exists. We find that the clearest product of mindfulness in teams is a high level of interpersonal trust. The practice of mindfulness fosters a climate in which participants' perception of others' integrity and openness improves considerably, and their comfort with the expected actions of others, and faith in others' reactions appears to reach a new high.¹⁹ Mindful actions and demonstration of dependability, responsibility, and competence provide participants with rational, objective reasons to trust others. Similarly, mindful actions and demonstration of concern for others' idiosyncratic orientations often provide subjective, emotional reasons to commit to the team's intents. Decisions that fail to accommodate divergent concerns begin to be viewed as unimplementable, and actions that fail to generate wide acceptance and support as untenable.

Team A's emphasis on testing the worth of new ideas based on responses of relevant constituents has contributed much to the mindfulness that has emerged. Similarly, the team building sessions held off-site, the leader's interest in coaching members to make decisions that accommodate the diverse orientations, and the extensive training members have received, have contributed to the emergence of mindfulness in Team B. By contrast, the low at-stakeness and meager transparency prevents mindful behaviors from emerging in low-collaboration teams. In Team Y, for instance, marketing and engineering representatives commonly describe their distrust toward the other. The representative from the production group notes that both he and his functional group are unwilling to commit to the new product designs unless they have had the opportunity to physically examine the prototypes developed by R&D. On the other hand, the R&D representative's responses show an almost total lack of interest in including production representatives during the prototype development stage. Their disparate thought

worlds and mutual distrust have effectively stood in the way of mindful behaviors.

Synergies

The conviction that new product activities are less meaningful unless products are better and cheaper, and that new product introduction is less meaningful unless it is rapid and preempts competitors, appears to trigger an interest in synergistic interactions. A distinctive developmental milestone is the shared conviction that high quality interactions and constructive conflict among people with necessarily diverse skills and orientations is essential for identifying creative alternatives. Another distinctive stage in the team's cognitive and emotional development is the realization that effective new products, and long-term competitive survival, call people of ordinary talents to take extraordinary, quantum leaps in their ways of thinking and interacting with others.

Synergistic interactions appear rooted in myriad team and environmental forces. For instance, synergies emerged in Team A when participants began to share an inordinate interest in identifying alternatives that expanded everyone's thinking, each time they were called to make decisions and take actions. Old ways of thinking and doing were perceived as inadequate for the dramatic improvements sought in terms of cost and time to market. Additional features of Team A that appear linked to synergy and to the emergence of creative solutions include: the deliberate inclusion of multiple perspectives in decision making, and the enduring belief that teams benefit from the diversity that exists; the emphasis on constructive conflict as a key vehicle for challenging status quo; and heavy encouragement of risk taking and notably high levels of tolerance toward failure. In Team B, the strong commitment to test current assumptions and ways of thinking appears linked to the emergence of synergies and creativity. Participants report strong skepticism and impatience toward tried and tested ways of making new product decisions, and toward the existing organization of workflows that initially prompted the search for creative solutions. The leader of Team B provides an example of the serendipitous links that can develop between risk taking, synergies, and creative new product decisions. He managed to reduce costs and time to market by providing two-way radios in order to ensure instant, on-line connection among participants regardless of their physical location in the sprawling facility:

The reaction from others in the organization when I suggested we use two-way radios to connect team members was: *it will not work, it can't work, we've never done that*. Well, I went ahead and did it. Now they won't give up their radios because now they could *talk* to each other. Although we all had beepers, you can't rely on that and the telephone. It's too late. I need answers now, you need the person who has a problem on line with the person who has a solution. So, we had to break some paradigms there in order to get that done.

Teams A and B show that the periods of synergistic interactions represent instances where the team has harnessed the process of serendipitous discovery, and achieved outcomes that not only surprise participants, but gain the emotional involvement and commitment of customers as well. By contrast, synergies are conspicuous by their absence in Teams X and Y, largely because the low levels of trust have failed to create a comfort zone in which participants feel motivated to take risks, abandon concern for turf, and propose creative ideas without fear of social censure.

