EXTREME CHAOS

"The world acquires value only through its extremes and endures only through moderation; extremists make the world great, the moderates give it stability."

—Paul Valery, French poet, critic

A project gold rush is in full swing. In 1998 Corporate America issued 200,000 new-start application software development projects. By the end of the Y2K "non-event," new starts went up by almost 100,000 projects to 300,000 this year and more than half a million will be resolved in the next 12 months. Most of these new projects are well within The Standish Group's criteria established in "CHAOS: A Recipe for Success" (1999), which limits the size of the projects to six months and six people. This newest paper is a continuation of our CHAOS research updated with our most recent findings.

The timeline of The Standish Group's seven years of CHAOS research shows decided improvement in IT project management. This year project success rates, while modest, are up again across the board, while cost and time overruns are uniformly down. Time overruns have significantly decreased from 222% over the original time estimates in 1994 down to 63% in this latest study.

Cost overruns have gone from 189% over the original cost estimates in 1994 down to 45% in the 2000 study. In 1994 required features comprised 61% of the final product. This year's research shows 67% of the required features and functions. This notably increases end-user satisfaction in terms of time, cost and features.

The best news is that we as researchers and you our readers are learning how to succeed more often. According to 1994 results, only 28,000 application development projects met the criteria for success — completed on time, on budget and with all the features and functions originally specified. This year's results show that 78,000 U.S. projects were successful.

The reasons for the increase in successful projects vary. First, the average cost of a project has been cut more than half. Better tools have been created to monitor and control progress and better skilled project managers with better management processes are being used. The fact that there are processes is significant in itself.

However, Nirvana is still a long way off — 137,000 projects were late and/or over budget, while another 65,000 failed outright. The reason most of these projects failed was not for lack of money or technology; most failed for lack of skilled project management and executive support.
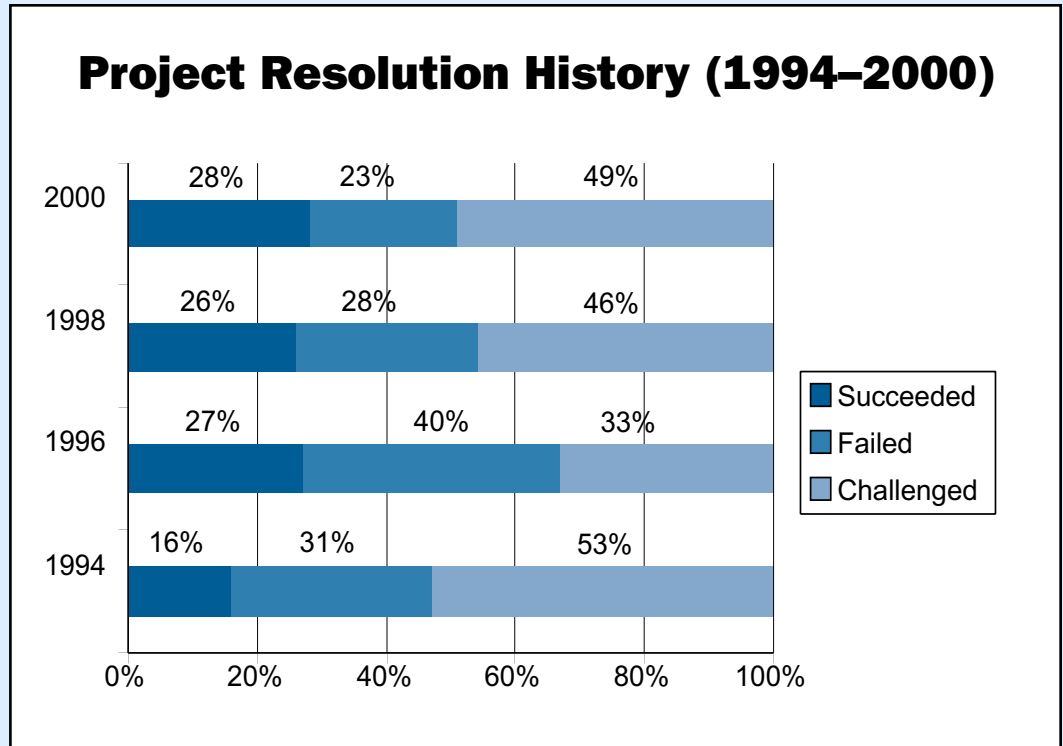
Lack of executive support has replaced user involvement as the number one cause of project failure. Without a staunch project champion with a solid business vision, projects can drift into a technological or political abyss. Project stakeholders must create business value by improving customer service, communicating a clear business plan and delivering a competitive advantage.

