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Managing for Breakthroughs in Productivity

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in Productivity[1]

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ABSTRACT

This article is about creating and managing projects so as to deliberately and predictably produce results well beyond what could have been reasonably expected beforehand. This methodology was originated in the mid-1980's and applied to 20 engineering projects at IBM with spectacular results. In the years since, many projects in a myriad of fields have been managed using the same techniques with similar results. This article describes the original IBM projects and some of the additional projects undertaken since then. It also outlines the methodology used and provides perspective on why the methodology works and the pitfalls to be avoided.

George Bernard Shaw (1903) captured the essence of the work reported in this article: "The reasonable man adapts himself to the world: the unreasonable one persists in trying to adapt the world to himself. Therefore all progress depends on the unreasonable man."

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[1] This article is almost entirely an electronic transcription of an article with the same title and author that appeared in *Human Resources Management*, Fall 1989, Vol. 28, Number 3, Pp. 403-424. A few changes and additions have been made to increase clarity and bring the information up-to-date.

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INTRODUCTION

This article is about producing extraordinary results, results well beyond what could be predicted given history and "business-as-usual." We call such results *breakthroughs* and describe an original approach to managing a group of people so as to intentionally and predictably cause extraordinary productivity increases. Our experience over the past two decades in using this methodology leads us to conclude that it is *itself* a breakthrough in management technology, with applicability extending to any endeavor that requires innovation for its fulfillment.

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The original research that this article is based on involved the initiation and completion of over twenty engineering projects during the mid-1980's at the IBM Corporation. The goal of these projects was to dramatically increase productivity and the result was that the average project was delivered with nearly a three-fold increase in productivity, with no negative impact on quality and with a noticeable increase in the morale of the participants. Table 1 shows profiles of ten of the twenty projects undertaken at IBM plus six in other companies. These projects were selected from the totality to illustrate the range of possibilities. Productivity gains were measured by comparing the original "business-as-usual" dollar cost estimates for the projects to the actual costs of the projects after completion. This methodology has been used successfully over the past years in other companies on similar technical projects as well as in diverse fields such as sales, capital expense management, construction, and manufacturing. It has been used with groups as large as several hundred people and as small as three.

This work was started when an IBM executive noticed that one of his equipment suppliers was achieving productivity levels far beyond what he considered possible. This small, relatively new company did essentially the same kind of engineering and programming work that IBM did, the quality of their work was comparable, and the backgrounds of the managers and professionals were similar. The author was challenged by this executive to discover how this supplier was producing these outstanding results and to bring the techniques that were found to IBM.

Conventional wisdom would say that this small company must have had some new process or tools for doing technical projects, or that they were staffed with a group of extraordinarily talented engineers (compared to IBM's staff). It very quickly became obvious that this was not the case. We were also given the usual explanations about the differences between entrepreneurial, new, small companies and established, larger ones. The insights that led to the methodology described in this paper came when we shifted our focus away from small companies and their alleged advantages.

How might we intentionally produce productivity breakthroughs in our existing organizations and culture? We studied IBM projects that had produced extraordinary results, some in productivity, others in creativity, problem solving, etc. Most of the people whom we consulted either had worked on or at least knew about a project that had produced extraordinary results. In most cases, people spoke about these projects wistfully. Many said that their work lives had not been as exciting since the project's conclusion. Consequently, we focused on the question of how to *deliberately* create projects that would have this quality for people and would *predictably* produce extraordinary, unprecedented results.

A large number of technical and scientific professionals take the position that innovation cannot be deliberately planned. "You can't schedule inventions," they say. "Managing for intentional breakthroughs is not possible." Some argue that breakthroughs do not occur by design but rather are accidental, random, and unpredictable. "It's mostly a matter of luck, hoping that the right people in your organization happen to be thinking

about the right things at the right time" (Nayak and Ketteringham, 1986, p. 345).   We reject this conclusion.

IBM PROJECTS		
Project Descriptions	Commitment vs. Business-As-Usual (BAU)	Result vs. Commitment
1. Large new software component for a mini-computer operating system.	Schedule improvement from 25 to 13 months, staffing cut from 35 to 18 for an overall decrease of a factor of four in dollar cost.	Dates and cost objectives met or bettered. Some quality problems with the final product due to breakdown in testing approach.
2. Enhancements to an existing software product	90 person team, executing a 3 year plan committed to double their productivity by adding additional work without adding people or changing the base plan.	After 12 months, average output per person was determined to be 164% of BAU. Plan was re-cast a this new level of performance.
3. Small software application	4 person group committed to 4x cost improvement compared to BAU, including reducing elapsed time from 12 to 8 months	Schedule and cost objectives were met. A redesign of the product was done to the reduce the size of the effort that accounted for 1/3 of the savings.
4. Major new software components with versions for each of several operating systems	100+ people on a complex plan with major checkpoints spread over several years. Project committed to a seemingly aggressive schedule, but BAU schedule and costs not determined until more than a year into project.	Project failed. No major breakthroughs were ever achieved. Commitment turned out to be only marginally better than BAU.
5. Joint IBM-customer effort to develop and test prototype software for new operating system function	BAU: 12 people for 12 months to do phase 1 (75% of total) Commitment: 12 people for 6 months for the total project, equivalent to a 2.7x increase in productivity.	Project delivered total function on time and achieved 2.8x normal output per person.
6. Develop new display workstation hardware and associated software	Project personnel located in multiple sites in Europe, USA, and at a software vendor. BAU was 2 years, Commitment was 1 year with same staff.	Commitments were met.
7. Firmware ("microcode") for a new computer system maintenance console.	Improve schedule from18 months (BAU) to 12 months. Staffing was also to be reduced resulting in a commitment for an overall productivity improvement of 1.8x	Dates and resource commitments were met. This higher level of productivity has been maintained in subsequent projects.
8. Creation of a software tool for internal use	40K new lines of programming modifying a 230K line base. BAU schedule was 28 months. Commitment was to reduce schedule to 12 months using BAU staffing. High quality and minimal overtime were also committed.	Schedule and quality were met. Resource savings of 19.2 person-years compared to BAU estimate. Overtime commitment was met, mainly because commitment was vague. Vacation and education breaks were given priority, however.
9. New communications protocol software support for a mini-	9 months prior to externally committed completion date, a	Product was shipped on time. Quality was excellent and