Accelerators of Collaborative Behaviors

Several features of organizational culture and senior management's resource deployment decisions have accelerated the development of collaborative behaviors in Teams A and B. The senior management in both firms are distinctive in their views that change can energize and revitalize the organization. The process of responding to changes in the market structure, technology, and customer preferences is embraced by the organization. Much of what occurs is aligned with objectives and strategies designed to engage emerging environmental contingencies. For instance, the senior managements in Companies A and B view teamwork as a new, complex task that requires both the participants and the organization to learn new ways of thinking and taking action. Both have sponsored programs to support learning of new team-related behaviors, often with the same vigor and intensity with which they have supported the learning of technical and engineering skills.

Companies A and B have also fostered a culture of inclusion. Leading customers, technology suppliers, and other contributors to environmental uncertainty are defined as insiders, interdependent with the organization, and capable of being trusted and engaged in the new product development process. Team B, for instance, defines new product development as an expedition involving

customers, suppliers, union members, and other constituents. As a result, a sense of urgency about new product development permeates their organizations. Product innovation is defined as a critical activity and features centrally in their mission statements. Both have established formal processes by which every new product idea, regardless of its origin, receives systematic, formal scrutiny. New ideas emerging from marketing or production groups, or directly from customers, receive as much credence and support as those that emerge from R&D. Hence, we find an unmistakable link between accelerated development of collaborative behaviors and organizational cultures that emphasize inclusion, embrace change, and hold product innovation as central to their mission.

Senior management's emphasis on decentralization, and high levels of tolerance for delays and failure, also emerge as important accelerators of collaborative behaviors.

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For instance, senior management in Companies A and B believe that teams are capable of making independent decisions, and, when provided with access to information and resources, are capable of acting in the best interest of the organization. Both teams report unprecedented access to the information and resources necessary for making and executing nearly all their new product decisions. The organizational emphasis on creating information redundancy has helped members of Teams A and B develop a holistic perspective and define their own involvement in new product processes in an informed manner. The participation of members of Teams A and B results from active, informed choice. By contrast, the members of Teams X and Y act mostly on senior management's directives. Collaborative behaviors have failed to emerge in Teams X and Y because the leadership tightly controls information and participants operate on a need-to-know basis. The manufacturing engineer from Team Y notes how members develop, at best, narrow, segmented views of their involvement in the new product process, and expresses his frustrations with restrictions on information:

The senior management and R&D breed the attitude that they'll get it done and they'll get

Table 2
What Companies A and B do to Create Cross-functional New Product Teams

| | |
|--------------------------------------|--|
| To increase at-stakeness in teams | <ul style="list-style-type: none"> • Select a cross-functionally trained team leader who possesses high levels of technical as well as interpersonal skills. • Ensure that all participants are involved from the initiating stages of the new product process. • Ensure that all members have equitable status within the team, and equitable access to information and resources. |
| To increase transparency in teams | <ul style="list-style-type: none"> • Select participants with high levels of technical as well as interpersonal skills, and with cross-functional experiences and training. • Emphasize intense, informal meetings and information exchange. Organize formal, ritualistic forums for the principal purpose of airing issues and seeking clarifications. Emphasize the use of hard data. • Colocate participants, functional heads, and, if possible, functional groups. • Promote the view that external constituents, including leading customers, suppliers and market intermediaries, are insiders capable of being engaged in the new product process. |
| To increase mindfulness in teams | <ul style="list-style-type: none"> • Sponsor programs to educate and train participants to improve interpersonal and teamwork skills and become better participants in the team's social, interactive environment. • Promote the view that every constituency's response to team decisions is valid and important. • Sponsor team activities that build trust. Remove participants unable to overcome turf protection behaviors, unwilling to trust, and/or incapable of committing to collective intents. |
| To increase synergy in teams | <ul style="list-style-type: none"> • Ensure that the team represents a breadth of interests, and emphasize that the team must benefit from the diverse orientations that exist. • Promote risk taking and tolerate delays, constructive conflict, and failure. • Promote the view that organizational change is necessary, and that it can function as an energizing, revitalizing force. Select members capable of embracing change, and adopting new ways of thinking and acting. |
| To increase collaboration in general | <ul style="list-style-type: none"> • Regard teamwork as a new, complex organizational activity that requires participants to learn new ways of thinking, making decisions, and acting. Sponsor educational and training programs to foster new learning. • Allow team leaders the autonomy to select team members, and to eliminate members when they feel necessary. • Consciously decentralize decision making and avoid using edicts and directives to foster cooperation among team members. • Hold new product development as a high priority organizational activity. Install a formal process that can evaluate every new product idea, regardless of its source. |

