About Business and Product Development

Skip Walter
CEO, Attenex Corporation
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Introduction

The transformation of business is continuing to accelerate as we begin a new century. We were barely understanding the Industrial Age when the widespread usage of computers in business moved us into the Information Age. The rapid doubling of processor power, storage capacity and network bandwidth coupled with innovations like the Internet and the World Wide Web not only resulted in a Global Interconnected Economy but also the ability of small firms to participate on an equal footing with the very large firms. Economy of Scale is operating simultaneously with Economy of Small. The myriad of change forces is leading us rapidly to the Knowledge Age where the fundamental challenge is not to create and access information, but rather to make sense of the enormous amount of information available AND act on that sense making before other competitors do.

Yet, the action that needs to occur must provide economic value and integrate with the values of the human beings that are at the same time employees, customers, suppliers and consumers of the value. As Amazon.com has shown, the consumers are generating new "products" in the act of consuming.

To develop new products, services and businesses in this new age two new sources of innovation are emerging:

- Developing knowledge about the activities of daily living
- Generating stories to understand and act on our understanding of human activities.

To be effective in building on these new sources of innovation, new tools are needed to capture, analyze, and use knowledge. Since knowledge is a human activity, these tools must be a natural part of the environments that humans exist in.

Purpose of Business

As businesses grow and become more complex it is easy to forget why the business was created and what it exists for. The following generic business goals are culled from a wide range of business literature:

- Get and keep a profitable customer – Peter Drucker
- Create a growth partner – Mack Hanan
- Make money – Eli Goldratt
- Create Intellectual Capital – Tom Stewart
- Create economic value while supporting user values – John Heskett
- Get and keep a profitable growth partner while optimizing risk and reward – Skip Walter

Drucker's definition gets at the heart of what the talent in each corporation needs to focus on. The first priority is to get a profitable customer. The second priority is keeping a profitable customer. It is very easy for employees in most corporations to spend most of their time dealing with internal *urgent* issues, and forget the *important* issues of getting and keeping profitable customers. A large part of the challenge is bringing the customer into each internal meeting. How does an organization keep its customers context real to every employee? The sales organization is most often chartered with being the keeper of the customer, but the customer relationships must be just as real to product development and manufacturing as it is to the sales force. A fundamental role for knowledge tools are helping an organization stay as focused on its customers as it is on the spread sheets which keep track of project plans, budgets and actuals.

Digital Business Design

Slywotzky in his book *How Digital is Your Business* defines **digital business** as "one in which strategic options have been transformed – and significantly broadened – by the use of digital technologies. . . A digital business uses digital technologies to devise entirely new value propositions for customers and for the company's own talent; to invent new methods of creating and capturing profits; and, ultimately, to pursue the true goal of strategic differentiation: *uniqueness.*"

Digital Business Design leads to 10X productivity improvements. Slywotzky states:

> "A 10X productivity improvement is more than an incremental growth in efficiency. It is a fundamental change in the way companies do business. It liberates resources to serve customers, leverage talent, grow the business, and help toward achieving strategic leadership.
>
> "Productivity is measured as a ratio of *value created* to *resources used*.
>
> "Why are 10X productivity improvements possible when Digital Business Design is employed? There are several reasons:
>
> 1. Most of the time, in most of the economy, atoms are used when bits would bring better results. Bits are cheaper. When bits are used instead of atoms, a lot of big costs go away.
> 2. Digital options make it possible to collect very valuable types of bits (such as information on what customers really want) *before* committing atoms. The result is that atoms (e.g., inventory or unused factory capacity) are not wasted. Huge costs vanish quickly when bits precede atoms.
> 3. Digital innovators have developed an entire array of bit engines (listed in Appendix A) to collect, process, and distribute bits with extraordinary efficiency. The goal is not just to focus on bits, but to have the tools to manipulate and distribute those bits in smart ways. When a collection of powerful bit engines is exquisitely tuned to the needs of customer, value can be generated at an extraordinary rate.
>
> "That's why it is extraordinarily important to be constantly asking: What bit engines have we put to work in our company? How can they be improved? What new bit engines will we need to address tomorrow's business issues?"

The Japanese did an excellent job in the 70s and 80s achieving high productivity gains in the manufacturing environment as epitomized by the Toyota Production Method. A key part of this method involved making everything on the shop floor very visible, whether it was the flow of materials, or the key statistics about production. The next step in Digital Business Design is our ability to visualize the flow of information and knowledge within complex distributed global businesses such that we can detect patterns, analyze those patterns, and act on the patterns.

Reverse Product Design

In *Digital Business Design*, Adrian Slowotzky indicates that the Choiceboard technology – the ability for the customer to configure a product before purchasing online in real time – holds the promise of reversing the traditional value chain. An example of the Choiceboard technology can be found at websites like Dell Computer where you can configure your own PC. In the typical non-digital business the value flows from:

> Assets > Inputs > Offering > Channels > Customer

The author points out that all along the value chain information and value leak out and the product/service producers are left to guess at what customers want. In a digital business the value chain is reversed:

> Customer > Channels > Offering > Inputs > Assets

The process begins with the key source of information – the customer. The digital business sells first, then produces. Companies like Dell and General Electric are particularly good at this model of digital business design.

With a human centered focus, it is now possible to reverse the steps of traditional product design to complement what is possible with a digital business design. In traditional product design, researchers and engineers start with a technology insight and *innovate* forward. They pass their finished product over to marketing where a *story* is created about how the new product will be "better, faster, and cheaper" than the old way for some hopefully large customer demographic segment. Finally, the sales people look for a set of customers who might be engaged in *activities* that will lend themselves to the new product. This process flows like:

Innovation > Story > Activity

In the information systems business the result of this sequence is that most products are not successful until the third version when the fit of technology to activity is finally realized.

With Reverse Product Design, development starts with the rapid observation and assessment of customer activities and needs. The reverse flow looks like:

Activity > Story > Innovation

From the direct observation of human activities, filtered through the lenses of physical, cognitive, social and cultural human factors, insights are gained as to the real customer needs. These needs are processed through the human centered case story method of:

Observation > Contention > Value > Solution

These vignettes are then gathered into a powerful story or scenario of use that guides the product developers to a powerful system of innovations.

Perhaps, the most accessible example of this process in action is the constant stream of innovations released through the Amazon.com Books web site. From the detailed observations of users trying to buy books that Amazon used to overcome the deficiencies of the physical bookstore to the stream of innovations related to trusted recommendations from a myriad of user participation, the site continually reinvents itself by first paying attention to user activities. The combination of Reverse Product Design with a powerful Digital Business Design leads Amazon.com in providing value to its loyal customers.

At every step of this new product design process, innovations are grounded in the observed activities of real users so that there is little guesswork needed as to what to create for whom.

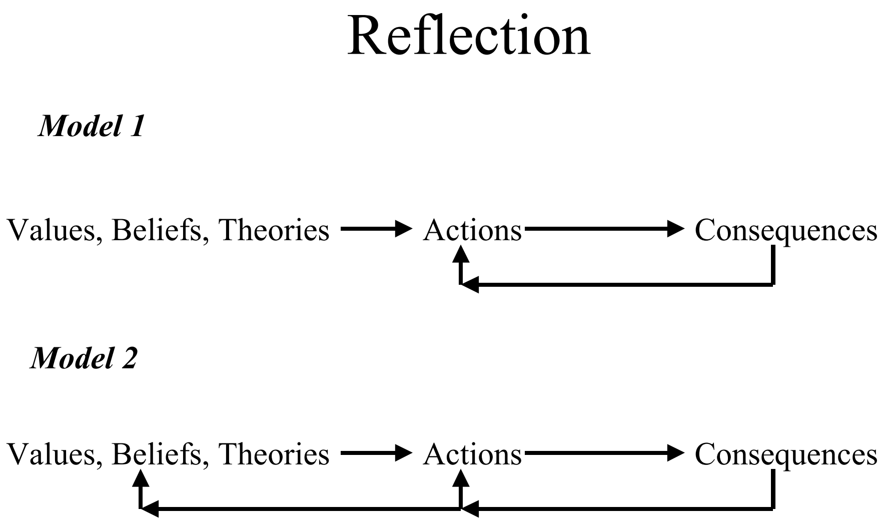
In practice, there are two types of stories that emerge in the product design and development process – stories for understanding and stories for persuasion. Once the activities are analyzed, a short story that captures the essence of the observations helps with the understanding of the problem and potential solutions on the part of the development team. The understanding story is a precursor to the innovation. Once the innovation is designed, it is then necessary to persuade someone to either fund the development of the project, product or service or to persuade a customer to buy the product. A story of persuasion must go beyond understanding and create a context for the "customer" to make a decision and move forward. Descriptions of both kinds of stories can be found in Steve Denning's *The Springboard: How Storytelling Ignites Action in Knowledge-Era Organizations* or on his website: http://www.stevedenning.com. Thus, the Reverse Product Design Process looks like:

Activity > Story for Understanding > Innovation > Story for Persuasion

By combining Digital Business Design and Reverse Product Design, a product development team can:

- Move from getting information in lag time to getting it in real time;
- Move from guessing what customers want to knowing their needs;
- Move from burdening talent with low-value work to gaining high talent leverage.

