OCTOBER 2001 THE FORRESTER REPORT

Site Development's Fate

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The business world is approaching the Internet existence threshold -- when customers and partners will equate a firm with its Web site. Firms must overhaul site-building efforts for this complex and high-risk environment.

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THE LANDSCAPE

Web Sites Take Center Stage For Doing Business

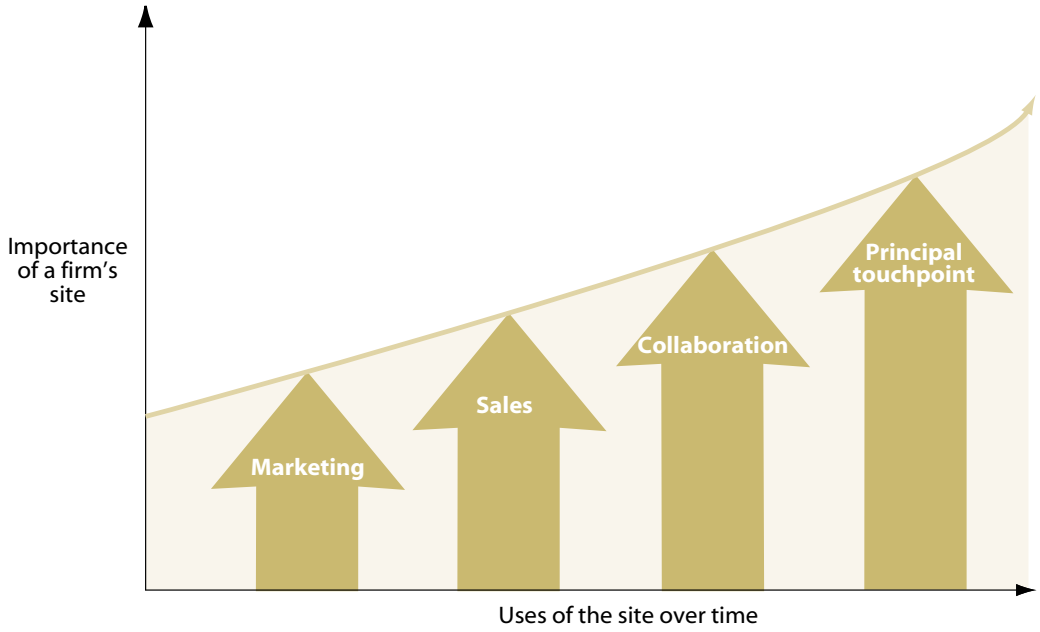
Firms are entrusting core business processes to the Web, from marketing to service and working with partners. As companies' sites become more important, people begin to treat the site as the company -- not just as another channel.

FIRMS OPERATE MORE AND MORE ON THE NET

The Web is littered with dull corporate home pages that offer little more than annual reports and fragmented product information.[1] But leading firms tap the power of the Net to transform the way they (see Figure 1):

- **Market.** The Web puts companies in direct contact with the end customer, leading firms to rethink the way they communicate their value. For example, when Travelocity.com launched, its managers discovered that the industry jargon gleaned from sources like Sabre -- customarily used by travel agents -- was meaningless to most people, so Travelocity adopted a completely new vocabulary as a result.
- **Sell.** Everywhere and always on, the Web delivers more customers for less money. Last year, for instance, energy giant Enron drove $500 billion in trade online by offering instant bid and ask prices on 1,500 commodity products. The firm transacts 5,000 trades per day on the Net while slashing transaction costs by up to 75% (see the July 2001 Forrester Report "Best Practices For B2B Sales").[2]
- **Collaborate.** Companies are turning to the Web to forge new links with business partners, slashing production costs and cycle times. Manufacturers like Harsco and its suppliers convene online using collaboration tools from vendors like Alibre to quickly identify and resolve emerging product design obstacles (see the March 2001 Forrester Report "New Products: Supplier Collaboration").[3]

Figure 1 The Net Transforms Core Business Processes



Source: Forrester Research, Inc.