it done in their own time frame, and everybody else will live with it. We really have to rely on them to provide us all the information. We don't know it all. When they hand everything to us and say, well, that's done, that's everything, we have to take their word for it.

Senior management's efforts to carefully select the leaders of Teams A and B have also made a meaningful difference. The leaders' cross-functional training, technical prowess, and skills for managing interpersonal interaction have helped participants transcend cultural differences and overcome implicit yet often deeply held notions of hierarchies of status, and strongly influenced the emergence of collaborative behaviors. Distinctive functions performed by leaders of Teams A and B that

have accelerated the development of collaborative behaviors include: carefully selecting and inviting the right combination of people to participate in teams; coaching, training, and educating members to create an interactive, supportive social environment; networking with key constituencies across and outside the organization, and ensuring that the team is responsive to its environment on a day-to-day basis; shielding the team from the bureaucratic forces of the organization; and foraging for and gathering information and resources from across the organization to promote the creative talents that exist within teams.

Similarly, characteristics of participants that accelerate collaborative behaviors are worth noting as well. Distinctive to members of Teams A and B, for instance, is the high degree of comfort they feel

about the changes occurring in new product processes. Their responses highlight the strong propensity to experiment with and adapt new ways of thinking and doing. All report the learning and adoption of new ways of thinking and taking actions since the inception of teamwork. By contrast, members of Teams X and Y report little in the way of cognitive or behavioral learning. For instance, the marketing manager from Team X notes that after providing his input about market feasibility, the ultimate decision to proceed on the project lies with engineering, and displays little interest in performing new activities entailed by teamwork.

Participants' personal identification with the team, and their willingness to cooperate with others also appears to accelerate the development of collaborative behaviors. For instance, we infer higher willingness to cooperate among members of Teams A and B for three reasons: they have developed a strong emotional involvement with their team that parallels or overshadows their allegiance toward their functional groups; they are committed to including and coordinating activities with all participants from the initiating stages of new product decision making, and to developing a common agenda; and they uniformly view the contribution of other team members as essential for making high quality decisions. Their demonstrated concern for cooperation is notable because it contrasts with the views, and more so with the reported behaviors, of members from low-collaboration teams. The responses of members of Teams X and Y suggest that they are primarily charged with protecting the interests of their functional groups and resisting changes. Worse yet, most also want to be left alone to perform their functional group-related tasks in the team. For instance, the representative from engineering in Team X wants exclusive responsibility for making technical decisions, and the representative from marketing wants exclusive responsibility for making decisions about product features. Moreover, their affiliation to the team is weak at best. Most participants view the team as a temporary mechanism for coordinating activities, and participate in new product activities mostly when their special skills are required to address problems after they have emerged.