An important part of Reverse Product Design is adding in the component of reflection at all levels of the model. Argyris and Schon spent most of their academic careers understanding the effects of what they called Model 1 and Model 2 behavior. The following diagram illustrates the differences between the two:



Abstracting from all the best research they could find on behavior, the authors described what they called Model 1 behavior. People or organizations are driven by Values, Beliefs and Theories which lead to actions in the context of those Values. The actions then have consequences which feed back into further actions. Most people and organizations stop there and operate on this simple feedback loop. This kind of model is useful for routine interactions but is very poor at learning or adapting to new opportunities which arise.

Model 2 behavior is characterized by adding another feedback loop of the consequences cycling to the Values, Beliefs and Theories level. People and organizations that utilize this model are quite adaptive to their environments. Now that we have unprecedented levels of technology and connectedness in the global economy, it is important that we start wiring in Model 2 behavior into our products and services.

But First a Story – The Development and Selling of ALL-IN-1

In the early 1980s I was a part of Digital Equipment Corporation's (DEC) Software Services group in Charlotte, NC. The unit I was a part of consisted of 10 software specialists and a manager. Due to the nature of our work located at customer sites, we rarely saw each other. Therefore, we always enjoyed getting together for our monthly unit meetings. But we were always disappointed when each meeting turned into yet another exercise in administrivia. What should have been a great forum for sharing our learnings about our products and customer needs over the last month, shared problem solving, and new

Activity

service creation brainstorming, always turned into going over the guidelines for filling out the latest paper form that had come down from the bureaucrats on high.

My officemate, John Churin, and I got so fed up after one meeting that we decided to design a solution to the administrivia problem. Anything that would ease our pain would be greatly appreciated by others as well. We determined that what we needed was a way to move the form filling from paper to networked computer systems along with a rich electronic mail and help system that would have more explanation about the forms than you could ever want. We figured that if we could move the routine communications to email, our manager would know that we'd received and read the material and then we could use face to face time for learning and really creative stuff. As luck would have it, John and I both had a couple of free days between customer engagements.

Understanding

We spent the next two days in design mode rapidly iterating between the needs our organization had and the capabilities that existed between the two of us (real time processing, electronic forms design, database management, transaction processing, and networking). We also looked at the expense side of what it was costing the company to do things manually with a horrendous amount of expensive multi-part paper forms. We quickly estimated that it was costing $200 per week per specialist just to do the basic time reporting and expense reporting to support our revenue stream. This included the paper forms, data entry personnel, maintenance programmers, and computer systems. These costs included none of the management and facilities costs that a robust cost analysis would include. We were excited just to find that are own unit had $100,000 of expenses associated with time reporting during the year.

While the expense side of the equation was one part of the value equation, unfortunately that expense was in another part of the organization so it would not suffice as a good offer to our management. The only offer that would really fly would be revenue, either in the form of systems integration projects or large amounts of hardware sales. We were quite pleased with our analysis of the needs and our initial design which would be based on electronic mail. We realized that if you looked at email as more than just pushing text around, particularly adding a robust electronic forms capability, you could solve a wide range of our administrative needs.

On the building it side, we examined DEC's product pipeline which consisted of large timesharing systems (DECsystem 10s and 20s), small real time computers (PDP-11s), and the recently introduced VAX systems. While there was only one model of the VAX at the time (VAX-11/780) it was clear that this was the system of the future. More engineering dollars were going into that hardware and software platform than the other two combined. We knew that there would be lower end models and higher end models so that configurations of very small and very large networks would be possible in the next two years. While there wasn't a lot of application software on the VAX, most of the PDP-11 software already ran on VAX systems.

As we emerged from looking at our own needs, we became aware that what we were really working on was what the marketplace started calling office automation. The components of office automation were: word processing, calendaring, electronic mail, spread sheets, electronic forms, and data management. These systems required both local and wide area networking. Early competitors in the space were Wang, Datapoint, and IBM with a mainframe adaptation (PROFS). At the time DEC was primarily known for its capabilities in the scientific/technical, medical and manufacturing environments. But the company realized that its next level of growth would come from the commercial markets. Office automation provided a potentially nice entry point because you didn't have to go up against IBM's mainframe database processing stronghold. What was common with all the competitive products was that they were had fixed functionality – what you saw was what you got. But our own needs and a cursory look at other needs showed that no two office automation problems looked alike. You had to take a customizing and component approach in order to be successful. At the same time since the hardware was relatively inexpensive, you couldn't require a large custom project to get the system going.

We spent some time discussing what our intent should be. Did we want to just solve our unit's administrative problems or did we want to go after something bigger? If we were interested in building a product, should we form a new company, stay at Digital, or try and transfer up to the central engineering group responsible for building application products? As we worked through these issues John and I realized that first and foremost we wanted to build a successful product. We each had built what we thought were products before coming to DEC, but they hadn't succeeded because we only looked at the coding part of the product effort. We knew that to be successful, you had to think of a whole product and all the functions required to create the product, get it to market and sold, get it installed, and have it be supported. We knew that the likelihood of us doing it on our own was slim, but if we could use DEC's resources then we had a chance of being very successful. So we decided that our intent would be to build an office automation product within DEC, preferably within the systems integration group so that we didn't have to relocate.

Reality set in after the two days when John and I were pulled back to our customer commitments and our support of the sales representatives. Yet, there was a subtle shift for both of us. Where before any customer project was as good, bad or indifferent as the next; now we were actively looking for customers which met our intent – building an office automation product.

The design of our product changed our worldview. Now almost every customer or sales situation we touched seemed like an office automation opportunity. We talked about our ideas to anyone who would listen. While none of the sales reps or customers looked at us as a first choice, several were now looking at us as a last resort rather than giving up on a piece of business or project.

Our first break came at RJ Reynolds Industries. They were looking for a way to replace their aging papertape Telex systems that were cumbersome to use and expensive to operate. As RJR was expanding the number of office and manufacturing sites, the speed with which they could move information was becoming increasingly important. We did a half day analysis and realized that our preliminary design would nicely match their needs since this was primarily an electronic mail application. Then the client gave us a rude awakening. They liked our ideas but IBM had agreed to give them a systems analyst and a corporate telecommunications consultant for a month to analyze their needs. We knew we could not match that offer but got the customer to agree to give us a chance to bid on the results of the IBM system analysis.

A month later we got called back in and given a copy of the IBM analysis. My spirits soared. All the IBM folks had done was draw a few illustrations and copy some brochures. I knew that we could do better in a few short hours. We recently installed one of our new word processors so we could turn out nice looking output in short order. I asked if we could come back tomorrow afternoon with the analysis and proposal that we had been working on for the last month (a small white lie, but the work that we would do that evening would look like several months work compared to the IBM analysis). The client agreed and we hurried back from Winston-Salem to Charlotte, NC. I phoned ahead to John to get him to start cleaning up some of the architecture diagrams that we created.

Innovation

Drawing on our previous design work we created a 20 page analysis with several diagrams and a three page consulting contract to design their system for real, for a mere $50,000. We took the proposal back the next afternoon and the customer was most impressed. They never expected DEC to upstage IBM, and to do a free analysis in the process. The customer agreed to our proposal and the next day sent us the approved purchase order. This was a first for our region, getting a paid project just to do a specification. We were off and running.

Persuasion

While John and I were the primary consultants on the project, having real customer dollars allowed us to tap into expertise around the country that we didn't have. Also, under the guise of project reviews we received great guidance and criticism of the completeness of our designs. We went back with well over a 100 page specification and a twenty page proposal for the next phase of the project. Once again, the customer was most impressed, but then gave us the bad news that RJR was reorganizing and that this project was cancelled. While disappointed, we now had a very complete specification that we'd been paid for. We had received real customer dollars without requiring our own company to invest.

Activity

In parallel, we worked on consulting projects to Milliken in Spartanburg, SC, a very large textile manufacturer. DEC was the major supplier for their plant industrial automation. They now realized that as they automated processes like the creation of fibers and the making of carpets that their automated processes had an incredible amount of paperwork that followed the products around. They were starting to do the prototyping for a plant office automation system and were working with Datapoint on the prototype. As they showed us what they liked about the Datapoint offering, we realized that with our specification and a little bit of rapid prototyping we could have a much better system in short order.

While Milliken was not willing to pay for our time to develop the demonstration, the District Sales Manager realized that he could sell them triple the amount of hardware systems if they bought our approach to office automation. Further, he could keep an unwelcome competitor out of the environment. So he funded our next activity that was to take our specification and create a demonstration. We estimated that we could do that in three short weeks.

Understanding

The other requirement that the customer had that no other competitor could deal with is the necessity for their large engineering staff to be able to add to the base capabilities of the system and to customize the capabilities. So an important part of our demonstration was illustrating the rate at which new functionality could be added. Therefore, a part of our offer and needs analysis was to have meetings with the client every three days to demonstrate progress and gain critical feedback on our approach and understanding of their problem. In three short weeks we had a demonstration of our office automation system and the customer was quite impressed. They were ready to buy. However, we still had some important lessons to learn about marketing and offers.

Innovation

In parallel with our demonstration project, the senior management team of Milliken was meeting with the top management of Digital for their quarterly meeting. The Milliken upper management knew that the plant office automation team selected Digital as the top vendor, but none of us had thought to brief top DEC management on our capabilities. So when Roger Milliken, CEO, asked Win Hindle, DEC Executive VP, about DEC's office automation products and could they see a demonstration of the products, Hindle replied that we had no products in that area. Further, he told them that he expected that it would be two years before we would have any products in that area and that there were no products to demonstrate. Talk about snatching defeat from the jaws of victory. No amount of lobbying on our part could overcome the authority of our own top management. While we didn't get the office automation project, we were selected as the hardware vendor of choice and the customer elected to develop their own proprietary system.