Project Resolution (2000)

Failed 23%

Challenged 49%

Succeeded 28%
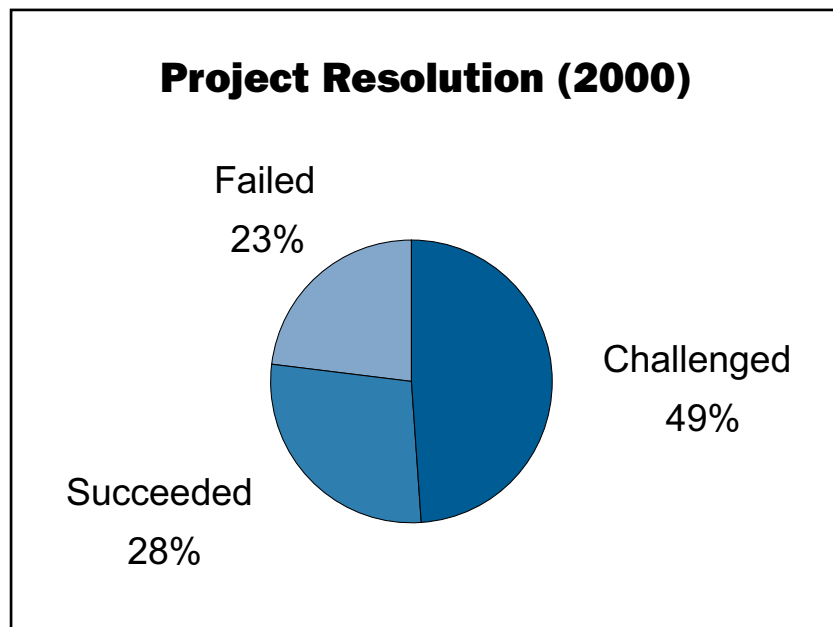
Project Resolution
The Historical Perspective

Project success rates are up across the board, while the frequency of cost and schedule over-runs is declining. The development community has made noticeable strides on the road to success. The CHAOS research timeline is evidence of the steady improvement in IT project management. In 1994 only 16% of application development projects met the criteria for success — completed on time, on budget and with all the features/functions originally specified. This year 28% of projects were in the successful column.

Project Resolution History (1994–2000)

Year	Succeeded	Failed	Challenged
2000	28%	23%	49%
1998	26%	28%	46%
1996	27%	40%	33%
1994	16%	31%	53%

Project success rates are rising. This chart depicts the resolution of the 30,000 applications projects in large, medium, and small cross-industry U.S. companies tested by The Standish Group since 1994.

The Standish Group categorizes projects into three resolution types:

- Successful: The project is completed on time and on budget, with all features and functions originally specified.
- Challenged: The project is completed and operational, but over-budget, over the time estimate, and with fewer features and functions than initially specified.
- Failed: The project is cancelled before completion or never implemented.

Tracking U.S. project outcomes showed that in 1994, 28,000 projects were successful, while over the last twelve months, 78,000 projects were successful — a three-fold increase. Conversely, failed projects amounted to 54,000 in the 1994 study versus 65,000 in the year 2000 study. This was an 18% increase while overall project growth totaled over 60%. Challenged projects grew at a rate of 62% to equal 137,000 over the 1994 number of 93,000.

Cost overruns in 1994 were 189% over the original estimate. This was reduced from 69% in the 1998 study down to 45% in the 2000 study. Time overruns dropped from 222% in 1994 to 63% in 2000. Another piece of good news is that in 1994, on average, only 61% of the required features were delivered on challenged projects, compared to 67% in the 2000 study.

Overall, the outlook is good. Project success rates are up and overruns are down. More importantly, although the number of projects is expected to double this year, the rate of failure is expected to take a major downturn.

