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FOLLOWING AND ACCELERATING THE DESIGN EVOLUTION CURVE IN HEALTH CARE

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Abstract

Designers of medical technology and innovations who ignore the complex economic and legal realities of the medical system can produce designs doomed to failure or a very slow implementation, especially when they trigger changes which interfere with organizational structure, funding, and profits. While policy makers and managers work to align the profit and funding systems with what is best for the patient, it is up to designers to manage their development process to ensure that beneficial new medical technologies are more completely developed to maximize the speed of their adoption in order to benefit the health of the population.

Health may be the most complex and complicated problem the species has ever worked on, and one certainly high in importance. The human body is certainly very complicated in its composition, dynamics, conflicts, and interactions. The natural environment which supports and affects human health is complicated in its composition, dynamics, conflicts, and interactions. The variety of resources developed for increasing human health are certainly complicated in their composition, dynamics, conflicts, and interactions.

The nature of the situation is far out on the dimension of simple to contingent to systematic to heuristic to ecological to chaotic.

Just to make it more interesting, the stakeholders and actors in the situation vary widely in values, goals, and motivations (even within themselves), producing the kind of problem that is labeled "wicked" and requiring the kind of thinking that psychologists label "cognitive complexity", the ability to deal with conflicting values without choosing between them.

Thinking about this complexity could cause one to give up, or to just focus on an perspective of limited complicatedness and complexity, and hope that it works in the world of markets and systemic chaotic interactions. (This limited perspective is the fundamental reality of academic disciplines and functional departments, and the source of their effectiveness.)

It is possible for knowledgeable people from differing perspectives to come together and develop a shared understanding (while their own perspectives, goals, and values remain conflicted) and invent and explore new alternatives which increase the effectiveness of the health care system while maintaining the effectiveness and prosperity of its constituent organizations. The best efforts can leapfrog years of “evolutionary” development and adoption.

Of course, it is difficult for these groups to work together at the highest level of synergy, especially when there are great differences in technical field, national origins, and/or cognitive style. Research into complex problem solving has demonstrated that different approaches to working together can have quite different levels of effectiveness.

Effective leaders of such efforts have learned to build a different climate of interaction that accepts and values disagreements without resolving them early, and to build relationships among the participants which can keep them thinking together while thinking differently. They have learned to disconnect intention from tradition, asking questions like “what does a hospital really do?” and “what else (especially in new technology) can do that?

Once the group has begun to accept disagreements and has begun to disconnect desired benefits from the traditional methods, they are ready to use methods such as criteria decision matrices and systems models to integrate and synergize their thinking and to use techniques such as analogies and visual brainstorming to generate ideas of sufficient complexity to meet the complex realities of the health care system.

Such groups can more rapidly see the potentials and problems of such innovations as a home blood test kit, Internet connections to medical knowledge and advice, a better educated population, or discovering an unpatentable cure for a condition that currently generates huge profits for various players. The quality of their interaction directly affects the rate of increase in the quality of health in the population and the quality of health care, so deliberate intervention in the quality of their work has a direct effect on the performance of the hospital and health care system of the future.

THE NEED FOR DELIBERATE MANAGEMENT OF COMPLEX CREATIVITY

Although focusing ones creativity and thinking within a perspective of limited complicatedness and complexity allows some amazing inventions, members of particular disciplines often laugh bitterly at what they see as the stupidity of humanity, telling stories of "inferior" technologies dominating the market and of "great" ideas getting rejected. Even ideas can be widely accepted for their benefit to the players' economics, but with negative impacts upon actual health of people.

It is easy to blame such failures on the stupidity of others, but is a technology truly superior if it has characteristics that make it a market failure, social failure, or ethical failure? Are designers right to believe that it is impossible to develop inventions that are superior both in technology and in acceptance? What do designers have to do differently if they decide to take responsibility for making new technology a total success?

This paper explores some famous mis-designs, considers their causes and how to avoid them, and suggests ways to better address the opportunities available in the health field. Ironically, it can be the very creativity and genius of people who understand a limited part of the problem that leads to some of the biggest problems, a process referred to often in the systems literature as sub-optimization. And the real trick to better design is to truly listen to those who resist your ideas. This is a difficult lesson to learn.

Over time, designs improve in a process often called evolution. Like biological evolution, variations on the original emerge. Where biological evolutionary success basically is determined by whether you have more grandchildren than others, in products the issue is the marketplace: do people make and buy products and services which include your design features. Some features gain support and become part of the product or service, other features find little support and disappear from the most commonly available products.

The evolutionary perspective gives important insights. Neither evolution nor the market always picks the survivors you would like. Mosquitoes continue to survive and evolve no matter how irritating they are to other species. And some products which succeed in the market place simply baffle most people. (For example, take a look at the other magazines available where you buy yours…) Also, many species of animals and plants have evolved as interactive systems in which the new features of one enable the new features of another. In the same ways, one technology change can unleash incredible growth in another by removing a critical constraint.

Basically, products and services are bundles of knowledge accumulated and integrated over time. From the Wright Brother's motorized kites with bicycle controls flown at Kitty Hawk to modern Jumbo Jets, Stealth fighters, and even ultra-light planes, there is a great deal of learning and knowledge and experience embedded in the designs. The speed at which our technologies can learn determines how fast we get new and better benefits. The question is whether technologists in health care can affect the speed at which product effectiveness and efficiency are achieved in the marketplace.