computer system	70K line program was projected to require 18 months more work. Commitment was to meet original schedule without additional staff and without compromising quality.	additional, important, unplanned function was added.
10. Assist outside vendor in bringing a major software project back under control	Project was projected to be 6 months later than externally committed date. Plans for staffing, developing programs, testing, etc. did not exist. Staffing was 90 people.	Detailed plans established, project reorganized, and was completed on committed date with no additional staffing.
NON-IBM PROJECTS		
11. Tooling and plant facility capital expense reduction for an automobile body and assembly plant.	Create a cost reduction program with the participation of 375 managers in the plant.	A savings of $435 million was reported.
12. Pharmaceutical sales organization	Committed to building "the best sales force in the industry."	Exceeded aggressive sales goals by 42%
13. Defense contractor developing new electronic field system	Fixed price contract with breakthroughs assumed in pricing (Estimated costs $14 million over bid). New technology introduced	The contract was completed a year ahead of schedule (represented 50% reduction in cycle time) and $17 million less than the original bid.
14. Electronics Manufacturer increasing product output	Committed to increase product manufacturing from 600 to 5,000 units per month	In the first year, production increased to 4,700 units per month
15. Major Financial Institution improving profitability	Committed to tripling revenues in three years while stabilizing costs	Revenues tripled in 3 years and the cost saving effort resulted in $8 million savings
16. Oil exploration costs and production cycle time	Team committed to developing the field for 24% less than the original estimate.	While they had promised costs 24% less than estimate, they delivered costs at additional 27% less than the 24% promise, AND produced first hydrocarbons 3 months early

Table 1: Profiles of IBM and non-IBM Projects

BREAKTHROUGH PRINCIPLES

The breakthrough principles are the foundation for organizing projects to intentionally advance performance beyond what can be reasonably expected based on past performance. While this framework was originally applied to engineering and programming productivity, over the years it has been successfully applied to a vast array of different situations where the only common theme is the achievement of breakthrough goals. This framework can also be seen to explain the extraordinary results often produced in small, new companies.

There appears to be a pattern to the occurrence of breakthroughs. They arise predictably around particular events we call *breakdowns*. Breakdowns are defined as situations where the circumstances and the predictable results that can be achieved with them fall short of committed goals. A breakdown occurs whenever there is a gap between a committed result and the predictable outcome given the current circumstances. In this context, the term "predictable outcome" is used to mean what can be reasonably expected

to happen given past experience and current knowledge. Two observations arise from this definition:

1. The resolution of a breakdown must be a departure from the past; unprecedented, extraordinary, a breakthrough
2. The bigger the gap, the bigger the breakdown, and thus the larger the potential breakthrough.

While it is obvious that unprecedented, extraordinary results will never be produced by simply executing the predictable recipes from the past, most people's actions in the midst of a breakdown situation are not consistent with this obvious fact.

Most commonly, breakdowns are seen as problems. Nayak and Ketteringham (1986, p. 347) in their study of 12 significant commercial breakthroughs (1966-1986) in 16 companies, concluded that: "The source of each breakthrough concept is a problem. This article will show that breakdowns in their most powerful form go well beyond the usual sense of the word "problem."

A breakdown, then, creates a demand for extraordinary action. This statement is a corollary of the aphorism "If it ain't broke, don't fix it." The occurrence of a breakdown causes people to shift their attention and to see things differently. This perceptual change is often the opening that enables people to see opportunities for previously unconsidered actions. As an example, consider the common situation in which the initial cost estimates for a project turn out to have been far too low. To avoid this situation, many organizations apply "contingency" factors to inflate early estimates. These factors take many forms: time buffers, additional people, reduced project scope, and so on. If the original estimate is exceeded, but the costs and schedule remain within the contingency factors, no breakdown is experienced and no action is called for. In an organization that commits to schedules and budgets without contingency factors, the same situation would be experienced as a breakdown and actions would be taken. The productivity implications are obvious.

Another real example is from a project where a committee responsible for the overall design of a new product had reached an impasse. The committee was comprised of representatives from two different organizations and was split along "party lines" over which way to go with the design. The committee brought the dilemma to the overall project manager for a decision. When the project manager declined to break the tie and requested a synergistic solution, the committee returned with a mass of evidence to support the contention that no such solution was possible. It appeared to the project manager that the committee members were more interested in defending their positions than in solving the problem. The situation was a breakdown for the project manager, but not for the committee.

The project manager met with the committee and had an open discussion with them about their commitment to the project. During a coffee break, one of the committee members jokingly said: "It doesn't matter whether we solve this problem or not; everybody knows the two groups will never successfully work together." It became clear that the

underlying commitment of each faction was to do the project their own way without working with the other group. At this point in the discussion, the un-workability became obvious to everyone. The project manager requested and obtained the commitment of each person on the committee to the cooperative project. Two weeks later, the committee returned with a combined solution that was also a technological breakthrough.