Project Estimating
Outdated Metrics

Project and program estimating is little more than predicting the future outcome of a project or program — it is a hard and unwieldy undertaking. There are really only two kinds of estimates: "Lucky" or "Lousy." These estimates are often made by different people, at different times, using different methods. More standards for estimating could produce significant improvements, however, there is a caution. Project managers must realize that using function points, lines of code, and computing hours of coding time as metrics for developing applications is approaching buggy whip status. In addition, only one-third of U.S. application projects resolved over the last year were developed from scratch using traditional languages and methods. The remaining two-thirds either developed or purchased components to build or integrate functionality into existing applications. Obviously, function points and lines of code have little meaning in estimating these projects.

The latest CHAOS research shows that 28% of application projects will come in on time and on budget. However, this is not the whole story. Most of these projects will have been overly estimated. In a number of focus groups, IT executives told us that they first get their best estimate, multiply by two and then add a half! It should not be surprising, therefore,

Developed from scratch using traditional languages and methods	33%
Purchased application & modified	15%
Developed from scratch using an object model	13%
Developed some components & purchased others	13%
Purchased application & modified extensively	12%
Purchased components & assembled the application	9%
Purchased application & performed no modifications	5%

that the majority of these successful projects where already 150% over budget before they began. Consequently, the three pillars of project management — time, cost and function — become questionable metrics in addition to function points and lines of code. But what are the right metrics and how can IT executives use them to be more accurate? The key issue is how can business executives forecast a return on their project investment without at least a good ballpark estimate of time to market and the ultimate cost of needed functionality? Is there a clear-cut, easy answer or solution to these questions? We don't think so, but finding the answers and solutions should be our mission.

In developing a more systematic approach toward project estimating, one needs to realize truly reliable estimates are rare birds. For the past five years The Standish Group has accumulated 30,000 cases on the cost and resolution of projects. Using case-based reasoning technology we have created a methodology to estimate project cost. However, it is no estimating panacea. Profiling one project against others to isolate costs is tricky and difficult at best, but this approach is much better than the alternatives — like using outdated methods or thinking of ad hoc estimates that are seen to be attractive to sponsors or "safe" for management.

Recipe For Project Success: The CHAOS Ten

The CHAOS Ten

Executive Support	18
User Involvement	16
Experienced Project Manager	14
Clear Business Objectives	12
Minimized Scope	10
Standard Software Infrastructure	8
Firm Basic Requirements	6
Formal Methodology	6
Reliable Estimates	5
Other	5

Each factor has been weighted according to its influence on a project's success. The more points, the lower the project risk.

What makes a project successful? The original CHAOS study, conducted in 1994, identified 10 success factors. We have updated the CHAOS Ten for the year 2000. Although no project requires all 10 factors to be successful, the more factors that are present in the project strategy, the higher the level of confidence.

1. Executive Support: Traditionally the number two spot was occupied by executive support. However, this is now the number one factor in project failure. Executive support influences the process and progress of a project and lack of executive input can put a project at a severe disadvantage.

2. User Involvement: Lack of user involvement traditionally has been the number one reason for project failure. Conversely, the number one contributor to project success has been user involvement. Even when delivered on time and on budget, a project can fail if it does not meet users' needs or expectations. However, this year it has moved to the number two position. It is not that user involvement is less important, but it is just that IT professionals have centered in on this and, in effect, solved this major problem.

3. Experienced Project Manager: Moving up to the number three slot is an experienced project manager. Ninety-seven percent of successful projects have an experienced project manager at the helm.

4. Clear Business Objectives: Moving down one spot to fourth place is having clear business objectives. This is not because clear business objectives are less important, but because evidence shows experienced project managers increase success rates.

5. Minimized Scope: Rounding up the top five is minimized scope. Time is the enemy of all projects. Since scope impacts time, or project duration, they are linked. By minimizing scope, time is reduced and therefore chances for success increase. Minimized scope replaced small milestones, which occupied the number five position in our 1990 CHAOS study. While these two factors are similar, the act of minimizing scope leads to greater success than that of creating small milestones. Small milestones are

within the "minimized scope" category, other factors have been moved to formal methodology and others to categories. Concentrating on the top five will give up 70 success points.