Finally, the high level of interpersonal trust developed by members of high-collaboration teams clearly appears to accelerate the emergence of collaborative behaviors. The trust in Team A has clearly promoted discussions of risky alternatives and prompted members to openly share seemingly far-fetched ideas and make themselves vulnerable to the responses of others. Similarly, the trust in

Team B has allowed members to openly discuss their confusions, lack of clarity, and feelings of ambivalence. Trust has created a social environment in which members can admit their inability to perform certain tasks, seek additional information, and ask for assistance without fear of negative repercussions. Interestingly, 40 managers in over 70 hours of interviews do not once mention reward systems as motivators of collaborative behaviors—a traditional part of the conventional wisdom about affecting behavioral change in organizations. Instead, our interviews provide a host of actionable insights for organizations interested in building collaborative teams. (See Table 2.)

Problems of Low-Collaboration Teams

Companies X and Y have instituted cross-functional teams primarily to increase interaction among participants and accelerate new product development. They have failed, however, to appreciate their capacity to deliver highly creative solutions, let alone nurture the learning and development that must occur before teams eventually exhibit collaborative behaviors. Distinctive in their belief system is the view that teams are structural panaceas for new product challenges, and that their functionally divided, hierarchical organization with linear workflows will instantly and pain-

Trust has created a social environment in which members can admit their inability to perform certain tasks, seek additional information, and ask for assistance without fear of negative repercussions.

lessly transform new product development processes. Cooperative behaviors, if and when they emerge, reflect managerial directives and edicts more than they do the cognitive or social development of the team. Although participants readily articulate rational reasons for cooperation, they fail to commit emotionally to making it happen. Without intrinsically motivated, emotionally committed members, however, Teams X and Y have become little more than microcosms of the divisiveness that exists in the larger organization. Members battle over turf, point fingers, and act to maintain or increase their access to resources. The lack of a sense of ownership, and the suspicion about others' intentions and competence, has prevented the development of a shared vision.

We also find that the cognitive and emotional development of Teams X and Y is stunted by senior

management's propensity to micromanage, particularly when newly instituted teams fail to produce instant results. Although Team X is charged with thinking outside the box, and is expected to take risks and develop innovative solutions, it is constrained by senior management's control mechanisms and check lists that sequence activities and specify which functional group will be responsible for which activity and when. Apathy, low commitment, and the failure to build cooperation have made cynics out of the very people from whom the organizations expect high levels of creativity. We find that trust is one of the first casualties, and cynical participants one of the common outcomes of poorly managed cross-functional teams.

The Virtues of Collaboration

Although we studied only new product cross-functional teams in high-technology firms, our findings may prove to have broader applications. We found that collaborative behaviors emerge when participants agree on a common agenda, openly share concerns and power, and commit to building trust. Collaborative behaviors are adopted more as a result of intrinsic need and an intrinsically-motivated process of experimentation and learning, and less as a result of senior management's directives. Environments that promote risk taking and tolerate failure appear to foster collaboration. Conversely, edicts fail to foster the cognitive and emotional development of participants, and often stymie the learning and adoption of complex behaviors. These processes may occur in other kinds of organizations, and in other kinds of teams charged with other kinds of initiatives. Our findings may be useful to managers and organizations interested in fostering high levels of creativity and innovation in teams responsible for managing other complex tasks, and delivering highly creative solutions.

Endnotes

¹ Donnellon, A. 1996. *Team talk: The power of language in team dynamics*. Boston: Harvard Business School Press.

² See Griffin, A., & Hauser, J. R. 1996. Integrating R&D and marketing: A review and analysis of the literature. *Journal of Product Innovation Management*, 13: 191-215, and Donnellon, A. 1996. Crossfunctional teams in product development: Accommodating the structure to the process. *Journal of Product Innovation Management*, 10: 377-392, and Donnellon, op cit.