This example illustrates that until there is a commitment that causes a situation to be experienced as a breakdown, effective actions will not be taken. The fundamental principle is that *there are no breakdowns independent of commitments*. As soon as there was an unequivocal commitment by the committee members, the situation became a breakdown for them as well, and the appropriate creative action followed.

Breakdowns result only from what are called "authentic" commitments, commitments that a person "really means." They have the quality of being unqualified and senior to circumstances. They are demonstrated by a promise like "I will do this, no matter what." Breakdowns are therefore high risk situations.

The traditional emphasis in project management is on avoiding breakdowns. The breakthrough framework reveals that the most effective strategy for avoiding breakdowns is to design one's commitments to be as safe as possible or, even better, to avoid commitments altogether. Examples include being committed to "doing you best," "trying hard," or to following a process rather than to producing a specific result. The latter often appears among technical or science professionals who embrace a particular process for conducting research, doing creative work, or developing a product as the end rather than the means. This approach provides safety because, if the desired result is not produced, at least the work was done in the correct manner.

A common misinterpretation of breakdowns is that they are negative and reflect on the competence of the people involved. Clearly, in the above examples, using contingencies or breaking the tie in the committee by choosing one side's approach over the other's would be acceptable, everyday solutions. In contrast, consider the case where a group is and has been committed to increasing its productivity by a factor of three, but has succeeded in "only" doubling it. The fact that the group is still committed to achieving a threefold improvement creates the conditions for a breakdown, but this situation exists in a domain of achievement that could hardly be considered negative. The examples introduce the possibility of designing commitments so as to produce breakdowns that can lead to breakthroughs.

There are two ways that breakdowns can occur. Starting with no breakdown, where the commitments and circumstances are seen as being mutually consistent, a breakdown occurs when either:
1. The circumstances degrade, for instance because of some natural disaster or events beyond one's control, and the predictable outcome is well below the committed result. Breakdowns of this type can call forth extraordinary action and creativity, but since the committed results had previously been predictable, the best that is generally achieved is a return to "business-as-usual."   In our

framework, the upper bound on accomplishment is the level of results that were committed prior to the change in circumstances.

2. The commitment is increased to a level significantly beyond what is the predictable, ordinary outcome. The type of breakdown is intentionally created and is not circumstantial. The breakthrough projects reported in this article were designed using breakdowns generated in this way.

It is important to note that once a breakdown exists, the experience of the participants is virtually independent of which way the breakdown was created. People get just as upset and uncomfortable.

Figure 1 shows the relationships of the elements discussed. The circumstances and the network of commitments interact to produce a breakdown. The multidimensional and frequently inconsistent nature of one's network of commitments is illustrated by a statement attributed to Bobby Knight, a famous basketball coach: "Everybody wants to be on a championship team, but nobody wants to come to practice." A different version, in the context of this article would be "Everybody wants breakthrough results, but nobody wants to take any risks."
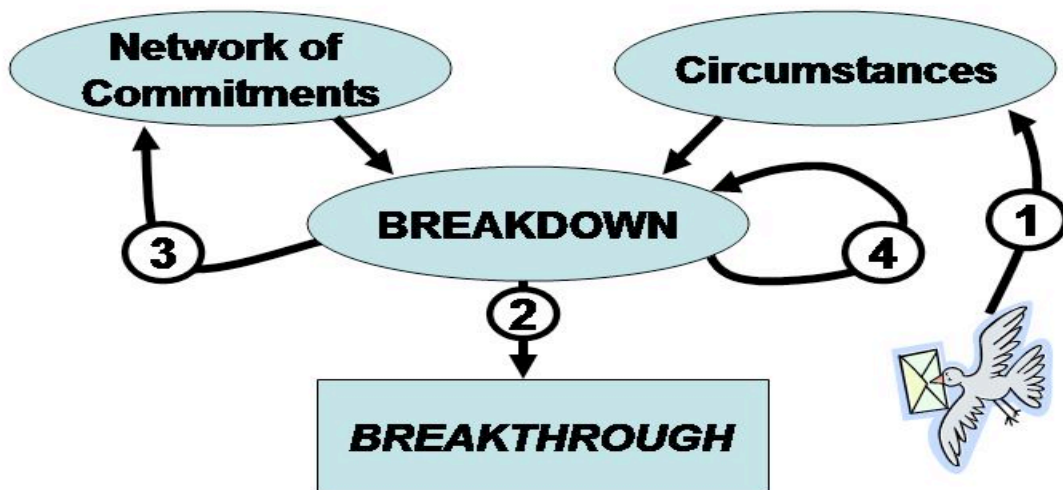

Figure 1: The Breakthrough Framework

There are four possible actions in a breakdown:
1. The circumstances spontaneously shift and resolve the breakdown (also known as "good luck" or "winning the lottery") or the solution is provided from an external source (also known as "a bluebird").

2. A breakthrough occurs. A previously unknown or unforeseen approach is discovered and used. The breakthrough may range from a truly momentous invention to a trivial rediscovery of a previously known technique.
3. The breakdown is resolved by changing the commitment. This is usually the first action that is considered. Some options are to extend the schedules, add people to the team, reduce the specifications for quality, performance, and/or function, accept higher costs or lower profit margins, kill the project and write off the costs, and so on. The goal of restructuring the commitments in this way is to return the work to the domain of predictability and business-as-usual, thus resolving the breakdown. Unfortunately, the possibility of a breakthrough is lost.
4. The breakdown continues. This only occurs as a result of a choice, whether overt or not, to remain true to the original commitment. This choice always involves a certain amount of discomfort because there is no evidence that the commitment can be fulfilled. It may even seem hopeless to the participants.