Persuasion

We now had a demo of our capabilities and we took every opportunity to demonstrate that DEC and the VAX computer systems were the best platform for office automation. In short order, the DuPont sales team from Wilmington, DE, contacted us to propose our system to DuPont. The DuPont productivity team wanted to do a demonstration project of what OA technology could mean for a Fortune 50 company. We analyzed their pilot needs, recast our specification and demo, and made a proposal for a project to transform the demo into a scaleable product for $100,000. The sales team liked it and we started the multi-layer sales process required in old line hierarchical companies. Finally, we made it to the top of the chain to present to Ray Cairns, DuPont Information Systems VP.

Activity

As part of the presales process, the sales rep and I went to lunch with Ray and we talked quite a bit about the history of our efforts and the capabilities of our ideas. He was an active questioner and probed far and wide about where we'd been and where we expected to go. He knew that we were developing this capability in conjunction with our customers and then would move it into central engineering. Our unique offer to them which they liked is that for the cost of the project, they would have an unlimited use license for the software within DuPont. Then, if they liked the tools, they would have to buy licenses for the next version of the product. This offer allowed them to amortize the cost of the project over quite a few hardware systems which made the costs appealing to their financial analysts. We appeared to be giving up quite a bit of future software revenue, but we were betting that we would have a new version of the product well before they were ready to deploy the software across a lot of systems. This offer was win-win for both parties.

Understanding

I relaxed and felt quite good that the decision maker would decide in our favor. Little did I know what I was in for in the formal agenda with Ray and all twelve of his direct reports. We now had nice 35mm slides to present our story and product ideas. At the end of the presentation, Ray asked several warm up questions and then hit me with the question that stood me on my heels: "how has this product helped

Innovation

impact Digital's bottom line, either positively or negatively?" Now, he knew from our lunch time conversation that the product didn't even exist, so that it couldn't have much of an impact. I knew he wasn't a stupid man, so what was going on here. In a flash, it came to me, that he wasn't really asking about DEC, he was using me as a convenient foil to get critical education across to his management team. I mumbled a few things about our unique approach to developing application software in conjunction with a customer. Then, I turned the question around to the team and asked them how they thought this product might affect DEC's bottom line. It is much easier to speculate about the cause and effect in someone else's organization when you are at a level of optimal ignorance than to do speculation about your own organization. What ensued was a great one hour conversation about the implications of such a product and technology on a large system like a Fortune 50 company.

After the meeting, we were awarded the order and we now had the funding to take the ideas of our specification and our demonstration into a full blown product. The learning for me in this meeting was quite revealing. Our way of approaching the selling of our ideas to individual contributors and middle managers was the more traditional features and benefits. What Ray made clear is that at a certain level of management, the rules change and the offer must move from features and benefits to second order implications, in this case, what effect would it have on both the revenue side of DuPont and the expense side of DuPont. In order to answer that kind of question you have to move from the product under study to the system under study. In particular you have to look at the interactions of an entity with its environment. In later years, I would come across the third order thinking which is how will this product or service change a company's valuation either positively or negatively.

Gordon Bell, DEC Senior VP of Engineering at the time, noticed a heuristic that no product ever made it out the door by requiring more than three new insights or inventions. During the specification and rapid prototyping stage we hit on our two core insights – that email was the core engine and that emailing should have multiple data types, not just text. Yet there was still something missing as we moved into the implementation phase. We couldn't figure out how to implement our ideas without having to rewrite parts of the operating system, which neither of us wanted any part of. The whole excitement of the VAX architecture was that we could build as complete an application as we were looking at without any systems work. One day a happy accident occurred when all of a sudden the contents of my VT100 screen changed. I'd been editing a file and all of a sudden a data entry form appeared on my screen. It was eerily like Alexander Bell yelling "Watson come here!" through his new invention – the phone. The joy was realizing the power of the messaging architecture already built into the VMS Operating System. While a bit esoteric, what it meant is that our system could be built on messaging from top to bottom and be fully recursive. With a few architectural rules, the system could generate a wide range of custom applications.

Activity

We expanded our team by three and developed the code, installation procedures, documentation and training for the pilot site at DuPont. During the process, I learned several invaluable lessons about engineers and product quality. Any problem an engineer experiences directly gets fixed immediately. The difficulty is that most critical problems in an application are rarely used by a software engineer. So they never see the problems and the problems never get fixed. Not only did I have to see the product opportunity at DuPont, and develop it, but I was also the person that had to go and install the software and train the users. The things that worked fine on our computer didn't work fine on theirs. No amount of asking, cajoling, screaming or yelling could get the engineers to fix the problems. Unfortunately, the problems were in an area of the code that I was unfamiliar with. Through shear desperation, I had John make the next trip to Wilmington, DE, to install the latest update. Imagine how I had to keep from laughing (or crying) when he came back after the trip and asked me why I hadn't told him about all the problems. Magically, they were all fixed within a couple of hours. Direct observation of problems or activities is worth far more than an abstract narrative.

Understanding

Innovation

Shuttling back and forth got old pretty quick so we created the next product support innovation – direct connection of our development network with their pilot prototype network. The connection improved the reporting of problems, the suggestion of improvements, and the quick delivery of new software and documentation. The beauty was that we were able to charge more for this service as it enhanced both companies capabilities.

Well, we were really moving now. We had a product (in today's terms it would be a beta of a product), we had a paying customer, and we had a development staff. Life couldn't be better. However, our intent was to build a successful product business. John and I had gotten this far before. How did we get farther? It was time to put a distribution channel in place and find a set of complementors. Little did we know we'd find them in the same place. About this time, the Corporate Software Services Organization made a proposal to the corporation that we could grow from a $60 million business to a $1 billion business in less than five years. One of the core assumptions was that there were already systems integration projects that we retained the intellectual property rights to and therefore could turn them into application products. Our product effort became the test case for this idea.

Persuasion

The first thing we needed to do was to train some of our best consultants on the product. The training was scheduled, but little time was allocated to prepare materials for the class. On the Sunday night before starting the training, I was looking at only a half days worth of material for a five day class. I had no idea as I started Monday morning how I was going to make it through the week. Through desperate acts, brilliance emerges. During that first morning's presentation, I kept getting questions about whether the product had this feature or that feature. Could the product be used to solve this customer need or that customer need? As I started to answer no to each of these and feel quilty that we didn't have those features or capabilities in it, I realized that each of the things they were asking for was easy to produce with the core functionality that we did have in the product. So now the answer to each question became "No, we don't have that capability yet, but you now have your homework assignment for the afternoon."

Activity

Understanding

As they broke for the afternoon laboratory, we had more than enough enhancement requests to go around to each of the "students." The students were all excited because they were getting to work on something that they cared about and in most cases they knew exactly which customers of theirs would be interested in that capability. Some of the features required the core ALL-IN-1 engine to change. So John would work with those students to figure out a good operational split between what the application engine would do and what the ALL-IN-1 applet should do and define what the interface or syntax between them should be. With 20 students and a week's worth of exercises that all arose from their questions, the product grew by leaps and bounds before our eyes. This was our first experience with the power of an open architecture and a large group of collaborators.

Innovation

The second order of brilliance was letting the students know that we would include all of their functionality in the next product distribution tape and we would give attribution to each of them for the parts that they contributed. With that simple context switch, the afternoon exercises took on new significance. Knowing that their work would be distributed, they didn't just do something that demonstrated that the function could be done. They switched into engineering mode and thought through the general case, implemented the functionality, tested it under a variety of customizations, and documented the features.

Persuasion

The next week we were teaching a group of 20 DuPont systems analysts who would be moving ALL-IN-1 beyond the pilot environment. We taught the class in the same format. In the morning, we lectured and explained the different capabilities of the system. As questions arose about whether the system could do this or that kind of application, those questions became the person's laboratory assignment for the afternoon. Very quickly several different departmental systems emerged – Human Resources, Plant Office Automation, Order Processing, Strategic Planning – and we made the same offer to them. We would include their efforts on the distribution tape internal to DuPont and external to DuPont if the feature were generic and give attribution to the person who created it. Unknowingly what we did was create 20 disciples who couldn't wait for the next Monday morning to demonstrate "their" creation to their peers or their internal clients.

Within three years, largely through the efforts of the 50 DuPont analysts who went through these courses, DEC installed $450 million of ALL-IN-1 systems in Wilmington County Delaware. Largely through the efforts of the first 100 DEC software specialists we trained in this manner and the sales representatives they converted, ALL-IN-1 systems became a $1 billion a year business for DEC for 18 years in succession. I was filled with awe and much trepidation (since the system is now quite dated being in maintenance mode for the last 14 years) when I visited a consulting client in Minneapolis, MN, in 1999 and found that they were still using ALL-IN-1 as their primary corporate electronic mail system.

Activity

The last of the core lessons we learned was the power of tailoring far beyond what we'd anticipated. I was asked to speak at the DEC European Software Services Meeting in Majorca in 1980 to describe what we were doing in the U.S. with Office Automation. I gave an overview of the product and the kinds of customer solutions we were generating AND the revenue we were creating. This got their attention as they were going through a revenue shortfall at the time. The immediate set of questions I got were around translating the product into each European language. It was an "oh, of course" type of question for me, but was unheard of in products of the early 1980s where the user interfaces were hardwired into the code. Sure, it should be no problem, if you want to change the interfaces, just change the forms using the standard VMS tools. All of the messages that we present on the screen are forms; just go ahead and change them. And we've adhered to all the VMS coding conventions so all the National Replacement character sets should work.