6. Standard Software Infrastructure: Requirements are in a state of constant flux, but the infrastructure needs stability. The Standish Group's research shows that 70% of application code is infrastructure. Some of this code is unique to the application; nonetheless, much of it is code that could be purchased from an infrastructure vendor.

By using standard infrastructure, the application development team can concentrate on business rules rather than technology. Many application development projects fail not in the development of the stand-alone application, but in the integration of existing applications. Here, standard infrastructures can shortcut application integration.

7. Firm Basic Requirements: The key to understanding this item is the word "basic." This refers to base level requirements. By creating a minimal, obtainable base level of requirements and then developing those features, the effect of change will be reduced. Changing requirements is as certain as death and taxes. Delivering minimal features allows users and executive sponsors to see results quickly. As a result, an added benefit is that project managers are better prepared to articulate the needs and priorities of the next phase of the project.

8. Formal Methodology: Does having a formal project methodology increase success rates? Formal project management provides a realistic picture of the project and the resources committed to it. Certain steps and procedures are reproducible and reusable; thus, the tendency to reinvent the wheel is minimized and project-wide consistency is maximized. Lessons learned can be incor-

porated into active projects. The process encourages a go or no-go decision checkpoint. A project team can proceed with a higher level of confidence or steps can either be halted or altered to fit changing requirements. This ability to adjust in real time enhances project skills and reduces project risk. CHAOS research shows that 46% of successful projects used a formal project management methodology, compared to 30% of challenged and failed projects. Therefore, this factor should increase chances of success by about 16%.

9. Reliable Estimates: When developing a systematic approach toward project estimating, again, being realistic is necessary. Estimating is just plain hard. Add to the difficulty the developing and purchasing of components and their integration into existing applications, package applications and outside services. As mentioned earlier, IT managers must use all their collective knowledge and experience to come up with estimates that reflect the true effort required.

10. Other Criteria: In last place is a collection of other factors. These factors include small milestones, proper planning, competent staff and ownership. In the past, each of these factors was represented as a category by itself.

There are over 300 possible queries across these ten categories. Using case-based reasoning techniques, The Standish Group assesses project risk. This is first done by profiling the project and then asking 100 questions related to the profile. The profile and the answers are then matched against a set of the 30,000 cases to calculate the project's risk.

The CHAOS Ten success factors continue to be a valuable tool to estimate project success potential. While there is no magic formula that can guarantee project success, ensuring the presence of the CHAOS Ten can increase the odds in one's favor.

Does a Project Manager Increase Project Success?

Certainly this is a question that a lot of business people have asked over the years. After all, a project manager is an additional expense, creates added paperwork for others and is an intermediary between users and developers. Understandably, some have asked why not just let the developers develop and let the users use? Overall, 82% of projects have a project manager assigned. The latest CHAOS research shows that only 28% of application projects will come in on time and on budget. Of these projects, 97% had a project manager assigned to the project. Twenty-three percent of projects resolved over the last 12 months went into the failed or impaired column. In this group, a much lower figure of 76% had a project manager assigned.

Forty-nine percent of the projects fell into the challenged category. A challenged project is one that is either over time, over budget and/or lacking critical features. Seventy-nine percent of these projects had a project manager assigned. These cases clearly show that having a project manager assigned to the project will not necessarily lead to success, but having a 97% success rate demonstrates that not having one defies the odds of success.

Just having a project manager is not all that is needed. Forty-eight percent of the successful projects had a formal project methodology, 64% had used requirement tools and 61% used project management tools and suites. Therefore, a project manager with the right tools and methodology can increase the success of a project.

In the "Recipe for Success" report, we stated that the IT community is just beginning to understand the true role of the project manager, the skill required to be a good project manager, and the benefits a project manager can bring to the project.

This year's CHAOS study clearly shows not only the benefits a project manager brings to a project, but also the skills required for effective project management. The following were skills most identified:

Business skills: CIOs reported that project managers of successful projects had good business skills, while managers of challenged projects had fair business skills. Those project managers whose projects failed had poor business skills. Our research shows that having business skills is the most important trait a project manager can possess. Without basic knowledge of the business objectives, the project manager could have a negative impact on the project.

Technical skills: Successful and challenged projects showed good technical skills for project managers, while failed projects showed the project manager had only fair skills. A good grasp of technology improves critical communication and translation between designer/developers and users/sponsors. A project manager needs to be able to envision project components and how the parts incorporate into the whole.