In the projects we have participated in, we have noticed that breakthroughs often come immediately after the choice is made to remain with the original commitment. The act of making this choice gives the commitment additional power which strengthens the breakdown as a call for creative action.

There is a correlation between the magnitude of the possible breakthrough and the size of the gap between the business-as-usual results and the results committed to. The larger this gap, the larger the breakdown and the potential breakthrough. A small gap will offer little or no possibility of a breakdown. A one-year project that is projected to finish in 12.5 months will not generate much action. People will rationalize (and hope) that the projections are pessimistic and with a little bit of luck, etc. etc. Obviously, commitments to aggressive goals with the potential for large breakdowns have high risk associated with them. Unfortunately, breakthrough results cannot be achieved by playing it safe.

One of the ways to test the validity of this framework is to see how it fits with what we know about results in small, new companies. Such companies have the reputation for having more than their share of breakthroughs. Why? First of all, new, start-up companies have natural pressures on them to commit to achieving extraordinary results. If they promise ordinary results, they do not get capital funding; or having capital, they do not get much business. For instance, if a small, new company charges what a large, established company gets for a similar product or service, there is no motivation to do business with the new company.

After promises are made for extraordinary results and the inevitable breakdowns occur, the small company environment supports the possibility of a breakthrough. Backing down from the commitment, extending the schedule, throwing in more people, writing off the project are extremely difficult if not fatal moves for a small, new company. Thus, the strength of small companies in the face of a breakdown as interpreted here is their *lack* of flexibility rather than the additional degrees of freedom often ascribed to them.

While this framework explains *how* breakthrough results are produced, its real power is in giving people *access* to producing breakthrough results. This framework was one of the foundations for the design of the projects listed in Table 1 and for the education and ongoing coaching of the project participants. Since commitment is at the source of this framework, a rigorous treatment of this subject is another important aspect of the education of project team participants.

COMMITMENT

Because it is the source of breakdowns, risk, uncertainty and discomfort, commitment has acquired a great deal of baggage. More importantly, there are often serious breaks in communication between people when the subject is commitment. The purpose of the following material is to give project participants a common ground for accurately communicating about commitment, and to provide them with a rich set of choices in this area. Examples of difficulties that can be resolved with a rigorous treatment of commitment are:

1. Individuals who have personal integrity issues about making commitments to results that cannot be guaranteed.
2. Managers assuming that they can direct their employees to be committed to a particular result.
3. Team members who are not unequivocally committed to the overall team result.

Characteristics of Commitment

In the model used in this article, commitment is defined as being unequivocal and unqualified. This implies that, ultimately, commitment is made for no reason. A commitment tied to a particular reason is qualified because if the reason goes away or is invalidated then the commitment will disappear. Obviously, people consider reasons before making commitments, but the reason cannot be part of the commitment. In other words, the commitment can not be conditional.

Another principle is that commitment is possible only when people are given a free choice to make the commitment. If one cannot say "no," then his or her "yes" has little power or meaning. Giving people free choice to make a commitment has been a new concept for some of the managers we have worked with. Ultimately, however, if there is no choice, there can be no authentic commitment.

In the coaching and education for the projects, people are often asked what qualifications, if any, their commitments have. Next, each person is asked if their commitment would still stand if that qualification were removed. In some cases, the qualification is resolved by turning it into an independent commitment. For instance, "I am committed that this project will be successfully completed by year-end if I can still take my vacation this year" can be transformed into "I am committed that this project will be successfully completed by year-end and I am committed to taking my vacation this year." Once each person in the group has had the opportunity to express their personal commitments, the group commitment for the overall project can emerge. Ideally, this group commitment

will embrace the commitments of the individuals. For instance, "We are committed to successfully completing this project by year-end and we are committed that Joe will take his vacation this year and we are committed that Mary will have time to take her course at State U. and …" Thus, if circumstances arise that appear to prevent Joe from taking his vacation, these circumstances will occur for the people on the team as a breakdown.

Because a breakthrough project is the result of an *authentic* commitment to a result that is well beyond what is *predictable*, it is worthwhile to define and distinguish these terms. Predictability is associated with probability, which in turn is a function of statistics derived from history. The results associated with a particular commitment can be said to be predictable or not. Results are predictable when historical data exist to support assertions that the results can be produced in the time allotted with the resources available.

What is the relationship between predictability and authenticity? Some individuals will not authentically commit even to what is predictable. They counter historical evidence by saying that things may not go as well this time. Sometimes they confuse commitments with guarantees. The breakdowns, if any, that arise from their commitments can never be big enough to provide for results beyond what is predictable. On the other hand, it is possible for people to authentically commit themselves to producing results beyond what is predictable. Such promises create immediate and powerful breakdowns and powerful opportunities for breakthroughs.

We do not ask people to make commitments beyond reason. The projects reported here are based on authentic commitments to results well beyond what was predictable. These commitments were made by responsible, experienced people. We have observed that nearly everyone we have worked with was willing, able, and often eager to operate in this domain.