Understanding

It was like I ignited a bomb. Everyone came out of their seats and started throwing a hundred questions at me. Seizing the moment, David Stone, DEC's European Software Services VP, called a half hour break so that the attendees could get their questions answered informally or so that country groups could caucus on what this meant for their business. He then called the group back to order and gave them a challenge. Based on what they heard did they think they could make up any part of the $100 million revenue bookings shortfall Europe was projected to have for the year.

Innovation

He first asked each country group to gather together and put together a straw plan for using the ALL-IN-1 product to address the revenue shortfall. In the process, the groups were to identify any issues, questions or concerns that they had and they could pose those to me in their group presentations. Each group went off and spent ninety minutes discussing the opportunity. Then each of the ten country groups made their reports and identified their issues. As each group reported, I went through my large library of 35mm slides to find the slides that addressed each issue or question. I got David to stall for a few minutes after the last group so I could arrange the slides in some semblance of presentation order.

I then stood up and gave a "custom" presentation addressing all of their issues. The management team was really excited now. Until that moment I had not realized the power of a "custom" presentation to go along with our easily tailorable product. The group correctly sensed that this product was quite real and most important could be readily adapted for each country's unique business needs. Up until now, Europe had to take a one size fits all set of products that were English language and US culture centric. Long delays would occur to get even minimal localization done for each country. Now they'd found a product that could be introduced Europe wide in each natural language at the same time as the US introduction.

Persuasion

David, then asked the country groups to go back with this new information and come back with a "committed" forecast of how much of the revenue shortfall they could make up with this product and what they needed to do to make this program happen in Europe. The groups quickly formed and in 15 minutes came back with their commitments. The commitments totaled $120 million. David scaled the numbers back to total $100 million to mitigate the exuberance factor. I was blown away and now fearful for my life. I wondered what would happen if they all woke up and decided they'd been railroaded into a commitment in the bliss of the moment. I figured they'd shoot the messenger – me.

The group then started to work on the marketing program to make their commitments happen. Using the natural creative competitiveness of the countries he broke them into their country units to develop logos for the $100 million in 100 days campaign. Then he organized cross-functional and multi-country groups to develop:

- the 20 page newsletter that would go out to all sales and software personnel in Europe,
- the training program for sales and software personnel,
- the localization teams to translate ALL-IN-1 into each country's natural language,
- other applications that could be combined with ALL-IN-1 in each geography.

By the end of the four day meeting, the Europeans now had a major new product that was their own, a marketing program that they could roll out, and a new found respect by their sales peers. I was asked to stay over another week to train the software consultants who would be doing the translations. My ask of them was that each country supply a software consultant to come work with our development team for a month at a time to make the engineers aware of multi-cultural needs. Within the month they had ALL-IN-1 translated into 10 different languages and cultures. Within the 100 days they'd exceeded their goals and in fact did $120 million of additional business.

In David Stone, I saw and appreciated a master at management leadership and motivation. For the next year I spent as much time in Europe as I could to learn about changing the behavior of a large organization. I asked David how he knew that my presentation would set off so much energy. He laughed and said that he had no idea that it would. "What I do is schedule an agenda that has as much informational diversity as possible running the gamut from product information, service information, corporate strategy, engineering strategy, organizational behavior change stuff, and management education. I never know which of these will cause an energy hit with these 150 managers, but I'm confident that one of them will. When that energy resonation occurs between the audience and the speaker then I go into action. I know how to move energy, that's what I'm really good at."

We succeeded so well in those first several months at promoting and selling our version of Office Automation that the company now had a dilemma. Taking a portfolio approach, DEC had six different central engineering groups working on office automation projects. The corporate powers that be met to decide which group would win and be anointed as THE office automation product. There were pluses and minuses to each product and the capabilities that each would add to the VMS product line and the push into the commercial market. But in the end, there was no clear winner at the features and benefits level. However, only one of the products had generated any revenue for the company – ALL-IN-1. That made the decision quite easy in the end. The implications of the decision were not so easy for me. I was asked to manage all the groups that "lost" and meld them into one group producing the next version of ALL-IN-1. Suddenly, I would be moving from managing 10 people to managing 250 people in five different organizations, in three sites, in two countries. But that's another story – managing global product development.

Reflections

The story of the emergence of the All-IN-1 product gives a brief illustration of the cycling and recycling of the core Reverse Product Design Sequence of:

- Activities
- Stories for Understanding
- Innovations
- Stories for Persuasion

Once a loop is carried through and the persuasion is successful, the product team starts back with a new look at the next category of activities. Another important lesson from the above is that innovations are not just about technological innovations. Many of the innovations in the above story were about insights in how to persuade or help create understanding (the presentation at DuPont with Ray Cairns). One of the most critical innovations for ALL-IN-1 was the transformation of "students" into product developers and then into evangelists.

Exploring Document Worlds – A 30 Year Dream Come True

Memo to Attenex staff dated August 30, 2001:

In life there are little things and big things. In the context of business, August 15, 2001, was a "big thing" day for me.

Activity

In 1968 I was fortunate to get a job in a psychophysiology research lab at Duke Medical Center at the start of my sophomore year in college. We ran experiments on human subjects looking at their physiological responses to behavior modification therapies and to different psychiatric drugs. To better deal with experimental control and real time data analysis of EEGs and EKGs, we purchased a Digital Equipment PDP-12 (the big green machine). It had a mammoth 8000 bytes of memory and two pathetic tape drives that held 256,000 bytes of storage.

Understanding

Embedded in the rack of the computer was a big green CRT which could display wave forms as well as text. A simple teletype device served as the keyboard. While we were controlling the experiments, we displayed in real time the wave forms from the physiological data of the human subjects. We experimented with multi-dimensional displays of EKG vs EEG vs the user task analysis. It was so fun to get lost in “data space.”

Along with doing all the programming for the lab experiments, I got to use the machine to play my first computer game (Spacewar). It was so cool being able to control a space ship in the solar system and have it be affected by the gravity of the planets on the CRT. There was no mouse at that time, but we used several potentiometers and toggle switches to control the X, Y and Z coordinates along with the firing of guns. Controlling green phosphor objects was a real feat for those of us who have no hand eye coordination.

Innovation

One semester while procrastinating in writing several term papers, I wrote a text formatting application called Text12 which was modelled on Text360 for the large IBM mainframes of the time. The formatting commands were eerily familiar to the HTML format that we know today. The results of the activity were that I could enter and edit the text of my papers and then print them out on a letter quality device. It eliminated all the messiness of using a manual type writer and white out. Several times at 2am in the morning I hallucinated about the combination of Spacewar, Complex Wave Form Pattern Detection and Text12 to provide the ability to take the electronic texts that I was creating, analyze them and display them in three space by the relatedness of the concepts within the papers. I got carried away thinking of a new document being indexed and “blasting” links throughout the galaxy of documents. I could almost feel the gravitational attraction of the important documents.

Over the next 10 years as computer processing power grew from the PDP-12 to the PDP-11 to the DEC VAX computers (wow 4 megabytes of virtual memory space for a program and 60 megabyte hard disks), I would periodically do a midnight coding project to try and bring my hallucinations from 1968 into reality. Nice idea but there was never enough algorithms, CPU power, or memory. And there were precious few electronic text sources available to actually index unless I wanted to type them in myself.

Persuasion

As I became a manager and began to acquire research budgets, I would squirrel away a little money each year to see if the technology was ready to tackle the vision. The technology was never ready and there was relatively little research into the indexing and display of document collections until the early 1990s. The other side of the coin was that there was no clear idea of the business value of such a tool. We’d use these prototypes to try and impress internal funders to create some larger research projects. But nobody ever funded us beyond the prototypes.

Activity

During this time I hooked up with Russ Ackoff of the Wharton School at the University of Pennsylvania. One of the many “idealized designs” that he worked on was a distributed National Library System that he published a book about. This design called for all the texts to be in electronic format and available for searching. A key feature of the system was to generate Invisible Universities. That is, using the reference lists of published papers and books, find out who references whom. This system could then create influence diagrams of idea evolutions. I was really hooked then on the possibilities.

One of the many reasons I joined Primus a couple of years ago was to bring this vision to reality using the Primus Knowledge Engine as a foundation. We even licensed the Inxight ThingFinder software to help us do the indexing we needed to automatically author “solutions” for our knowledge base. We got started but it became clear that we had no visualization talent within the engineering department and no clear idea of the business driver for such a technology.

Which brings us to PGE and Attenex. Thanks to Marty Smith who connected this semantic indexing and visualization with the electronic discovery problem we now had the baseline tool to see the dream come true. Thanks to the efforts of Eric, last week we were able to connect the indexing capabilities of Microsoft tools so that we could inhale MS Office documents into the document analysis tool and generate concepts from Word, Powerpoint, Excel, HTML, and Adobe PDF documents. Then, we were able to load an Attenex Patterns Document Mapper database with my research papers from the last several years about customer profiles, document visualization and knowledge management.

Understanding

Then Kenji and Dan figured out how to cluster long documents and normalize the frequencies of the concepts. And Lynne added the final layer of being able to add a document viewing window for the multiple formats along with cleaning up the interaction with the concept window panes on the right side of the Patterns display.