Project Management skills: It would seem very obvious that a project manager must have project management skills, but this is often not the case. Many companies are assigning a project manager to projects without the key skills needed to be a good project manager. Many of these key skills involve basic management proficiency such as good judgment, diplomacy and time management. An investment in project management education, which is taught at many colleges and universities, may be needed. Private companies, such as the consulting firm Robbins-Gioia, offer formal classes and the Project Management Institute certifies professionals. The bottom line is that projects that have managers with good project management skills have a greater chance of success.

Decision skills: The ability to pass judgment on issues under consideration, and reach a firm decision is a vital project management skill. Throughout the course of a project there are hundreds of decision points. A bad choice can lead to increased time and expense or outright failure. On the other hand, good choices can bring a project in on time and on budget. Projects need managers with good judgement and strong decision making skills to succeed. Project managers, like other managers, often learn the hard way — from their experience in the trenches and hopefully from past mistakes. Because of this, an experienced project manager with failed and challenged past projects could well be the best candidate for the next important project.

Process skills: Planning, enacting and tracking a series of activities, tasks, changes, or functions to arrive at a goal are other skills the project manager must maintain. As the centipede said to Alice in Wonderland, "If you do not know where you are going any path will take you there." Here again, if you have good processes and plans, the chances of success increase. Forty-six percent of successful projects had a formal project methodology, while challenged and failed projects used formal project methodology 30% of the time.

Detail skills: Features and functions must be considered individually and in relation to a whole. In other words, "the devil is in the details." Project managers who have an eye for details as well as the whole will fair better than those that only have a grasp of the big picture. The big-picture-only view is for the executive sponsor; the detail view and the big picture view are for the project manager. For example, the project manager must decide at the detail level what features and functions will be part of the project, whether for the first phase or for a later release. There must be a detail-change contingency plan in place, with associated risk factors and cost increases.

Organization skills: The project manager must be able to organize project components into a working structure and support that structure by having various functions contribute to the whole project. A project manager must create and maintain structure in which individuals cooperate systematically. The results showed that successful projects had program managers with good organizational skills while challenged and failed projects had project managers with fair to poor skills.

Communication skills: Project managers must be able to clearly express and exchange thoughts and information. Good communication is the cornerstone of successful projects and IT management needs to encourage development of these skills. Project managers should be encouraged to use the organization's business dialect to keep communication simple and understandable to business-side management or sponsors. The project manager should use simple terminology, and avoid IT buzzwords and acronyms. Research showed that successful projects had project managers with good communications skills in contrast to challenged and failed projects which had project managers with fair to poor skills in this area.

Seventy-eight percent of all projects will have a primary user representative. Our research found no correlation between having a primary user representative and the success of the project. However, we did find a heavy correlation between the skills of the primary user (when present) with respect to success and failure.

Operational skills: The basic skill necessary for the primary user is knowledge of business functions. The primary user must be able to answer operational questions and their role must be clearly determined with clear responsibilities. Good operational skills are expected from the user and if they are not present could cause the project to be challenged or impaired.

Evangelism skills: Projects that had a primary user who zealously evangelized and disseminated the project's value throughout the organization scored better than those that did not. In essence, evangelism is a very intense form of communication, and, as mentioned earlier, the greater the degree of communication between parties, the greater the chance of success. Projects in which the primary user scored well as an evangelist had a higher success rate. Projects in which the primary user had a fair to poor rating as an evangelist had a lower success rate.

Business skills: Often the primary users will understand their own narrow operational requirements, but lack knowledge or understanding of how those requirements fit into the overall business. Projects in which primary users had an understanding of their functions within the context of the overall business scored better than those did that did not posses this skill. However, this skill should not be given too high a rating of success or failure.

Technology skills: While in most cases technology skills are a plus, the technology skills of primary users can also be a negative factor. Time and schedules are influenced by technology skills. Having too little technology skill can slow down the project, but on the other hand too much technology skill can also slow down the project. Projects in which primary users had a fair knowledge of the technology being used scored high in the success column. Projects in which primary users had a good technology understanding were more likely to be challenged. Projects in which primary users had a poor rating were more likely to end up in the failed or impaired categories.