Commitment in Established Organizations

Successful organizations often give high priority to the minimization of risk and maximization of predictability. This is done to encourage what is seen as the source of past successes and to discourage what is seen as the cause of past failures. This priority is inappropriate, however, if unprecedented, extraordinary results are sought. Nevertheless, the management systems established in most large organizations have an implicit and largely unexamined bias against creating the kind of projects described in this article.

Many large corporations have management systems with inherent contention between entities and levels: line vs. staff, headquarters vs. remote sites, quality assurance vs. manufacturing vs. engineering vs. customer service, etc. Typically, a group engaged in a project is asked to provide evidence that their plan is feasible, that they have accounted for the breakdowns of previous, similar projects, and that "everything is under control." Consider the probably reaction in such an organization where the commitment is to achieve an unprecedented result and the method or path to produce the result is not well

known and cannot be substantiated with convincing evidence. The project would most likely be rejected or reformulated with more "feasible" objectives because it could not withstand the kind scrutiny it would undoubtedly get.

The resolution of this dilemma lies in distinguishing projects intended to produce breakthrough results from ordinary projects. The distinctions are often subtle and can be seen by analyzing the conversations that occur in organizations.

The work of a manager can be said to be embodied in conversations, whether written or spoken, conveying commitment (Winograd and Flores, 1986, page 143 ff.). One type of commitment is an *assertion*, a statement in which the commitment conveyed is to provide evidence validating the stated premise. The commitment to provide evidence is often implied rather than explicit in the wording of an assertion. The following statements are common examples of assertions:

> "The project is on schedule."
> "I have met my sales quota."
> "We have a plan to complete this work by February."
> "My client is innocent, and we will prove it."

Assertions are the fundamental unit of exchange in most large corporate management structures, and they are necessary and useful. However, because assertions are based on evidence, they are always about the past or extrapolations from the past. Since there is no evidence from the future, breakthroughs cannot be asserted. A different form of commitment is required.

A form of commitment not tied to the past (but ultimately accounting for it) is the *declaration*. The commitment to produce an unprecedented result is made using a declaration. A famous example is the 1961 declaration made by President Kennedy that the United States would put a man on the moon and bring him back by the end of the decade. At the time of the declaration, there was no plan to accomplish this nor was there convincing evidence that it was even feasible. Yet President Kennedy's declaration was the source of an unprecedented national "breakthrough project."

One of the pitfalls of using declarations is they are often heard and responded to as if they were assertions. Several years ago, the author was running a very large programming project and a key component of the software was a disaster. This component was the product of several people's work over two year's time, and it had to be completely redone in three months or the entire project would have to be delayed. One of the people in the group went to his immediate manager and said that he would re-write the component in the required time by himself if management would "leave me alone for three months." The manager proceeded to bombard the employee with all the usual questions: "How do you know you can do it? How are you going to do it?" The employee had no evidence that what he was committing could be done, and so the meeting went badly.

By the middle of the conversations, the employee, disgusted, walked out of the manager's office, whereupon he nearly ran me over in the hall and repeated his offer. I knew him, had respect for his ability, and fortunately was too busy to grill him. Besides, I had no other alternative to solving the problem. I told him to go ahead, overriding his immediate manager. He came back three months later with the program. It worked, and the project was ultimately delivered on time. Incidentally, the quality of this re-written component had one of the highest quality levels of all of the components of the product measured by defects reported by customers.

The point of this story is that people are not trained to distinguish declarations and generally hear them as assertions. In effect, the employee in the story was declaring "I don't know how I will do it, but leave me alone for three months and I will solve the problem." The manager's response, asking for evidence for the declaration, was clearly inappropriate and in this case produced frustration and anger. Such a response often serves to have the declarer reduce the committed result to what can be successfully defended—grinding the potential breakthrough back into a business-as-usual result. Thus, if an organization needs breakthroughs, the people in the organization must be able to hear declarations as declarations.

We will now turn to collective commitment in a group of people. A *team* is defined as a group of people who have common commitments. It could be said that they were all playing the same game, committed to winning. The next section discusses teamwork, the synergistic effects in a team, and how conventional management approaches may suppress the formation of an effective team.

TEAMWORK

A common way to organize projects is an approach that has been called "bottom-up planning." A bottom-up plan is created by dividing the work into pieces and asking each sub-group or individual involved in the project to make commitments for their piece of the action. This approach has some merit in that it provides an easy way to generate a level of commitment to the project. It also creates the illusion of safety.

Here is the classic scenario: suppose there are six groups involved in a project. If one group experiences a breakdown, the project manager can report that five of the six groups are on schedule. The down side is that only one of the groups would experience the situation as a breakdown. Therefore, only one sixth of the people would be in action to solve the problem. Moreover, if a solution is found, it must be within the ability of the group with the breakdown to implement it. Getting assistance from the other groups when the breakdown is not theirs is usually difficult.

Consider the possibility of organizing the project exactly as previously stated and, in addition, having every person in the overall organization committed to producing the overall project results. Then, every breakdown would be everyone's concern. There would be more people engaged in looking for a solution, and the implementation of the solution could be done by any or all of the groups. One would expect that breakdowns

would be handled in an accelerated fashion. Furthermore, because of the larger number of point-of-view involved, the solutions would be more creative and efficient. For instance, engineering could help with a sales problem, software could solve a hardware problem, and so on. This is exactly our experience.

During a project committed to producing a fourfold improvement in productivity, a particular breakdown occurred. One of the two groups involved was on schedule, meeting all of its checkpoints. The other group was falling behind rapidly. No improvement occurred from counseling the manager of the failing group. What finally precipitated a breakthrough was reminding the manager of the group that was on schedule about his commitment to the overall project. When he turned his group's attention to the breakdown in the other group, the entire project was back on schedule within two weeks.