At 5PM yesterday, I saw my 30 year dream come alive. I was able to display my research papers. I navigated around the clusters and the concepts. And then when I selected on a document, whether it was MS Word or a PDF, up it would pop in its own document viewer. Unbelievable. The only thing missing is the ability to index the books that I have in my home library.

Innovation

But synchronicity strikes again. Just this week, Amazon.com started selling electronic versions of the popular management texts that are a core part of my library. They come in either Microsoft reader or Adobe eBook format. I quickly bought ebooks in each of the formats to see if we could index them. Of course they are protected from that. So close, so far. But then it occurs to me, books are intellectual property. I bet that someone in the Intellectual Property Practice at Preston was involved in negotiating the licenses for some of the book properties. Sure enough several folks in the group were. So hopefully the last step in the journey of the dream is close at hand, the ability to not only pour my own writings and email, research reports, and published papers into the Attenex Saffron document database, but we can also get full length books indexed.

Persuasion

Now I will be able to SEE the idea and concept relationships between all these wonderful publications that I can only fuzzily keep in my human memory today. I can't wait to glean new insights as I index more documents and as I use the re-cluster on anchor documents to see relationships I've never been able to see before. I look forward to being able to publish meta-data about a corpus of documents and open up a whole new field of Document Mining.

As a researcher, teacher, and business person, yesterday was the happiest day of my professional life. My heartfelt thanks to all of you who've helped bring these concepts to life.

Words Mean Something, Not Necessarily the Same to Everyone

I am always amazed at how words mean something, but rarely the same thing to different people. One of the hardest words to get agreement on is the word customer. It’s used in so many different ways by each function within a corporation that rarely is there the same image conjured up in each mind in any conversation where the word customer is used. The clearest insight into this problem came when I was reading a book by William Luther called *How to Develop a Business Plan in 15 Days.* At the very start of his book, Luther begins:

> “In December 1984, I was hired by Clemson University to conduct a two-day marketing seminar for five state colleges in Florida. The first half-day was most difficult, because the people from the colleges kept stating that there was no way someone with no experience in education could help them develop a marketing plan. I tried to convey to them that the planning process was the same regardless of the type of product or service, but they just wouldn’t buy it. The use of a bad analogy made matters worse – the analogy being that the planning process was the same whether you were selling a college or a can of beer. The meeting did not go very well until just after lunch, when they were presented with a five-step procedure that helps you determine who your customer

> is and what the message should be. As I went through the sequence, I proved to them that they had been spending all of their marketing dollars for the last five years on the wrong target audience.
>
> “Like so many other institutions of higher learning, these colleges realized that they must get a better understanding of marketing, now that federal and state funding assistance has diminished. The group was openly hostile until the purchase-process priority was discussed. When asked who should be number one in the purchase-process priority, the college officials, after several minutes of discussion, stated that it was the parent. Number two was the high-school guidance counselor. The student was listed as number three. At this point, I asked them how they had been allocating all their marketing dollars during the past five years. Almost in unison they said words to the effect of ‘son of a gun.’ They had been committing their complete marketing budget to the students.”

Here we are 18 years later and colleges are committing the same mistake. Our three kids are now in college and our household has been the recipient of untold pieces of marketing literature from colleges starting in the sophomore year of high school for each child. In the six years we’ve endured this onslaught (2-5 pieces of mail every day), not a single direct mail piece was addressed to the parents. Everything was aimed at the student. Amazing.

Luther’s process starts by identifying those categories of people involved in purchasing decisions, and then classifies them as influencers, purchasers and users. In the above example, the parent is typically the purchaser, the guidance counselor is an example of an influencer, and the student is the user. So when we start talking about customer, it is important to think just a little harder to understand which role the person we are talking about is playing – influencer, purchaser, or user.

One of the fundamental mistakes made in product development is focusing all of the design and functionality on the user. The most successful products design in capabilities for the purchaser and influencer.

Another definition of customer was popularized by Deming as part of Total Quality Management – customer as next person in line. As business becomes more market and customer centric, we tend to think of customer in an external sense. Deming pointed out that it is hard for most of us when we are inside of a company to have much exposure to an external customer. Therefore, it becomes easy to think that quality is someone else’s problem and nobody will realize I’m not paying attention because I’m so far away from the customer. Deming then defined customer as the next person in line to receive the work that an individual produces. By providing this definition of customer, more direct measures of quality can be taken.

Whole Product Thinking

Geoffrey Moore is one of the best marketing management writers in the business today. His first major work, *Crossing the Chasm*, introduced to a wide audience the notion of Whole Product thinking in conjunction with the Technology Adoption Life Cycle. I use this model as the first thing I introduce in my graduate school classes at the Institute of Design of the Illinois Institute of Technology to aid both with analysis of existing products, as well as, to help generate ideas during the brainstorming phase of product creation.

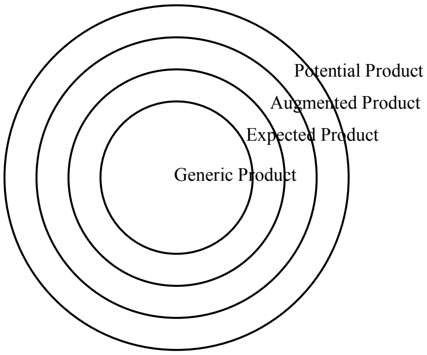
Moore describe the Whole Product Model in the following excerpt:

> “One of the most useful marketing constructs to become integrated into high-tech marketing in the past few years is the concept of a whole product, an idea described in detail in Theodore Levitt’s *The Marketing Imagination*, and one that plays a significant role in Bill Davidow’s *Marketing High Technology.* The concept is very straightforward: There is a gap between the marketing promise made to the customer – the compelling value proposition – and the ability of the shipped

product to fulfill that promise. For that gap to be overcome, the product must be augmented by a variety of services and ancillary products to become the whole product.

"The formal model is diagrammed by Levitt as follows:

The Whole Product Model



"The model identifies four different perceptions of product, as follows:

1. *Generic Product:* This is what is shipped in the box and what is covered by the purchasing contract.
2. *Expected Product:* This is the product that the consumer thought she was buying when she bought the generic product. It is the *minimum* configuration of products and services necessary to have any chance of achieving the buying objective. For example people who are buying personal computers for the first time *expect* to get a monitor with their purchase – how else could you use the computer? – but in fact, in most cases, it is not part of the generic product.
3. *Augmented Product:* This is the product fleshed out to provide the *maximum* chance of achieving the buying objective. In the case of the personal computer, this would include a variety of products, such as software, a hard disk drive, and a printer, as well as a variety of services, such as a customer hot line, advanced training, and readily accessible service centers.
4. *Potential Product:* This represents the product's room for growth as more and more ancillary products come on the market and as customer-specific enhancements to the system are made.

"In the PC world, on the product side, this means having an open architecture – the bus slots on the IBM PC, for example – such that third parties can build add-in boards to extend the capabilities of the product. On the service side, this might involve hooking up with network-based service providers such as Prodigy or CompuServe to provide on-line banking, information services, and home shopping. In the area of supporting customer-specific enhancements, it means providing some sort of development language and environment.

> "Now at the introduction of any new type of product, the marketing battle takes place at the level of the generic product – the thing in the center, the product itself. This is the hero in the battle for the *early market*. But as the marketplaces develop, as we enter the *mainstream market*, products in the center become more and more alike, and the battle shifts increasingly to the outer circles."

To gain a better understanding of this model, I have students deconstruct two very different products – a Starbucks café and an online newsletter like AnchorDesk on ZDNet:

http://www.zdnet.com/anchordesk/stories/story/0,10738,2699718,00.html

If you look at a Starbucks Café what is the generic product offering:

Most people start off with the coffee offering and forget about all the design work that has gone into the environment and the "crafting" of a cup of coffee. It is attention to the design details of the environmental aspects of the café that allows a Starbucks to charge 2-3 times what others do for a cup of coffee. Go through a quick deconstruction of Starbucks in the context of generic product, expected product, augmented product, and potential product to get a feel for this model.

Then do the same for an information based product like Anchor Desk. In both cases it is helpful to actually experience the product. In the Starbucks case, go find a café and have a cup of coffee. Better yet, experience several different Starbucks locations to see the range of designed experiences – Starbucks at the corner of First and Yesler, at the airport, within a mall, the Starbucks restaurant near Lake Washington. How are each of these settings differentiated by local market or user type? Similarly, sign up for AnchorDesk and experience a daily newsletter. How does a free newsletter make money? For both businesses, who are the influencers, purchasers, and users? For a given function within one of these businesses, what are some examples of the Deming type of customer?