People Distinguish Less And Less Between A Firm And Its Web Site

Just as companies are depending more on the Web to run their core business operations, people increasingly rely on the Internet to connect with suppliers and partners, as they:

- **Turn to manufacturer sites directly -- not online intermediaries.** Consumers don't know or care about channel strategies and reseller arrangements -- they just want information, and they go directly to the source to get it. Eighty-four percent of consumers Forrester surveyed expect manufacturer sites like Columbia to have better product and pricing information than online storefronts like REI.com (see the June 2000 Forrester Report "The Manufacturer Growth Spiral").[4]
- **Assess companies based on their Internet presence.** Firms that achieve Web dominance by building great sites earn brand dominance in the process, especially among young consumers. In a recent study of technology and financial habits of 16- to 22-year-olds, Forrester found that more than a quarter of young online consumers would trust Amazon.com and Yahoo! to manage their money (see the September 2000 Forrester Report "The Next Financial Consumer").[5]

- **Give up on companies whose sites disappoint.** Empowered consumers don't tolerate flaky Web sites. Fifty-eight percent of consumers we spoke with said that if a site failed on their first visit, they wouldn't return (see the February 2000 Forrester Report "Is Nonstop Enough?").[6] Two-thirds of people who book travel online report that they'll simply switch to another site if the one they're on doesn't quickly provide value (see the August 2000 Forrester Data Overview "Travel Data Overview").[7]

ANALYSIS

Firms Must Overhaul Site Development To Succeed

Industry by industry, Web sites will become so central to business that the distinction between a firm and its site will evaporate. With Web sites playing such a crucial role, companies will have to treat them as full-scale software engineering efforts, aligning people, architectures, processes, and tools accordingly.

YOU ARE YOUR WEB SITE

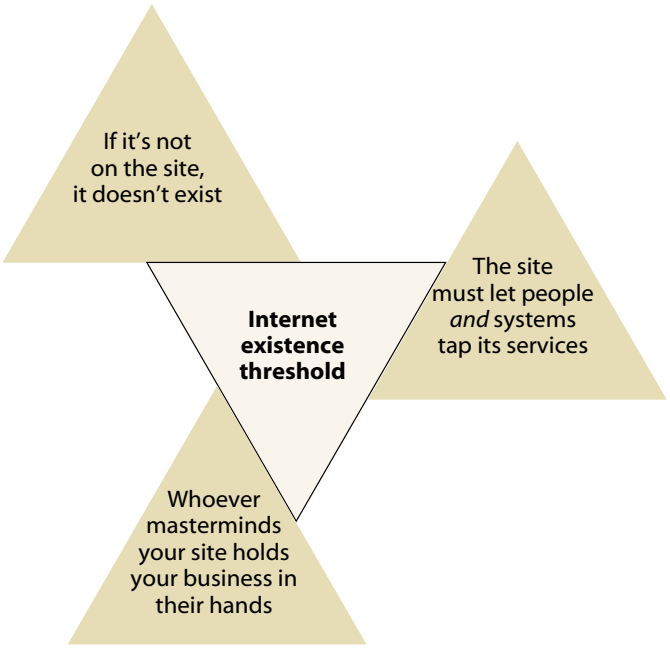
The steep rise in site importance will transform the way companies are perceived. As a growing number of firms in a given industry tap the power of the Net for the day-to-day dealings of their personnel, customers, and systems, that sector approaches what Forrester calls the Internet existence threshold:

> *When people view most companies in an industry as the sum of the data and services they offer on the Net.*

As an industry approaches the critical mass of online innovation required to tip it across this threshold, the whole sector -- including laggards -- becomes subject to three governing principles (see Figure 2):

- **If it's not on the site, it doesn't exist.** Sears stores sell jeans, but Sears.com doesn't. The consequence: To empowered consumers, Sears is no longer in the jeans business. Even if a product is listed, if users don't see it, it might as well not exist. If CircuitCity.com can't point out the speakers that are compatible with a particular stereo, it's as if they were never manufactured.
- **The site must let people *and* systems tap its services.** Companies build sites to help people buy or get service as quickly and easily as possible. But a site also needs effective interfaces for system-to-system integration with other firms -- otherwise it makes some of its most crucial assets unreachable.
- **Whoever masterminds your site holds your business in their hands.** The people who decide what information and services to surface on your site are more than implementers and technicians -- they have your eBusiness strategy under their control.