The necessary action in creating a project *team* is to obtain the personal, authentic commitment of the participants to the overall result. We have found that the most effective way to get this commitment from individuals is simply to ask for it and give people the opportunity to freely accept or decline the request. Our results strongly demonstrate that people across a broad spectrum of companies inherently want to be committed to producing extraordinary results at work. What is lacking is the environment in which people can effectively express this commitment. The next section expands this notion to a view of the factors present in the environment that have been strongly correlated to success in breakthrough projects.

CRITICAL SUCCESS FACTORS

In our work with the productivity breakthrough projects we have observed that when certain conditions are absent, the effectiveness of the project team is reduced. Conversely, when these factors are present, the teams seem to be able to handle breakdowns with more velocity and effectiveness. These critical success factors are:

1. The project must be a real project: a team effort to produce a specific result by a specific time. The more precise and specific the statement of the required results and timeframe is, the more likely the project will succeed. The Apollo Project's goal of "putting a man on the moon and bringing him back by the end of the decade" remains one of the best examples of a powerful, precise, concise, and inspiring project definition.
2. The project's objectives should be something that is needed and wanted, not something invented to "try out this new technique for organizing projects." Management must be willing to take risks to have the project succeed. To the degree that they join the project team in taking the risks, management will be effective in the face of the inevitable breakdowns.
3. A closely related factor is the commitment by management to the successful completion of the project. What we have seen is that as you travel up the management chain from the project team itself, the unequivocal commitment to the project's success is sometimes lost or reduced. For example, consider a

project team committed to doubling its productivity compared to business-as-usual. If upper management has the attitude that a productivity increase of 20% is acceptable, their effectiveness in assisting the team in handling breakdowns will be substantially diminished. We have found the higher in the management structure that the project team's commitments are matched, the more likely the project is to succeed.

4. Perhaps the most fundamental success factor is having a conviction among the people who would be doing the project that substantial breakthroughs are possible. This is not to say that they know how to accomplish the breakthroughs, but rather that they are willing to engage in a serious conversation about being committed to such a project. In the area of productivity, nearly every team we have worked with has been convinced that substantial productivity gains are possible. If no such conviction exists, there is no basis for setting up a project intended to produce breakthroughs in productivity.

5. The project team should have a good sense of what outcomes they could expect doing things the way they already know how to do them. In other words, the team should know how things will likely turn out if they operate in a business-as-usual manner. Recalling that a breakdown is the result of the gap between what can be predicted and what is committed, if there is no knowledge of what is predictable there can be no breakdowns regardless of how far out the commitments are. This situation can occur when a group of inexperienced people are put onto a project. Until they fail to meet a checkpoint, an inexperienced group will have no idea that they were not on track for success. It is always a good idea to create early progress checkpoints so that breakdowns are identified early in the cycle when there is maximum flexibility to solve them.

The most powerful way to being a breakthrough project is to have it be created at the request of a high-level executive, the higher the better. Often, a project will immediately come to mind when such an executive hears about the breakthrough approach. It is frequently a project with high visibility and importance. So much the better. It may even be a project in the midst of a major breakdown. If this is the case, it demonstrates that strong commitment is present.

The following section describes the overall scenario for initiating and conducting breakthrough projects and gives two representative examples of such projects.

CREATING A BREAKTHROUGH PROJECT

The creation of a breakthrough project or the transformation of a conventional project into one requires a combination of education and group process. With a common framework for communication, the group is guided to create the commitments that are the foundation for the breakthrough project.

Breakthrough projects are usually started by presenting the breakthrough framework to middle management. The level of management chosen is typically higher than the level responsible for the day-to-day leadership of any particular project. The goal is to get the

highest possible levels of management committed to the possibility of a breakthrough project. The presentation concludes with a request for management to identify candidate projects. Then, we usually work our way down the management chain with this presentation until we get to the immediate management of the targeted project. At every step in the process, people are *invited* to participate. This means that they are always given the maximum opportunity to decline.

In the invitation to create a project, we typically ask that the people consider committing to a productivity improvement of at least two and preferably three times their norm. Thus, if they accept the request, there is a sufficient commitment such that substantial breakdowns are assured. We have found that commitments for relatively small gains do not produce breakdowns that are powerful enough to generate real breakthroughs. People operate in the hope that hard work and a little luck will make the difference.

The definition of productivity that is used is important. With a narrow definition like number of circuits designed per engineer per year or lines of program code per programmer per year, some possible avenues for breakthroughs are shut off. If a schedule problem is solved with a new design requiring fewer circuits or lines of code, it could be seen as having a negative impact on such a productivity measure. For this reason we have generally limited our metrics to dollars and elapsed time to produce the outcome. We answer two questions:
1. What would the project have cost if done conventionally and how long would it have taken? Ideally, we would get the original cost estimates and schedule plan for the project.
2. What is the cost and elapsed time for the breakthrough project to produce the same outcome? And ultimately, what was the cost and elapsed time for the completed project?

The value of this before and after quantification cannot be overemphasized. We have found that when people do not fully understand what can be done in a business-as-usual project, they cannot fully identify, appreciate and effectively act on the breakdowns occurring in a breakthrough project.

Once a potential project is identified, we work directly with the project team. Four to six days of training are provided to the management, with a three to four day subset for the remainder of the team. The training is usually delivered in two-day segments. The first segment focuses on the breakthrough framework. A key aspect, using examples from the participants' personal experience, is to demonstrate that when extraordinary results were produced, they were driven by unequivocal, personal commitment.