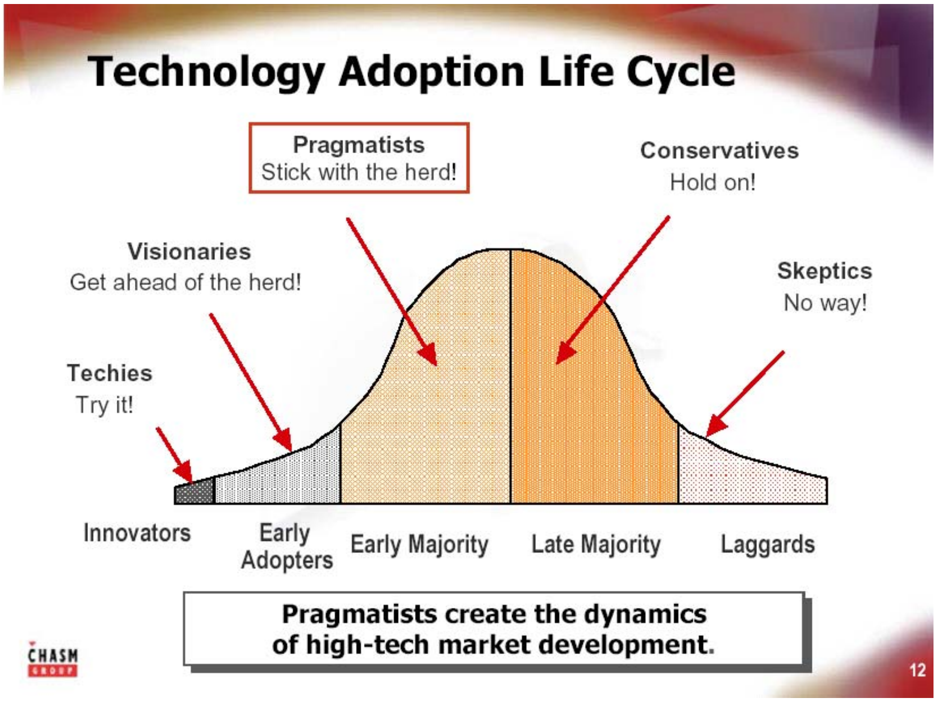
And by all means enjoy a cup of coffee or tea and great conversation while you are thinking through the meaning of whole product.

How would you describe the Whole Product for your class project? While it's a little early to answer this, from what you've heard to date, what might be the generic product? What might our customer expect? Who are other companies that we could get to join us in a value web to produce the augmented product? What are the potential products that might result from this research?

Technology Adoption Life Cycle

Moore's Technology Adoption Life Cycle (TALC) provides an understanding of why it is so hard to develop a business around product innovations in the high technology industry. The following slides look at different aspects of the TALC (available at the Chasm Group web site - http://www.chasmgroup.com/publications/sampleslides.htm) while the text is taken from Geoff Moore's latest book *Living on the Fault Line:*

> "The technology adoption life cycle models the response of any given population to the offer of a discontinuous innovation, one that forces the abandonment of traditional infrastructure and systems for the promise of a heretofore unavailable set of benefits. It represents this response as a bell curve, separating out five subpopulations, as illustrated in the following figure:



Technology Adoption Life Cycle

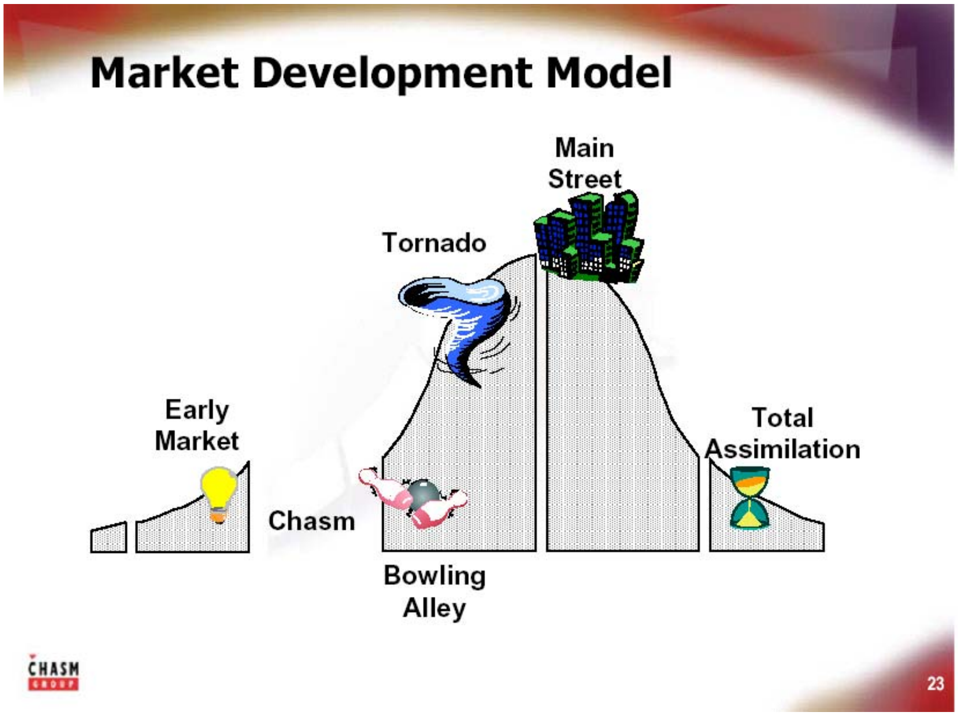
Pragmatists create the dynamics of high-tech market development.

12

> "The bell curve represents the total population of people exposed to a new technology offer. The various segments of the curve represent the percentage of people predicted to adopt one or another of the five different strategies for determining when and why to switch allegiance from the old to the new. The five strategies unfold sequentially as follows:
>
> 1. The *technology enthusiast* strategy is to adopt the new technology upon its first appearance, in large part just to explore its properties to determine if it is "cool." The actual benefits provided may not even be of interest to this constituency, but the mechanism by which they are provided is of great interest. If they are entertained by the mechanism, they often adopt the product just to be able to show it off.
> 2. The *visionary* strategy is to adopt the new technology as a means for capturing a dramatic advantage over competitors who do not adopt it. The goal here is to be first to deploy an advantaged system and use that head start to leapfrog over the competition, establishing a position so far out in front that the sector realigns around its new leader. Visionaries are mavericks who want to break away from the herd and differentiate themselves dramatically.
> 3. The *pragmatist* strategy is directly opposed to the visionary. It wants to stay with the herd, adopting the new technology if and only if everyone else does as well. The goal here is to use the wisdom of the marketplace to sort out what's valuable and then to be a fast follower once the new direction has clearly emerged. Pragmatists consult each other

frequently about who's adopting what in an effort to stay current but do not commit to any major change without seeing successful implementations elsewhere first.

4. The *conservative* strategy is to stick with the old technology for as long as possible (a) because it works (b) because it is familiar, and (c) because it is paid for. By putting off the transition to the new platform, conservatives conserve cash and avoid hitting the learning curve, making themselves more productive in the short run. Long term, when they do switch, the system is more completely debugged, and that works to their advantage as well. The downside of the strategy is that they grow increasingly out of touch for the period they don't adopt and can, if they wait too long, get isolated in old technology that simply will not map to the new world.
5. Finally, the *skeptic* strategy is to debunk the entire technology as a false start and refuse to adopt it at all. This is a winning tactic for those technologies that never do gain mainstream acceptance. For those that do, however, it creates extreme versions of the isolation problems conservatives face.



Market Development Model

Main Street

Tornado

Early Market

Total Assimilation

Chasm

Bowling Alley

23

"The model segments the evolution of a technology based market as follows:

- The first phase, or *early market*, is a time when early adopters (technology enthusiasts and visionaries) take up the innovation while the pragmatic majority holds back. The market development goal at this stage is to gain a few prestigious flagship customers who help publicize the technology and celebrate its potential.
- The early market is followed by a *chasm*, a period of no adoption, when the early adopters have already made their choices, but the pragmatist majority is still holding back. The barrier to further progress is that pragmatists are looking to other pragmatists to be references, but no one wants to go first. The market development goal at this stage is to target an initial beachhead segment of pragmatists who can lead the second wave of adoption.
- In the development of most technology-enabled markets, specific niches of pragmatic customers adopt the new technology before the general pragmatist population. We call this period the *bowling alley* because the market development goal is to use the first group of adopters as references to help win over the next group, and the next, and so on. Typically the "head bowling pin" is a niche of pragmatists who have a major business

problem that cannot be solved with current technology but that does respond to a solution built around the new innovation.

- As pragmatist adoption builds in niches, one of two futures emerges. In one, adoption continues to remain localized to niche markets, a pattern we call "bowling alley forever." In this pattern, each niche's solution is relatively complex and differentiated from every other niche's. As a result, no mass market emerges and the market development goal is simply to expand existing niches and create new ones as the opportunity arises.
- In the other pattern, a "killer-app" emerges – a single application of the innovative technology that provides a compelling benefit that can be standardized across multiple niches. The killer app transforms niche adoption into mass adoption, creating an enormous uptick in demand for the new technology across a wide range of sectors. We call this period the *tornado.*"

High Tech Value Chain

Moore expands Porter's value chain to look at the players in moving from a technology to a customer at each stage of the TALC.