Figure 2 Principles Of The Internet Existence Threshold



Source: Forrester Research, Inc.

But Companies Struggle To Build Sites Today

Despite their best efforts, most companies fail to deliver the blend of content, interactivity, and transactions users want. Over the past two years, Forrester has evaluated more than 100 sites. Not one has achieved a passing grade.[8] Site development teams struggle because:

- **Packaged applications are harder to implement than they look.** Hoping to buy speed, companies opt for feature-rich software like commerce platforms, content management systems, and customer service apps. Although these products help to jump-start the site, they don't differentiate it from the competition. Firms still need to apply integration and development skills that are scarce and expensive (see the July 2001 Forrester Report "Putting J2EE To Work").[9]
- **Most firms that build custom-coded sites do it poorly.** Companies that decide to go it alone are rarely equipped for the caliber of project that a good custom site represents. Poor planning, lack of standards, and mismatched technical skills leave companies with hastily built sites that they can't evolve to meet changing needs. For example, one company Forrester interviewed had to abandon a J2EE-based commerce site effort because its C++ programmers weren't able to manage the object modeling and N-tier architecture requirements of the new system.

What's Coming Is Beyond Today's Teams' Abilities

Teams that can't keep up today will be brought to their knees in coming years as they try to evolve their sites:

- **From PCs to the X Internet.** PC browser-focused eBusiness road maps have run their course, as companies explore wireless delivery of content. The advent of the X Internet -- intelligent apps that execute code near the user to create rich, engaging conversations via the Net -- will broaden site-building efforts even further to touch smart devices in automobiles and chips embedded in appliances (see the May 2001 Forrester Report "The X Internet").[10]
- **From pair-wise partnering to dynamic collaboration.** The Net already helps companies collaborate online, but firms struggle to go beyond one-off pairings. A new generation of collaborative software will let multiple companies share a single instance of an application and push interfaces throughout entire business communities (see the May 2001 Forrester Report "Apps For Dynamic Collaboration").[11]