Another aspect of this first segment is the nature of commitment. The participants see the cultural factors that work against powerful commitment, particularly in its expression. A rigorous discussion of the anatomy of commitment facilitates people's ability to communicate precisely and powerfully in this domain.

Finally, the participants are asked to declare the committed outcomes for their project. This becomes the springboard for the needed breakthroughs. This discussion may occur once for the entire team on a small project or in groups of six to twenty for a large one. In the latter case, care must be taken to align the commitments of all of the separately trained groups. This has not proven to be difficult.

Since people are committing to results that they do not yet know how to produce, a certain amount of anxiety is present during the creation of the project commitments. Often the discussion turns to a concern about using overtime and weekend work as a potential solution to possible future breakdowns. To satisfy this concern, we have encouraged groups to address these issues in the project commitments. Groups have included commitments on limits to weekend work and hours worked per week in the overall project commitments. Turning the project into a "death march" is removed as an alternative.

The next educational segment is provided a few weeks later. It focuses on breakdowns: their anatomy, the opportunities they present, and some strategies for addressing them. By the time this session occurs, there are usually several real breakdowns that the project team is experiencing.

When a breakdown occurs, the first response by the individuals affected is what we call *assessment*, and is usually focused on assigning blame or cause for the situation. People ask "what's wrong with this project?" What's wrong with management?" "What were we thinking?" "What did those consultants put in the coffee?" and so on. The assessment phase is virtually always unproductive, and the project participants are trained to recognize and move on from this type of activity.

Throughout the early stages of the project, coaching is available to the team. Typically, there is a strong demand for such coaching, particularly in the area of dealing with the breakdowns at hand. The aim of the breakdown coaching is to assist the project participants to recognize and move beyond the assessment phase. Next, the commitment at the source of the breakdown is usually questioned and recreated by the participants (or not). One of the primary pitfalls at this point is that participants will be limiting their conversations to assertions. Here the role of the coach is to assist participants in maintaining the distinction between the circumstances of the breakdown and their commitment and keeping the conversation open for declarations.

A third round of group sessions is usually held at or near the completion of the project. The purpose of this phase is to deal with the successes and failures so that the participants are left with as little baggage as possible. Each participant is acknowledged fully for his or her bold commitments, hard work, creativity, and contribution to the completion of the project. Another aspect of this session is to capture the lessons learned about what worked and what did not work. We have found that when projects are completed this way, the individual participants are more willing and even anxious to be a part of another breakthrough project.

The next section illustrates some of the details of the process by describing two particular projects.

PROJECT PROFILES

Two specific projects are described in this section. They were chosen because they are representative of the spectrum of projects in the original study.

Project A

Project A was just starting when this material was presented to upper management. As a part of the presentation, a request was made for projects to be nominated. When Project A's second level manager (i.e., a manager of managers) heard of the request he immediately offer his project as a candidate. The motivation for its nomination was that the project was scheduled to be completed in 25 months but was needed in 13 months due to marketplace demands. The project had been budgeted for $9 million and was staffed to just over 50% of what was called for by the existing plan.

The second-level manager, on his own, quickly formulated a personal commitment to a breakthrough result.   He declared his conviction that productivity could be significantly improved and committed to complete the project in the required 13 months using only the staff that was already on-board. This amounted to cutting the schedule nearly in half and reducing the dollar cost of the project to one fourth of its original estimate.

This commitment was confirmed during a two-day training session held for the second-line manager and the people directly reporting to him. When the two-day session was given to the group at large, the commitment was expanded to include a promise for no overtime being used. The corporate quality requirements and the mandated participation from the company's independent quality assurance organization were both to remain operative.

Three months into the project, the marketing department (a group outside the project team) informed team management that certain additional functions were required in the product or the entire effort would be for naught. This additional function represented a workload increase of approximately 30%. The group met and decided to take on the additional work. Rather than add team members or slip the schedule, the team members chose to work overtime. The net result was that the project successfully finished in 13 months with a productivity rate over five times the established norms. The reported overtime was an unremarkable 13.5%-- equivalent to 5.4 hours of overtime per work week or just over one hour of overtime per work day.

Several factors contributed to the results of this project. First, there was unqualified commitment to the overall results from the top of the organization to the working level. Second, breakdowns were handled at an exceptional rate. Third, a development process was created that was tailored specifically to the needs of this project. The usual practice had been to use the standard "one size fits all" process for every project.

Other factors reported included more efficient meetings, more effective communication, and better than usual results from the service and support organizations outside of the project. These results have frequently been reported in our projects and are attributed both to the training people received in the communication of commitment (requests, promises, agreements, etc.) and to the clarity individuals had about their own personal commitments.

People on the team were excited about their project. They operated as if they were the cream of the technical community working on a leading edge technical project. This was not actually the case. The project was of commonplace technical content staffed with the people who were already in place.

Another aspect is that it was virtually effortless to enroll the team members into making the commitment to the breakthrough schedule and productivity. Only one person on the team declined the request to make the initial promise, and he stayed on the team throughout the project. We have found this pattern to repeat on many other projects and have come to expect it. People are apparently waiting to be invited to participate in projects like these.

The second-line manager who ran this project says that he is now capable of managing "normal risk" projects at the level of twice the productivity he considered normal before he started this effort. On of the first line managers proposed a new project with an additional 50% productivity boost.

Project A was a new, relatively small and self-contained project. Project B was different in several significant ways and is another important example of a breakthrough project.