³ The study was conducted in two phases. For a pilot, we interviewed six managers from four organizations in depth to identify key interpersonal interaction issues of new product development processes that were both understudied and of direct relevance to managers. A host of research questions were distilled from their responses and an interview protocol was

developed to guide the second phase of the study. The 10 high-technology industrial firms we included in the second phase employed at least 650 employees. Our sample consisted of manufacturers of automobile transmissions systems and components, electrical construction materials, single package cooling units, radar systems, emissions control equipment, electric and electronic components, medical diagnostic instruments, jet engine cables and harnesses, locomotive brake systems, and high technology specialty metals. All the firms invested in R&D to overcome product obsolescence. To gain multiple perspectives, we included at least one manager from R&D, production, and marketing from each firm. Most of the participants had worked for at least 10 years in the industry (90 percent) and in their firm (70 percent). The sample included representatives from R&D (10 percent), marketing (10 percent), and manufacturing (10 percent), cross-functional team leaders (12.5 percent), department heads in charge of R&D (17.5 percent), marketing (15 percent), manufacturing (20 percent), and others (5 percent).

⁴ High-technology firms are uniquely identifiable because they employ a disproportionately large number of engineers and technically qualified people, face high levels of product obsolescence, depend on new products for organizational survival, and invest disproportionately in R&D and design engineering. See Von Glinow, M. A., & Mohrman, S. A. 1990. *Managing complexity in high technology organizations*. New York: Oxford University Press.

⁵ Our study reinforces the findings of Dougherty, D., & Handy C. 1996. Sustained product innovation in large, mature organizations: Overcoming innovation-to-organization problems. *Academy of Management Journal*, 39: 1120-1153, and Donnellon, op. cit.

⁶ Donnellon, op. cit.

⁷ Ibid.

⁸ See Brown, W. B., & Karagozoglu, N. 1993. Leading the way to faster new product development. *Academy of Management Executive*, 7: 36-47, and Zahra, S. A., Nash, S., & Bickford, D. 1995. Transforming technological pioneering into competitive advantage. *The Academy of Management Executive*, 9: 17-31; and Kleinschmidt, E. J., & Cooper, R. G. 1995. The relative importance of new product success determinants—Perceptions versus reality. *R&D Management*, 25: 281-298; and Gehani, R. R. 1995. Time-based management of technology: A taxonomic integration of tactical and strategic roles. *International Journal of Operations and Production Management*, 15: 19-35.

⁹ See Pegels, C. 1991. Integrating functional areas for improved productivity and quality. *International Journal of Operations and Production Management*, 11: 27-40; and Walsh, W. J. 1990. Get the whole organization behind new product development. *Research Technology Management*, 33: 32-36; and Benghozi, P.-J. 1990. Managing innovation: From ad hoc to routine in French Telecom. *Organization Studies*, 11: 531-554.

¹⁰ For the link between integrating mechanisms and complexity of organizational tasks and the environment, see Galbraith, J. R., & Kazanjian R. K. 1986. *Strategy implementation: Structure, systems, and processes*. St. Paul: West, and Lawrence, P., & Lorsch, J. 1967. *Organization and environment*, Boston: Harvard Business School.

¹¹ By new product task environment, we refer to the structures, systems, and processes by which new product-related decisions are made, activities are organized, and work flows are managed.

¹² See Thomas, K. 1992. Conflict and negotiation processes in organizations. In Dunnette, M. D., & Hough, L. M. (eds.), *Handbook of industrial and organizational psychology*. 2nd Edition, Palo Alto: Consulting Psychologists Press.

¹³ See Liedtka, J. M. 1996. Collaboration across lines of business for competitive advantage. *The Academy of Management Executive*, 10: 20-37.

¹⁴ In rest of the article, we compare and contrast specific instances from Teams A and B (high-collaboration teams) and Teams X and Y (low-collaboration teams) to illustrate distinctive features of collaboration, the learning and development that occur, and the transformation process and its key accelerators.

¹⁵ For current thinking on collaboration that has largely shaped the way we analyzed our data and developed our findings, see Dougherty, D. A. 1992. Practice-centered model of organizational renewal through product innovation. *Strategic Management Journal*, 13: 77-92, and Kahn, K. B. 1996. Interdepartmental integration: A definition with implications for product development performance. *Journal of Product Innovation Management*, 13: 137-151, and Liedtka, op. cit.