Process skills: Projects in which primary users has a good understanding of the project management process had a better rate of success than those did that did not. On average, projects in which primary users only had a fair understanding of the project management process fell into both challenged and failed groups. A basic tutorial on the project management process could help in the success of a project.

Results skills: While it may seem unexpected, many users are not skilled at telling what they want, or if they get what they want, then describing how it will benefit them. It is a given that the project will produce a result; however, that result may or may not be a consequence of the user knowing what they originally wanted. Projects in which the primary user had skills in understanding the project results faired much better in the success rate than projects in which primary users were uncertain about the results they hoped to achieve.

Communication skills: Primary users must have the ability to explain the business process in detail to the IT organization. Primary users should be trained to follow project management protocols. Successful projects showed primary users with good communication skills versus challenged and failed projects that had primary users with fair to poor communication skills.

Realism skills: Of all the skills on the list, realism shows the starkest contrast. Users must be aware of the limitations that can beset projects. Project developers cannot be expected to produce miraculous results if resources are restricted. Primary users who possessed good realism skills had high success rates. Projects where the primary user had fair skills in this area had high challenged rates. Those primary users that had poor skills had high failure rates. Primary users that have an inclination toward literal truth and pragmatism should minimize project risk.

Seventy-seven percent of successful projects have executive sponsors with good vision and responsiveness. Challenged projects had an executive sponsor 67% of the time while failed projects had executive sponsors 59% of the time. Here again, skills played a major part of the success and failure rates.

Visionary skills: An executive sponsor who has a global view of the project will greatly increase the project's chances of success. An executive sponsor that only has a fair knowledge of how the project fits into the corporate goals and how it benefits the organization could cause the project to overrun or fail. The executive sponsor should set the agenda, arrange the funding and articulate the project's overall objectives.

Champion skills: If the executive sponsor is an ardent defender or supporter of the project, its chances of success are higher. If the executive sponsor is only mildly supportive, the chances for success will more likely go down with overruns and failure. If the original executive sponsor leaves the company, or is replaced, the project's viability will need to be reassessed.

Responsiveness skills: Projects that have an active and responsive executive sponsor fair better that those that do not have such a resource. Being readily available to answer, suggest, influence and resolve appeals indicates responsiveness. If this is done well, chances of success increase. If done only fairly, it is likely that the project will experience overruns or failure.

Responsibility skills: The executive sponsor needs to be personally accountable to ensure a successful outcome. If the executive sponsor does not provide skillful and personal leadership, then the outcome could be either challenged or failed. The greater the skill in this area the greater the chances of success.

Business skills: Calvin Coolidge once said, "The business of America is business." For the executive sponsor the business of the "project" is business. The greater the understanding of what business the executive brings and communicates to the project team, the greater the probability of success. The converse is also true.

Technology skills: This has proven to be dangerous ground for executive sponsors. In rare cases where the executive sponsor has an IT background, technology skills can be a plus. However, in the majority of cases the executive sponsor may only have enough knowledge to be hurtful. Successful projects show that the executive sponsor should have a fair knowledge of technology. Challenged and failed projects show either end of the spectrum with good or poor technology expertise.

Results skills: Here, like the primary user, the executive sponsor should know what the completed results will be. Without concrete and clear expectations, the resolution or endpoint of a project may never really be known. Executive sponsors with good skills in this area will have greater favorable results than those who have fair to poor skills.

Process skills: Here again, like the primary user, projects in which the executive sponsor had a good understanding of the project management methodology had a better chance for success than those where this was absent. Projects in which the executive sponsor had a fair to poor understanding of the project management process fell into both the challenged and failed groups. As with primary users, a basic tutorial on the project management process for executive sponsors could help in the success of a project.

Project Management Tools

If clothes make the man, tools make the project. It is clear from our latest research that tools can have a major impact on the outcome of a project. Over 60% of successful projects used project management tools such as project management suites and requirement software. On the other hand, challenged projects used such software just over 50% of the time. Failed projects used project management tools about 40% of the time.

What tools make the most impact on the project outcome and what tools may use valuable resources with little to no impact?