Project B

The 90-person group of Project B was engaged in adding improvements to a software product that was originally introduced 15 years prior. The overall project manager and the two second-level managers reporting to him went through the two-day training session and declared that they were committed to a two- to three-fold increase in the average output per person in their organization. This commitment was echoed in the subsequent two-day session with the first-level managers. However, when the training program was presented to the twelve technical team leaders (non-managers), the direction changed dramatically.

The team leaders were much less interested in raw productivity improvements than they were in the opportunity to use additional productivity to revitalize their product. In effect, they could finally catch up with customer requirements and transform their product into "the best of its kind in the marketplace." They declared their commitment to achieve this within three years.

As the details unfolded, it became clear that to accomplish this commitment, productivity would have to more than double. They committed to this increase with no additional resources, no change in existing commitments, and in the face of a three month schedule problem (breakdown) in the original plan that they did not know how to solve.

During the first two months of the breakthrough project, the team solved the three month schedule problem. Early in the project, the team leaders determined that a streamlined development process was required to meet the need for increased productivity. They scheduled a meeting to formulate a proposal. Before the meeting ever occurred, middle management expressed serious concerns that the quality, predictability and control obtained with the standard process would be lost. The team leaders met and the meeting provided the first opportunity the group had ever had to thoroughly review the existing process.

The new process they put together was virtually indistinguishable from the old one. A number of small improvements were made and the net result was that more steps were added than removed. The significance of the meeting was that for the first time, the technical leadership of Project B now understood and "owned" the development process they were using.

The project ran nearly a year, facing and solving numerous breakdowns. During one breakdown precipitated by a resource reduction and a key management change, upper management observed that they had actually achieved a real 60% improvement in productivity. Achieving the remainder of the committed productivity was judged to be a substantial and unacceptable risk. Consequently, they altered the commitment to match a new productivity level of 1.6 times the original. This level is now considered business-as-usual and is being consistently achieved.

CONCLUSIONS

We have now[4] had enough experience with breakthrough projects to conclude that the formulation we are using produces results and is repeatable. Since the original 20 projects in IBM, there have been dozens of projects started in other companies and most have successfully produced breakthrough results. These other companies have been in a variety of industries and the breakthrough technology has been successfully applied to goals other than increasing productivity.

Here is what has been observed and concluded:

1. The vast majority of the people in our organizations are convinced that productivity can and must be substantially improved. Many people have specific ideas for how to go about making improvements; most do not.

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[4] This section is revised from the perspective of the year 2004, but has substantially the same conclusions of the original 1989 version.

2. Given the opportunity, individuals and groups can and do make authentic commitments to produce results beyond what is predictable. Such people represent the overwhelming majority of the individuals we have worked with.
3. Breakthrough productivity projects have been relatively easy to create and the overall project commitments have been owned by virtually the entire team.
4. Breakthrough productivity projects have been created out of mundane technical projects staffed with ordinary people. The approach has also been successfully applied to leading edge technology efforts staffed with world-class scientists and engineers.
5. The success rate of the approach is high and the quality levels (i.e., error rates, etc.) are the equal of business-as-usual projects. Among the original 20 projects, only one failed to achieve a substantial productivity gain. This failure has been attributed to the lack of a sufficient goal to generate powerful breakdowns. Another project which failed, not in IBM, had an impressive goal, but the participants were too inexperienced to appreciate the nature of the breakdowns they were thereby creating.
6. Morale among the participants has been high. Rather than being burned out at the end of a high-productivity project, people are usually energized and ready to go again.
7. The culture of breakthrough projects can be spread and productivity improvements have been seen in adjacent business-as-usual groups. The key to spreading this culture is upper management support for taking the risks that are inherent in such endeavors. If management cannot tolerate risk and the occasional failures that occur, it does not take long for the culture to return to conventional, business-as-usual ways.

BEYOND BREAKTHROUGH PROJECTS

Ultimately, the fundamental issue addressed by breakthrough projects is one of organizational culture. While the original breakthrough projects were relatively easy to create and had a surprisingly high rate of success, they did not spontaneously spawn other such projects without the active support and engagement of management.

The challenge to management can be seen by considering an example. Suppose a breakthrough project completed with a substantial increase in productivity but still well short of the original commitment. For instance, suppose that a three-fold increase was committed, but only a doubling was achieved. Punishing the leadership of the project for "over-committing" themselves will have the obvious outcome of suppressing powerful commitments for future projects. On the other hand, rewarding the team for their accomplishments may have the result of encouraging people to settle for less than what was committed and/or to make irresponsible commitments. They will see that any significant improvement will be rewarded regardless of whether the underlying commitment was actually delivered.

This example demonstrates the three major elements of the required cultural shift:

1. Honoring people for their courage in taking the risks required to commit to produce breakthrough results.
2. Supporting people in keep their commitments by creating a demand for integrity and accountability.
3. Rewarding people for the results they produce compared to their commitments.

Perhaps the most lasting effects of the breakthrough projects have been that the participants have retained

- a powerful understanding of what it means to be committed to producing results, and
- a high level of confidence and effectiveness in dealing with breakdowns.

REFERENCES

Nayak, P.R., and Ketteringham, J.M. *Breakthroughs* New York, NY: Rawson Associates 1986.

Shaw, G. B., *Maxims for Revolutionists*, Westminster, UK, 1903.

Winograd, T. and Flores, F., *Understanding Computers and Cognition*, Reading, MA: Addison-Wesley, 1986.