¹⁶ The term at-stakeness was originally used by Liedtka, op. cit.

¹⁷ The principal purpose of the straight-line diagonal in Figure 1 is to portray the order of developmental milestones along a continuum of difficulty and complexity. It would be erroneous to infer from the figure, however, that the learning and development of collaborative behaviors occur predictably, at a uniform rate, or that the portrayed distances between milestones are drawn to scale.

¹⁸ See Liedtka, op. cit.

¹⁹ See Sonnenberg, F. K. 1994. Trust me . . . Trust me not. *Journal of Business Strategy*, 15: 14-16, and McAllister, D. J. 1995. Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations. *Academy of Management Journal*, 38: 24-59.

Exhibit A: Profiles of New Product Teams

High-collaboration Team A. Company A has historically served the national and international defense market. Faced with declining defense spending by the U.S. government, the CEO is attempting to transform the company into an innovative, high-technology organization serving the civilian sector. Team A includes representatives from marketing, production, R&D, and finance. The departmental chiefs of production, R&D, and marketing have handpicked, via consensus, all participants. The CEO of Company A has a vision of developing a collaborative organization, and is championing collaborative behaviors. The R&D representative initially functioned as the leader, however his role was strictly defined as a coordinator and facilitator of activities. The leadership role has rotated with the stage of the new product process. For instance, the production representative functioned as the leader when the team was involved in working with the production group for tooling for production runs.

High-collaboration Team B. Company B is a manufacturer of automotive equipment. Its largest customer is one of the Big Three U.S. auto makers. The decision to form cross-functional teams was strongly influenced by this customer. Team B includes representatives from manufacturing, production engineering, R&D, and marketing, as well as representatives from MIS, finance, the labor union, and a leading supplier. The customer's representatives participate in Team B and frequently

influence new product decisions. The leader of the team was originally selected by senior management because of his experience in working with the largest customer, as well as his technical capabilities, and interpersonal skills. The team leader identified potential participants after intense discussions with all functional heads. All participants in Team B have volunteered in response to the invitation from the team leader.

Low-collaboration Team X. Company X manufactures industrial machines. The production, marketing, and R&D representatives in Team X, along with the heads of R&D and production in Company X participated in the study. The organization is multilayered, and functional groups, including R&D, production, and marketing, are located in different facilities. A cross-functional team of senior managers reviews all new product development initiatives. Soon after the institution of this team, all new product projects were assigned to cross-functional teams, as well. The representative from R&D is automatically appointed leader in all teams, and makes independent decisions about how the project will be run, which functional group's representative will be included, and when. The senior engineering managers, with the aid of consultants, have developed a checklist of new product activities that all new product teams and their participants are required to follow. Although the leader of Team X often consults with the representative from the marketing group, the production group's representative has had a negligible impact on new product related decisions.

Low-collaboration Team Y. Company Y, a manufacturer of electrical products, has recently undergone major restructuring. The original R&D department was dissolved and its key people were reassigned to product groups led by product line managers, who in turn report to the marketing managers. The R&D and marketing functions are jointly responsible for new product development. The production department views new products as a low priority, and is consumed mostly with problems related to manufacturing of existing products. Senior marketing managers have tried to convince their counterparts in production to increase their cooperation with new product teams. There is a marked level of distrust among functional groups. Marketing managers report using a combination of influence tactics, including persuasion and coercion. The disparate thought worlds and the lack of trust that exists in the larger organization is reflected in the dynamics of Team Y. The marketing, pro-

duction, and R&D representatives we interviewed hold clear views about others' agendas and motivations, but show little interest in testing their conjectures. The marketing representa-

tive on the team often has to request intervention from the marketing chief to gain cooperation from the production representative on the team, and from the production group.



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