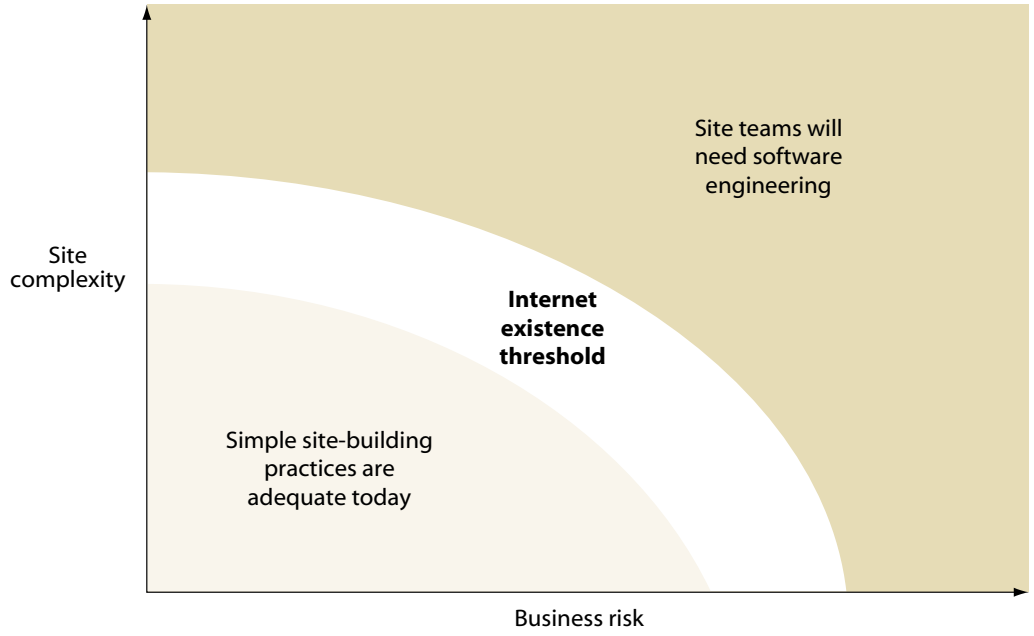
IT'S NOT JUST SITE BUILDING -- IT'S SOFTWARE ENGINEERING

Anyone can slap together a pontoon bridge to get a few vehicles across a river. But a span built to last requires more sophistication -- much more. As industries evolve toward the Internet existence threshold, site builders will have to grow up and acquire that sophistication. Where to find it? In the experience of software engineering leaders who for decades have battled two key challenges now shared by site builders (see Figure 3):

1) **Extreme complexity.** It's not a "Commerce Sites For Dummies" world anymore. Beyond HTML pages, site maps, and Visual Basic, architecting a site now requires mastery of advanced technologies like Enterprise JavaBeans and N-tier architectures, C# and XML ontologies. As sites get more complicated, the teams that build them must ramp up -- not only in their technical skills, but in their processes and tools.

2) **High risk.** As sites take on more key business transactions, they assume higher risk. Just one bug in an investment bank's portfolio management system can shut down the whole works, lose millions in revenue, and drive disgusted customers away in droves. A mere hour of downtime for a company like Intel can cost the firm as much as $275,000 (see the January 1999 Forrester Report "Nonstop eCommerce").[12]

Figure 3 High Complexity And Risk Require Software Engineering Practices



Source: Forrester Research, Inc.

TAKE A SOFTWARE ENGINEERING APPROACH TO YOUR SITE

What site builders have already internalized -- speed, new technologies, instant customer feedback -- will help them prepare for the Internet existence threshold. But to advance toward maturity, firms must tap the knowledge of software pros and research organizations like the Software Engineering Institute (see Figure 4).[13] Successful transformation depends on four categories of critical best practices (see Figure 5):

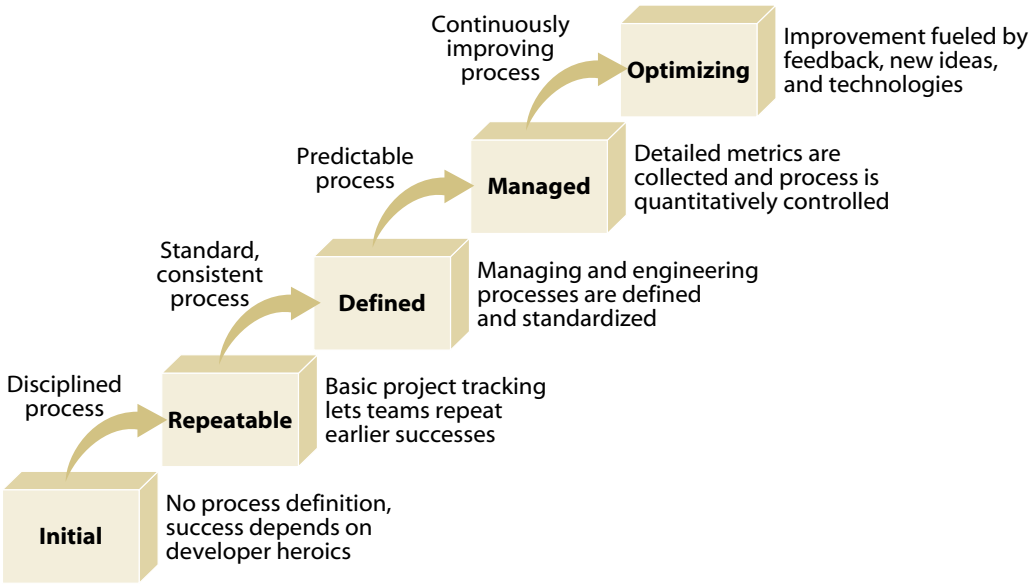
1) **Assemble the right team.** Even skilled, hard-working teams of developers, programmers, and designers will fail without the help of experienced system architects, usability experts, and actual users.