Requirement tools: These seem to have the biggest impact on the success of a project. This may seem strange since "Firm Basic Requirements" is number six on the top ten list. However these tools, if used as a platform for communications between all the stakeholders, such as executive sponsors and users, can provide enormous benefits. This tool needs to be at the top of the shopping list for any firm involved in developing software applications.

Project Management: These tools are broken into several categories: General Project Management (GPM) tools, Project Management Suites (PMS), Professional Service Automation tools (PSA) and the new Collaboration Project Management (CPM) tools. GPM tools are the most widely used tools. They are primarily used by and for the project manager and offer tracking, planning and scheduling. Traditionally, GPM tools have helped when collected information is accurate and shared. Far too often, however, this is not the case and the GPM tools are used simply to justify poor results. Since practically every firm uses some sort of GPM tool the overall CHAOS study results reflect their benefit.

Project Management Suites were used on less than 10% of the projects. This could be because PMSs require a major commitment by the organization. Of the projects that used a PMS, results were mixed and we found no conclusive evidence that these systems affected the project outcome. PSA tools are used primarily by professional service organizations and were not tested. Again, while these tools were not tested, we feel that CPMs hold a lot of promise. They combine the tracking, scheduling and controlling aspect of GPM tools with communication to all the stakeholders through the Internet.

Design/Analysis: Successful projects had a slightly higher use of design/analysis than those did that did not use this type of resource. However, the data is inconclusive and it is not clear that selecting these tools will improve the success rate.

Modeling: Projects that use a modeling tool had a higher rate of failure than those did that did not use a modeling tool. However, it should be noted that modeling tools are used in larger projects and large projects also have a greater failure rate. Like the design/analysis tool, this tool should not be selected just to improve success rates.

The purpose of any tool should be to support the project management process. The sole use of any tools cannot really control an individual project's outcome. On the down side, tools can be used improperly and when they are, it can add time and effort to the process, resulting in what is called "paralysis through analysis." On the positive side, when coupled with appropriate education and experience tools can improve the success rate.

Project Management versus Collaboration Management

In 1998 The Standish Group's CHAOS research defined the roles and responsibilities of each stakeholder in an application development project. The theory was that if each person did his or her job then the chances for project success would increase. This premise still holds true for most large projects; however, the latest Standish Group CHAOS research shows a major decrease in the size of application development projects. Coupled with high turnover rates among project staff and rapid time to market requirements for many new eBusiness projects, the importance of individual performance and roles is changing. For smaller projects, collaboration management, along with an iterative development style, may be a better technique.

Keeping a close relationship between team members and the project leader helps identify project stress points as well as ensure members are aware of all potential setbacks. Once again, communication is the most important aspect of any relationship. If a team head drops out, or contracted developers or programmers leave, it is a setback but not a total disaster. Collaboration management can mitigate this risk by transferring knowledge, management and control among the stakeholders.
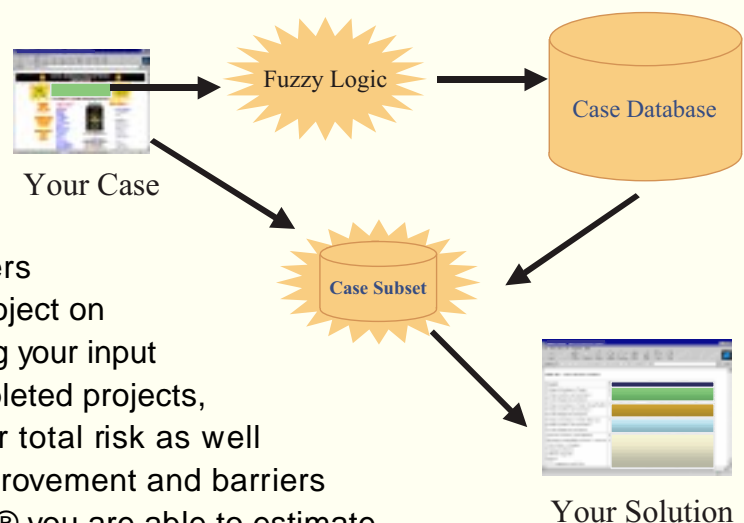
In The Standish Group's "Recipe for Success," the top five traits a project manager must posses were listed as:

1) Multilingual - the ability to translate business and technical requirements between the business people and the technology people
2) Gatekeeper - the ability to decrease the scope of the project thereby reducing time ("Time is the Enemy of all Projects," Johnson, 1996)
3) Maestro - the ability to have all participants work together
4) Cattle Driver - the ability to keep the project moving
5) Clark Kent - the ability to clearly articulate the requirements and progress of the project

Ideally, collaboration management, using appropriate tools, distributes these activities among the stakeholders so that information is self-translated, scope is self-selected, and activities are self-coordinated, expedited and documented.