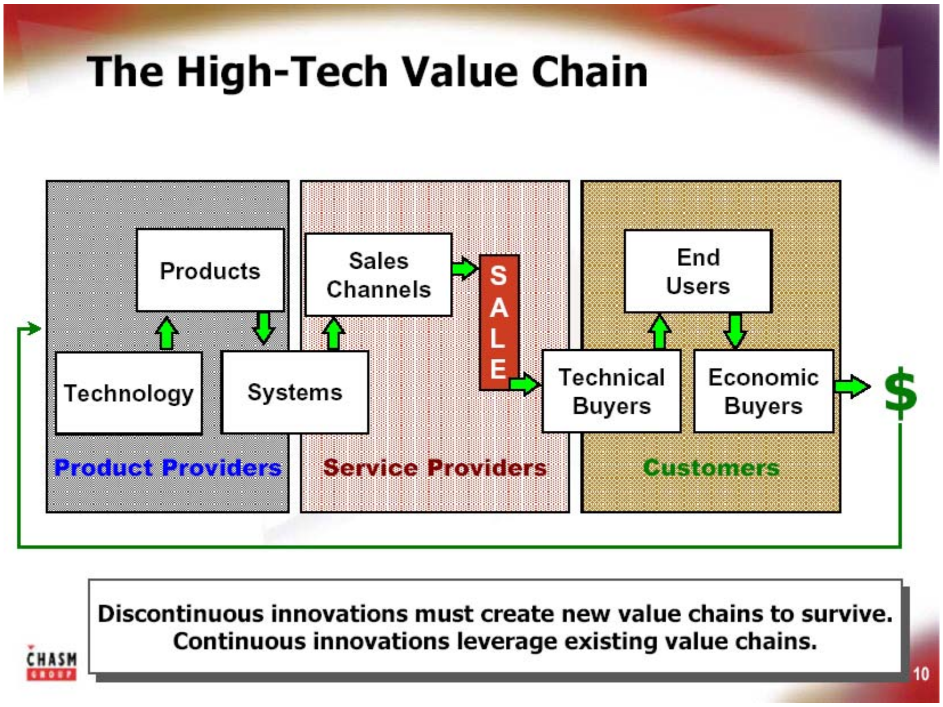
> "To actually get onboard with the new technology, companies must understand the value chain that is forming to support it and secure for themselves a powerful position within it. Failing to do so will relegate the company to the periphery of the market where it will fight for scraps and leftovers from better-positioned competitors.
>
> "Value chains are voluntary alliances of product and service providers coming together to provide a complete offering to a given set of customers. The metaphor of the chain is a bit simplistic – they are almost always something more akin to value webs – but anytime things get presented in more than two dimensions, I get lost. So we will stick with chains for now. In cable television, for example, members of the value chain include manufacturers of TVs, VCRs, and set-top boxes; cable head-end equipment providers and cable broadcasters; service installation, billing, and maintenance organizations; and content providers, including the major TV networks, HBO, the Discovery Channel, and the like.
>
> "The goal of any company wanting to participate in the emerging market is to claim one or more of the product or service-providing roles. In the computer industry, within the domain of product providers, there are three main options:
>
> 1. Technology Providers
> 2. Products and Accessories providers
> 3. Application software providers.
>
> "Within the domain of service providers there is a parallel progression:
>
> - Consulting services
> - Sales and support services
> - Customer service
>
> "The last segment of the diagram covers the customer domain.
>
> - Economic buyers
> - Technical buyers
> - End Users

As an example let's look at the value chain strategy in the early market:

> "On the left is the *technology provider*, the supplier of the discontinuous innovation, with ambitions of constructing an entirely new marketplace based on a new platform. On the right are one or more visionary executives, in the role of *economic buyer*, who also have ambitions of their

own. They want to reacrchitect the marketplaces they participate in to install their company as the new market leader – and they want to do it fast. They see in the new technology an opportunity to disrupt the established order and insert themselves into the lead.

“Between these two poles, however, there is at present no existing value chain that can link their ambitions. Indeed, the existing value chain is appalled by them. There is, however, one institution in the market that can bridge the gulf between the two, can transform the technology provider’s magic into the economic buyer’s dream, and that is the *consulting firm.* Rather than try to incubate a value chain in the marketplace, this consultancy will instead create a temporary value cahin to serve a single project’s specific needs. That is they will pull together the products, the applications, the sales and support, the customer service, and in extreme cases even substitute their own people for the customer’s technical buyer (and even the customer’s end users), allo to make the value chain work *in a single instance for a single customer.”*



The High-Tech Value Chain

Discontinuous innovations must create new value chains to survive.
Continuous innovations leverage existing value chains.

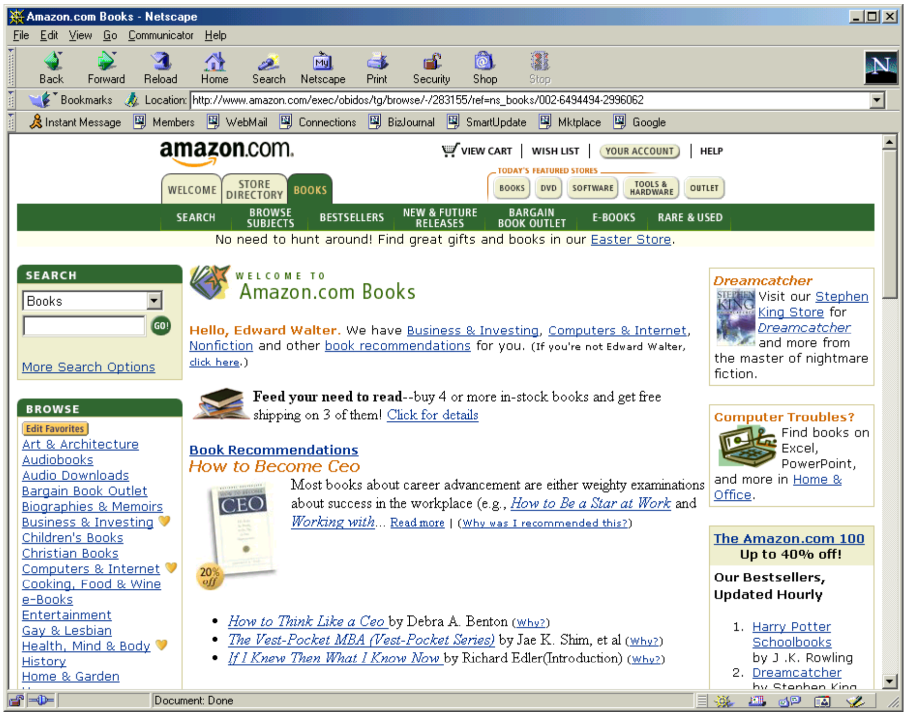
Building on Digital Assets

As I looked at successful web sites and software products that have emerged over the last 20 years, I began to see a pattern emerge – building from digital assets rather than financial or physical assets. I call the pattern r2DNA for *recombinant reflective digital network assets*.

The best software products and web sites aren’t just about code, they also include ways to extend the code either through content or plug-ins. Digital assets can be as simple as a record in a database or as complicated as a browser plug-in. A networked digital asset is the start of creating a value web by linking my digital assets through the network with someone else’s digital assets. Recombinant implies that I am able to recombine either my digital assets or networked digital assets to provide increased value to the user. Finally, reflective has several meanings. The simplest meaning is to create a mirrored space, much like the P2P technologies are doing today. Groove is an example of a technology that mirrors collaborative spaces on peer computers rather than on servers. The next level of reflection is to pay attention to the pattern of user interactions to discern a higher order intent. For example, Amazon.com may notice that a person is buying several books on management and begin to figure out that the customer has gotten a promotion.

The system could test that assumption directly and then start suggesting hardware or software to purchase, other books, or possibly seminars to attend. The last meaning of reflection is similar to what Donald Schon describes in *The Reflective Practitioner*, where not only do you feed back from actions and their consequences to the next set of actions to take, but you also feed back to your theory about what is taking place. This type of reflection enables double loop learning (see discussion of Model 1 and Model 2 behavior).

If we take a look at the Books section of Amazon.com we can deconstruct the website from an r2DNA perspective:


Amazon.com Books - Netscape
File Edit View Go Communicator Help
Back Forward Reload Home Search Netscape Print Security Shop Stop
Bookmarks Location:
Instant Message Members WebMail Connections BizJournal SmartUpdate Mktplace Google
amazon.com.
VIEW CART | WISH LIST | YOUR ACCOUNT | HELP
TODAY'S FEATURED STORES
BOOKS DVD SOFTWARE TOOLS & HARDWARE OUTLET
WELCOME STORE DIRECTORY BOOKS
SEARCH BROWSE SUBJECTS BESTSELLERS NEW & FUTURE RELEASES BARGAIN BOOK OUTLET E-BOOKS RARE & USED
SEARCH
Books
GO!
More Search Options
BROWSE
Edit Favorites
Art & Architecture
Audiobooks
Audio Downloads
Bargain Book Outlet
Biographies & Memoirs
Business & Investing
Children's Books
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- *The Vest-Pocket MBA (Vest-Pocket Series)* by Jae K. Shim, et al (Why?)
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From a *digital asset* standpoint, we can start a long list of the digital assets that Amazon.com has just on the books section. Here is just a partial list of the assets:

- Demographic information like name, shipping address, bill to address
- What topics I'm interested in like: business and investing, computers and internet, health, mind and body.
- Order transaction history
- Ratings of books that were purchased or are owned
- Reviews of books
- Database of information about books, both books in print and out of print
- Cover images for each book
- Inventory status for each book
- Selling history of each book

With a well developed site like Amazon, the list of digital assets can go on and on.

To see the effect of *recombinant*, we start looking at the ways in which Amazon begins to make recommendations. The book recommendations are made by looking at others who have bought the same book and seeing what they also purchased. Another way of recombining assets is to look for demographic indicators – people like you are also buying XYZ book. While there is not a clear example of *reflection*, we are starting to see the capabilities for humans to reflect on the underlying assets through the introduction of related lists of books whenever one does a search. Searchers can also rate other user reviews as to how helpful they were in selecting a given book.

Finally, from a *networked digital asset* standpoint we see a couple of examples. Within Amazon, digital assets are networked from store to store. The system comes up with messages like "people who bought this book also liked these CDs or DVDs". Perhaps, the most useful networking of assets is connecting the user to UPS for package tracking of an order. When Amazon acknowledges an order it also provides the tracking number and a linkage to the UPS site so that the user can check to see where the package is on its journey from Amazon to the specified delivery site.