2) **Architect and plan for a data-driven site.** To keep the site stable while updating it frequently, firms need flexible software that they can control with data tweaks.

3) **Give practitioners the tools they need.** With the appropriate tools strategy, firms can lower technology barriers and improve team productivity.

4) **Get serious about process.** By taking a step back to examine and optimize how they design, build, and maintain their sites, firms can reduce project risk and secure application quality.

Figure 4 The Path To Software Development Maturity



Adapted from the Software Engineering Institute's "Capability Maturity Model"

Figure 5 Ingredients Of The Software-Engineered Site

Skills	• Model complex content with information architects • Design sound architecture with object engineers • Help site visitors achieve their goals with usability experts
Architecture	• Create configurable site software • Drive site behavior with frequent data updates
Tools	• Give content authors and coders a free hand to choose editing utilities • Coordinate the work of large teams with shared collaboration software • Capture intellectual capital and best practices with online repositories
Process	• Encourage process awareness and creativity • Identify risks upfront and estimate impact on schedule, budget, and quality • Improve quality with independent testing • Develop quantifiable metrics and analyze team performance

Source: Forrester Research, Inc.

1) Assemble The Right Team

Sophisticated site initiatives with dozens -- as opposed to a handful -- of programmers, designers, and content experts need a new and different class of player to guide and shape application development.

- **Architects, not just builders.** Solid programmers and developers are the lifeblood of any site project -- without them, applications don't get built. But to master the complexities of modeling N-tier infrastructures and content taxonomies, firms should bolster their staffs with object and information architects. Without these skills, teams won't be able to properly create the logical partitions developers need to work safely in parallel or effectively manage the metadata and business rules that drive advanced interactions.
- **Usability experts, not just design gurus.** Creative designers help make the Web better looking and more entertaining. But creating software requires usability experts to build interfaces that help users achieve their goals on a site. One construction hardware manufacturer had designers create a navigation bar that looked like a drafting board. Marketing was ecstatic until usability consultants pointed out that the design meant too few product categories were being shown on the home page, frustrating customers.
- **Real users, not just product managers.** Product managers have a deeper understanding of the features and benefits offered by the sites they supervise than anyone else in the organization. But even the best can't objectively assess the quality of the content and tools their firms provide online. Saving $50,000 upfront by relying on a product manager's recommendations without gathering usability data is penny-wise but pound-foolish. Why? Because the firm will have to redesign the inadequate UI, adding six more weeks and $90,000 of customization to the project.

2) Architect And Plan For A Data-Driven Site

To respond nimbly to changing requirements, firms must be able to tweak the site weekly, daily -- even hourly. But with complex, high-risk sites, releasing code changes so frequently is a recipe for disaster. To reconcile speed and quality, firms must architect the site to be data-driven.

- **Build software flexible enough that it rarely needs updating.** A site software update should be a recurring but rare and carefully orchestrated event. To deploy a new app for collaborating with partners, firms must manage complex dependencies and production processes. Site managers need to plan the deployment and carefully perform impact analysis and testing.

- **Change site behavior with simple, frequent data changes.** Between infrequent software updates, the system must let nontechnical contributors rush presentation content out the door often. At the same time, expert architects must be able to alter process flows and component assemblies on-demand by adjusting the data parameters that drive the site's software -- without touching the code. A pharmaceutical manufacturer must be able to open up a collaboration app to a new distributor, for example, by updating a configuration file -- rather than having to change and recompile code.

3) Give Practitioners The Tools They Need

No tool can ensure a project's success, but by arming teams with the right technologies, firms can encourage creativity, sidestep communications obstacles, and automate tedious manual processes. At minimum, companies should:

- **Give team members tool freedom for authoring code and content.** Persuading programmers and content creators to give up their favorite authoring tools -- like Quark, JBuilder, Visual Studio, or eMacs -- in favor of a corporate standard will only drive up training costs, delay launch dates, and alienate employees. Firms should focus on accommodating creators' preferences with an inclusive tools strategy.
- **Deploy corporatewide standard tools for collaboration.** Large site teams need all their contributors to use the same tools for collaborative aspects of their work, like versioning and configuration. For example, if Fidelity did not have standardized versioning across its numerous application teams, a task as routine as isolating a bug during the build phase could take a developer hours of tedious labor.
- **Offer repositories to capture and store best practices.** Employee turnover -- whether because of layoffs or a hot job market -- can sap team productivity as crucial intellectual property walks out the door. Firms must externalize code libraries, project documentation, and best practices into easily accessible online resources to alleviate the problem. One systems architect we interviewed estimates that the lack of a repository costs his team 8 to 10 hours per week as managers scramble between email and phone to verify status reports and as developers reinvent previous well-honed processes.

4) Get Serious About Process

Firms that rely on code-like-hell heroics to build their sites might as well trade in their business plans for lottery tickets. But many site managers fear that focusing more on process will undermine team creativity and agility. This is a mistake.[14] Companies should:

- **Educate teams about process creativity -- not bureaucratic overhead.** Every team has a process. Some know their process while others are in the dark. Stuck-in-the-mud process haters just follow a process they're blind to, rather than creatively crafting one that works. A site team should first figure out what its current processes are, then turn to improving them -- instituting a process from on high will only rouse team resentment and slam productivity.
- **Communicate the personal benefits of process improvement.** To overcome resistance, firms should also point to the advantages for individuals. When one of our interviewees decided to implement software reuse, managers emphasized that the new processes were designed not only to capture and share engineering best practices, but also to eliminate inefficient code duplication and overtime.
- **Analyze risks upfront and test frequently.** Firms that skip risk assessment for the sake of speed have little chance of delivering applications on time and on budget. Team members can hedge against risks before they derail projects by building risk assessment and priority models. If the team estimates that external legal reviews pose the greatest threat to scheduling, it can proactively resolve the matter by integrating planned reviews into the workflow. Frequent testing -- at both the team level *and* by an objective outsider -- can further safeguard projects from common hazards like feature creep and unstable code.
- **Apply metaprocess: Measure and optimize.** Quantifiable process evaluations are the eyes and ears of advanced application projects. To understand the effectiveness of their process management strategies, firms should collect and analyze relevant performance data so that teams can track progress, identify weaknesses, and model the impact of proposed changes. For example, one interviewee's methodology enables managers to isolate root causes of project failures -- such as weak requirements gathering -- and run cost-benefit analyses involving potential remedies gleaned from other teams' documented experiences.

COMPANIES WITH SOFTWARE-ENGINEERED SITES WILL WIN

Firms that invest the time and effort now to begin applying software engineering practices to their sites will prevail as they:

- **Lead their industries across the Internet existence threshold.** Companies that align the people, architecture, processes, and tools required to build high-performance sites will raise the bar for online interactions in their sector. Early adopters will climb the site design and development learning curve faster and steer critical technologies like marketplace standards and partner collaboration apps.

- **Preserve and extend their business.** With a lead in providing more compelling interactions for users than their competitors, winning firms will create higher switching costs and increase customer loyalty. Their systematic development of flexible architectures and processes will let them explore and colonize business opportunities involving new technologies like the X Internet before the entire industry is forced to just to survive.
- **Control costs through thick and thin.** Sophisticated site teams will use quantifiable metrics and ongoing process analysis to optimize returns on application spending in the face of shifting market pressures. While less organized competitors resort to knee-jerk personnel shuffles and ad hoc technology purchases, winning firms will have the data required to assess the full range of options and make sound strategic decisions.

ACTION

In addition to the four classes of software engineering best practices, companies should also:

Analyze completed projects to gauge need.

If all your site initiatives are already on time, on budget, and high-quality, you'll have a tough time justifying the software engineering approach. But most firms will find ample ammunition for making the case simply by looking back at their last few projects. Site managers should catalog past budget overruns, schedule slips, and site failures candidly to demonstrate the business need for overhauling current site-building practices.

Assume high risk to demonstrate value.