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Recipe for Project Success

Now in its sixth year of publication, The Standish Group's Extreme CHAOS continues to refine the ingredients that contribute to successful project completion. This calls for reducing requirements to the bare minimum, providing constant communication systems and coupling those with a standard infrastructure. Mix these ingredients with good stakeholders, an iterative development process, project management tools and adherence to key roles, and success is practically in the oven.
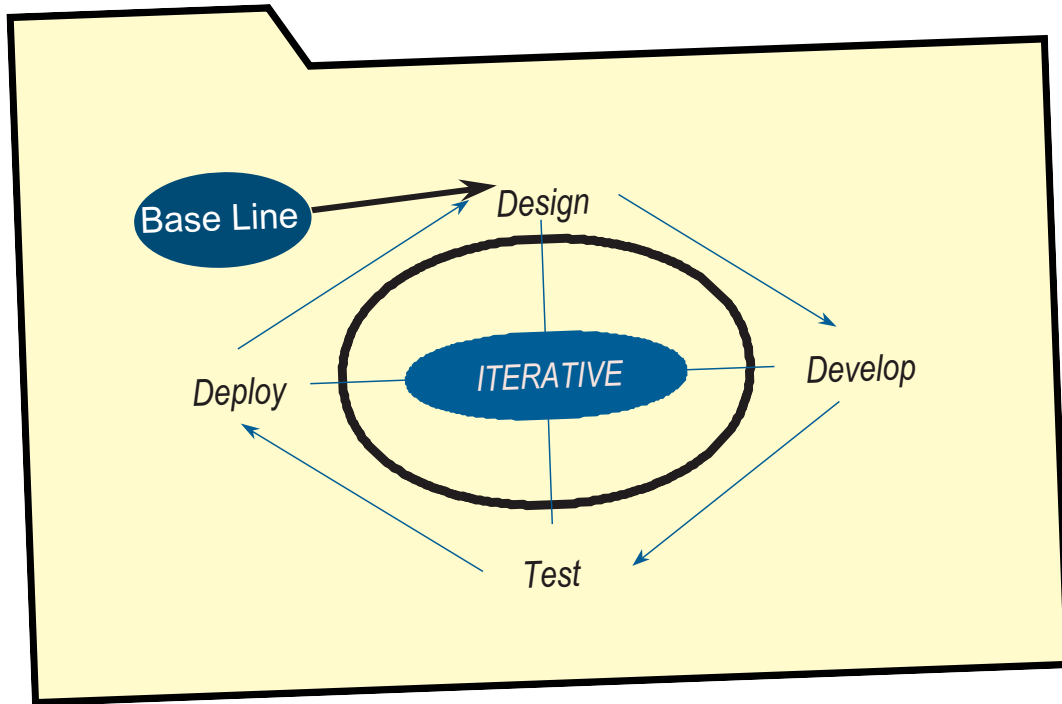
This recipe for success does work and we have seen it work again and again. In the right amounts, these ingredients can produce incredible results. Nevertheless, we understand that there are always potential elements that can sour project success. Too many cooks can certainly spoil the stew — especially with half-baked ideas. This year we learned that less can be even more.

Our newest data suggests that we need to further reduce the amount of resources to increase the success rates even more. The key is to trim the fat by economizing all available resources. This year's CHAOS recipe calls for no more than four people, for no longer than four months at a cost of less than $500,000. We find that the less the features, the greater the yield. When it comes to project success and features you can never be too thin — waste not, want not.

Through lessons learned from our collected CHAOS experience, The Standish Group continues to examine the reasons why achievable project success often turns into fruitless endeavors. All the ingredients are there to turn a bitter situation into a sweet reward.

"Oh, God, why don't I remember that a little chaos is good for the soul?"

—Marilyn French, US writer