To get a better feel for how others use digital assets, use the r2DNA descriptive model to look at 3-4 websites. I would recommend doing a full deconstruction of one of the Amazon store sites all the way through to the ordering and delivery assets that are kept. Then I would look at two other classes of sites: financial investing and trading, and travel sites with an airline that you have frequent flyer relationships with. If you get a chance, pay particular attention to any mapping or analysis tools that might be present like Fidelity and Smartmoney.com are providing. What are the r2DNAs used to supply the market map at SmartMoney.com?

As a brainstorming or design tool, r2DNA is particularly helpful at the innovation stage. The sequence that one should think through the r2DNA in order to be prescriptive is:

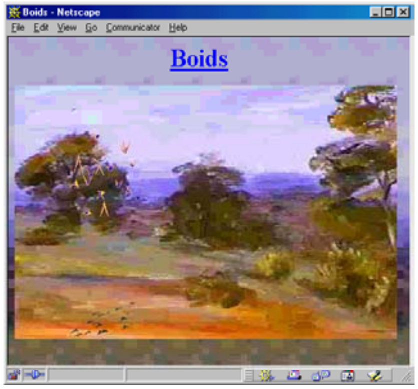
- Identify the *Digital Assets*
- In what ways can the Digital Assets be *recombined*
- What other Digital Assets can I *network* my Digital Assets to
- For a given user, *reflect* on the pattern of usage to determine higher order intents or goals on the part of influencers, purchasers and users.

Perhaps, the biggest step forward for the kinds of software tools that we want to build is to have the software itself be reflective so that it can learn as it interacts with users. For example, in the early use of Attenex Patterns, each of the attorneys is constantly developing new strategies for how to identify clearly non-responsive and clearly responsive documents. These strategies need to be rapidly shared with the other attorneys doing the initial review on that case. Over time we want to figure out how to incorporate these strategies into the system so that more of the analysis can be done automatically.

Simple Rules Lead to Complex Behaviors – BOIDs & r2DNA

An exciting break-through in computing came from Chris Langton at the Santa Fe Institute when he discovered that flocking behavior in birds could be simulated with essentially three rules. Most of us assumed that there was always a leader of the flock. Chris showed that with three rules he could emulate flocking thus starting the field of generative computing. To see an example of Boids flocking, this URL has a Java applet as well as dynamic boids moving across the html page:
http://www.vergenet.net/~conrad/boids/

Flocking - the BOIDS



Flocking Rules:

1. Boids try to fly towards the center of mass of neighboring boids.
2. Boids try to keep a small distance away from other objects (including other boids).
3. Boids try to match velocity with near boids.

http://www.cse.unsw.edu.au/~conradp/java/Boids/example.html

The music that you listen to on the web site of Sseyo (http://www.sseyo.com/) are compositions done with a program called Koan. Now I am not a composer by any stretch of the imagination. I grew up playing the trumpet and French Horn in high school band, but never took any composition courses. I am not particularly able to hear new compositions in my head, rather I whistle tunes that I like. Then I came across this program on the net and downloaded the player. Every time I listened to a piece from SSEYO's web site it was different, yet the same. What was going on? So I downloaded the composition tool.

In a short burst of fooling with the interface, I created my very own composition. I didn't like that first composition very much so I started over. I found some sounds that I liked from the downloaded templates and through easy dragging and dropping I created music like on the web site.

What I now had in my hands was a tool that was matched to my level of capability. At the lowest level I don't know how to compose. But at the level of function I know what music I like to listen to. This tool now allowed me to create music that matches my taste. I urge you to play with the tool and see if you can generate music that you enjoy. The neat part is that each time you play it, it's different. Similar but different – that's generative music.

Brian Eno, famous as a music producer, worked with the producers of Koan to refine their tool set. In his book *A Year with Swollen Appendices* he describes the nature of generative music:

> "Ten RCA students over to look at Koan and screensavers. I gave them all a talk about self-generating systems and the end of the era of reproduction – imagining a time in the future when kids say to their grandparents, 'So you mean you actually listened to exactly the same thing over and over again. Interesting loop: from unique live performances (30,000 BC to 1898) to repeatable recordings (1898 -) and then back to – what? Living media? Live media? Live systems?"

He goes on to talk about composing generative music:

> "Of course, the real can of worms opens up with the new stuff I'm doing – the self-generating stuff. What is the status of a piece of its output? Recently I sold a couple of pieces as film-music compositions (a minor triumph, and an indication of how convincing the material is becoming). I just set up some likely rules and let the thing run until it played a bit I thought sounded right! But of course the film-makers could also have done this – they could have bought my little floppy (for thus it will be) containing the 'seeds' for those pieces, and grown the plants themselves. Then, what would the relationship be between me and those pieces? There is, as far as I know, no copyright in the 'rules' by which something is made – which is what I specify in making these seed programs."
>
> "For me, this is becoming a stronger body of work every day. Having now had the chance to try out some of the work on lots of different people (even without telling them how it is being made), I am convinced of its musical worth. Then the fact of its infinite self-genesis comes as an incredible bonus. So I will be very happy if, at the end of it all, I get recognition as a pioneer in this area. That in itself (given the way things have worked for me in the past) will also turn out to pay the bills. It's something to do with what Esther Dyson was saying about servicing an idea: if I let the idea free, then I get paid for servicing it – extending it, updating it, extrapolating from it.
>
> "The end of the era of reproduction."

Then Brian goes on to tie the many generative systems together:

> "A by-the-by: I've noticed that all these complex systems generators (such as 'Life' and 'Boids' (the flocking one) and 'The Great Learning') have something in common – just three rules for each. And these three rules seem to share a certain similarity of relationship: one rule generates, another reduces, another maintains (or a tendency to persist). I suppose it's obvious, really, but perhaps it's not trivial to wonder if those three conditions are all you need to specify in order to create a complex system generator (and then to wonder how those are actually being expressed in complex systems we see around us)."

While the Koan tool works well for me, it is not the appropriate tool for some one who does know how to compose or someone who is willing to learn how to compose. For that, the SSEYO folks created KOAN PRO. This version lets the composer manipulate more than two hundred separate rules that go into the creation of the templates that are in the basic Koan tool. However, the novice can use the KOAN PRO tool to modify those templates set up by others. With the three tools, KOAN, KOAN PRO, and the KOAN player, anyone can quickly compose music to suit their taste. Imagine, me, a composer. Better yet, imagine, you, a composer.

Over the years, the Boids programs and understanding have proliferated. My personal favorite is BOIDS. I can stare at this for long periods of time, much like losing yourself in watching the fish and plant life in an aquarium. The BOIDS home page provides considerable detail in what is behind the rules in the program and has several downloadable examples of the programs for birds, fish schooling and other similar behaviors. To look at how you can change the parameters associated with the rules, download one of the Boids programs and see another form of generative software.

Once exposed to this idea of how complexity can arise from the interaction of simple rules, one is never quite the same in looking at the phenomena in nature, social groups, and business. Nicholas Negroponte in a talk at a recent TED conference quipped "he's so ignorant he still thinks that bird flocks have leaders." This is as esoteric a put down as one is likely to encounter.

Another example of generative computing in the visual realm is Imogene originally developed for the Thinking Machines massively parallel computer. Starting with a random set of generated images then using genetic algorithms it generates new images. As a user you guide the generation by selecting which variants appeal to you. You are playing god with the program's evolutionary behavior. As you pass through generation after generation "selecting" images you become aware that there is an aesthetic at play that you are trying to trace. As Joe King of Design Intelligence noted "it's real hard to play god. It's difficult to be explicit about what you are trying to select for. If you aren't clear then you just end up with visual mush." Or as my organic chemistry professor at Duke used to call the Fourth Law of Thermodynamics "all organic chemistry reactions if left long enough eventually turn to gunk."

While the above examples are interesting and show the future of computing, a useful example of generative software is iPublish from Design Intelligence. This program provides the user with a graphic designer through software. It is page layout for the rest of us. Good communicators know that the communication of a message has as much to do with the form of the message as with the content in the message. For the medium of print, graphic designers are critical for translating the desires of a client in order to meet the needs of a consumer. A graphic artist balances the rules of layout and typography and illustrations to create a print piece that communicates. Programs like Quark and PageMaker became invaluable tools for the graphic designers to make the representation task easier, but did little for the rest of us in terms of understanding what is good form.

IPublish makes the task of generating the form quite easy. The user creates or identifies the content they want for their print or web output. Using iPublish they then select a template or style of representation and then the program uses a generative set of rules to make all the layout decisions about form that a graphic artist would make. The brilliance in their approach is that they didn't write an exhaustive set of rules for every possible condition of layout and medium that the layout could be published in. Rather they created a simple set of rules that then interact with each other to produce good-looking results. To make life even easier the user interface is tightly integrated with the web and uses drag and drop technology. If you like some text, photos or illustrations on the net or on your own computer, just drag and drop and your document adjusts itself automatically. Cool.

The art form of generative product design is to come up with a comprehensive set of Digital Network Assets that can then be endlessly *recombined* using "BOIDS" like rules to better meet the needs of a diverse set of influencers, purchasers and users.

References

Geoffrey Moore, *Living on the Fault Line*
Malcolm Gladwell, *Tipping Point*
Stan Davis, *Blur*
Joan Magretta, *What Management Is*