Once senior management has seen the light about trying the software engineering approach, IT leaders will have to pick the project to which they can start applying it. The best way to confirm the value of this new path is to use it to tackle the most difficult, ambitious, and high-risk project on the docket. Nothing today will quite match the complexity that lies beyond the Internet existence threshold. But this is the best way to secure the resources, to silence after-the-fact naysayers, and to build expertise around the skills, architecture, processes, and tools that sites need.

Overcome code cowboy backlash.

Expect a few hotshot developers to whine that process stifles innovation. Don't dismiss the importance of their individual creativity -- channel it into process improvement. After all, processes are like algorithms -- they must be architected, debugged, and maintained. To smooth the transition, execs should enlist their top architect to coach the team, especially the doubters. If you don't have the senior technologist you need for this, hire one, and expect to pay top dollar -- at least $200,000.[15]

Share the wealth -- to grow it.

Having incubated the software engineering approach in one project, firms will have begun building an arsenal of engineering and management best practices. To replicate success, managers should make sure that their full array of tools and documented processes are available to peers. New converts will create sufficient demand to justify ongoing, direct funding for improving Web software development.

WHAT IT MEANS

The SEI will attract business interest -- and funding.

Firms that have been writing the most complex and mission-critical software in the world -- like NASA, Lockheed, and Raytheon -- turn to the Software Engineering Institute (SEI) for guidance on how to optimize development. As industries approach the Internet existence threshold, many more businesses will flock to the SEI to learn. These companies will take over the government's role of funding the organization in exchange for privileged participation in research and first access to the institute's findings.

Rational's market -- and competition -- will mushroom.

Rational Software dominates the market for software development suites. But few firms have applied Rational's best-of-breed tools to Web site building. As the ranks of companies developing highly complex sites swell, Rational's market will balloon. But don't expect the vendor to reap all the rewards. Other independent software vendors like IBM, Microsoft, Borland, and Interwoven will flesh out their own tool sets to get a piece of the action.

Integrators will learn to plug into their clients' methodologies.

Today, service firms like Accenture and Sapient train their consultants in their own methodologies. But companies will want to build in-house process expertise to tightly control newly sophisticated site efforts. In response, the integrators will assign elite methodologists to specialized practices offering high-level process mentoring. The vast majority of their remaining staff will have to learn how to plug in to the client's methodology.

VCs will shun startups that lack software engineering expertise.

Shortsighted firms that stick to business as usual will soon be hamstrung by their Stone Age site development techniques. Whereas the dot-com implosion was triggered by poor business plans, the next wave of high-profile defeats will stem from poorly crafted site software. This will impact VC firms that focus on business plans and give only a cursory glance to technical issues. To protect their investments, they will assign independent software engineering experts to scrutinize the prospect's site-building capabilities in depth.

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RELATED MATERIAL

Companies Interviewed For This Report

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Related Research

July 2001 Forrester Report "Putting J2EE To Work"
May 2001 Forrester Report "Apps For Dynamic Collaboration"
May 2001 Forrester Report "The X Internet"
December 2000 Forrester Report "Scenario Design"
October 1999 Forrester Report "Empowered Consumers"
January 1999 Forrester Report "Nonstop eCommerce"

GRAPEVINE

Pay now, or lose your shirt later.
Software sage Barry Boehm showed that fixing software projects late can cost firms between 50 and 200 times more effort than resolving them during the planning and requirements phases.[16] Is this true of Web development? Forrester's interviewees say it is. As one consultant we spoke with put it, "Software engineers will tell you that Web stuff is simple. But they tend to forget that it's also very new -- and few companies have the skills to do it all on their own. So these companies end up relying completely on systems integrators and vendor services teams to help them. If you added up all the time these companies spend trying to manage the agencies, reworking lousy sites and unreliable infrastructures, I bet you'd find that Boehm's findings are frighteningly conservative."

Now *that's* agility.
Agile methodologies -- the current favorite is called "extreme programming" -- are picking up momentum. Designed to let small-to-midsize teams develop reliable code in the face of rapidly changing requirements, these practices address real-world pain with little overhead. And among the expert users we spoke with for this report, we found an even higher order of agility. "Sure, we have guys doing extreme programming," said one interviewee. But his programmers have to jump between methodologies with agility, too. "Those same guys sometimes have to switch over to projects that require the waterfall approach. We manage methodologies just like reusable software components. We plug them in on a case-by-case basis."

Anyone for 3-D chess?
Cerebral efforts like content hierarchies, taxonomies, and thesauruses already leave firms struggling. And the pressure to keep up will only increase as companies approach the Internet existence threshold. So where can you find the information architects you'll need? A VP of eBusiness at Fidelity shares her recommendation, "Look for experienced database administrators who love to play 3-D chess." Forrester's take is that the job description should read: "Candidates must be addicted to deep thought."

ENDNOTES

1 Forrester has evaluated the user experience on more than 100 B2B and B2C sites. These reviews reveal that most sites fail to support even basic user goals, such as finding and comparing products and completing transactions.

2 Enron was able to achieve such high savings by moving 75% of its trades from the phone to the Net.

3 To gain the most from their partners' engineering expertise, firms must master distributed development environments. Leading firms will build these highly interactive connections by following three principles: 1) cultivating collaboration-compatible partners; 2) developing fast-turn processes; and 3) fostering partner-friendly practices.

4 Forrester surveyed 10,000 American and Canadian members of Greenfield Online's panel of online consumers. Not only do Web shoppers expect manufacturer sites to feature the best information and prices, most online buyers would turn to a manufacturer's site first for post-sales assistance.

5 Forrester surveyed more than 100,000 consumers between the ages of 16 and 22. Results showed that this population has already developed sophisticated technology habits and uses the Web instinctively for research, shopping, and entertainment.

6 Forrester surveyed 4,000 online consumers to gauge their attitudes toward site downtime. The results showed that for the majority of both first-time and repeat visitors, site failure was viewed as a showstopper.

7 This survey included more than 9,000 North American consumers who travel for leisure at least once a year. Of these, 2,718 had booked travel arrangements online.

8 Forrester's Web site review methodology is a heuristic evaluation based on Forrester's research informed by third-party usability and human factors studies. The review answers five critical questions: 1) Does the site offer valuable content and function; 2) can target users easily find the site; 3) can users quickly find what they're looking for; 4) does the site communicate effectively; and 5) is the site reliable and fast? The evaluation comprises 25 tests, each receiving a score ranging from -2 (catastrophic failure) to 2 (exemplary pass). Fifty is the highest possible score; 25 is considered a passing grade.

9 Forrester recently interviewed 50 managers responsible for the technology strategy for their firms that were committed to the Java 2 Enterprise Edition platform, primarily for the cross-platform portability offered by the standard. However, our respondents admitted that implementing Java-based best-of-breed applications was more challenging than anticipated. They cited a lack of Java experience, J2EE specification changes, and a steep learning curve as their primary impediments to on-schedule and on-budget implementations.

10 To date, the Web's primary function has been to connect people to computers through browsers. But two new waves of innovation will drive the next round of innovation: an executable Net that enriches online interactions, and an extended Net that connects users to the real world.

11 Forrester believes that for firms to effectively expand the scope of supplier, channel, and customer relationships, they must embrace dynamic collaboration, a network-centric partnering strategy. This will require a new class of business apps that Forrester calls XRM -- extended relationship management.

12 For large Internet retailers that handle $1 million of transactions per day, lost revenues for 1 hour of downtime will exceed $8,000 per hour, assuming 20% of transactions were lost during downtime.

13 For more information on the Software Engineering Institute's research, go to www.sei.cmu.edu.

14 Research that shows the cost savings and better quality firms get from careful process definition and management is abundant. Useful references include the Software Engineering Institute's research site at www.sei.cmu.edu and Steve C. McConnell's "Rapid Development: Taming Wild Software Schedules," Microsoft Press, July 1996, which offers a rich bibliography.

15 The average salary for an experienced architect is $150,000. Assuming 40% overhead for benefits, facilities, etc., total compensation will exceed $200,000.

16 Source: Boehm, Barry W., and Phillip N. Papaccio, "Understanding and Controlling Software Costs," IEEE Transactions of Software Engineering, Vol. 14, No. 10.