EXAMPLES OF ERRORS

It may be wrong to label these examples as errors, because in many cases, the design was pure genius, given the problem they were focusing on. Its just that other parts of the situation they did not understand prevented complete success, or parts of the situation they did understand changed, and the design become a problem.

Changing Realities and Constraints

Most technology lovers are familiar with the "**QWERTY"** keyboard, standard on English language computers because it was standard on electric typewriters, because it was standard on manual typewriters as a way to slow down the better typists so they wouldn't jam the keys. This was a great creative solution to their biggest problem at that time. It is hard to sell typewriters if your customers spend a lot of time unjamming the keys. As an additional feature for the salesmen, the designers even shifted a few keys so that the word "typewriter" could be typed very fast alternating between two fingers just on the top line so salesmen could make typing look easy and fast. That idea, so useful then, is wasting an incredible amount of time around the planet as we try to type words on a keyboard designed to slow us down.

And of course it was a stroke of genius to use the **YYMMDD** format for dates, even better the Julian date of two digits for the years and three digits for which day of the 365 in the year. When the author was programming for the J. C. Penney catalog in 1978, giving every transaction the full four digit year would have required the spending of millions of dollars for additional disk drives. Of course, that great efficiency became the **Y2K Bug**, with inconceivable amounts of money spent to fix that one field.

But as you look back at these two cases, could those designers have understood the potential problems from their creative ideas and developed new ideas which worked in their situation and the future? And more importantly, can <u>you</u> avoid being the genius who contributes the next QWERTY or Y2K Bug to the future of technology?

And, even more disconcerting, how many absolutely required design elements in our systems are related to the old realities, and invalid in the new?

Missing Part of the Problem

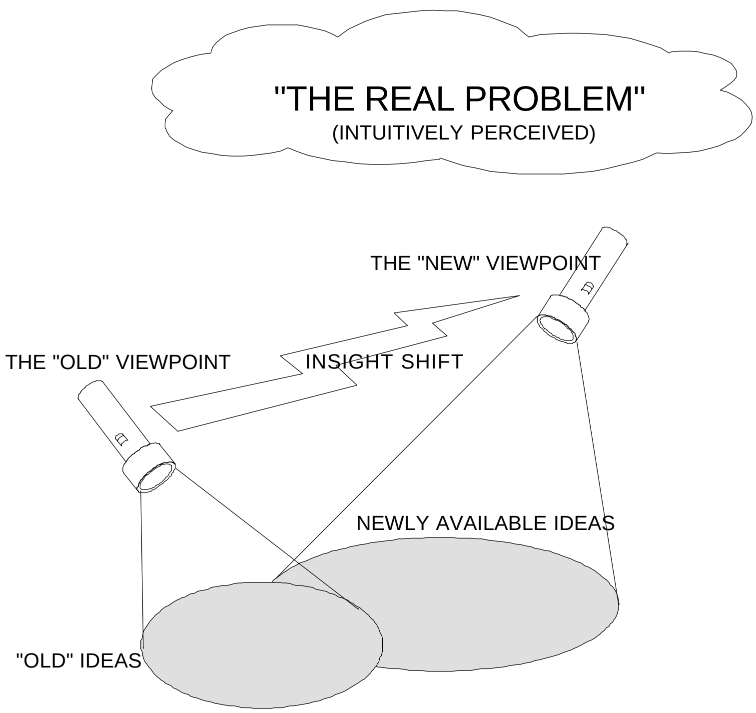
Petroski [1] tells of the marvelous Britannia Tubular Bridge built in 1850 over the Menai Strait on the Northwest coast of Wales to carry passengers to the port for a Dublin bound ferry. A wrought-iron tube with the train running on the inside, it was a technological marvel of design and construction, a work of true engineering genius. Only after construction was it discovered that the bridge was unusable. Imagine a black, wrought-iron tube sitting in the hot sun of a summer day, with more sunlight reflected off of the water. Imagine the temperature inside as this wonderful solar collector stores heat. Now, take a wood-fired engine pulling a trainload of passengers through this tube with no ventilation. Imagine the heat, the smoke, the sparks flying from the engine. It could easily be described as hell on earth. Examination of the design notes and specifications shows not a single bit of attention paid to the realities of passenger trains, only wind loads and ocean storms and spans. It was a remarkable solution to the problem as understood, but missed one of the most important parts of the problem.

AVOIDING AND OVERCOMING "ERRORS"

Very few individuals have the breadth of background, knowledge, and relationships to pull off a well designed technological development. So the trick is in assembling a collaboration which is capable of seeing all the issues and all the possibilities. Lets introduce some key ideas from the field of deliberate creativity.

AHA as insight shift

So many different people and events are involved in the development and implementation of any innovation, our old concept of inventors getting great ideas and implementing them seems to miss much of what is happening. Barlow [2] proposes that understanding collaborative creativity is facilitated by defining creativity as the changed perspective of the creator rather than ideas. This "shifted insight" model has its roots in that most subjective and individualistic phenomenon of all, the "AHA" or "Eureka!" experience. Throughout history, various individuals such as Koestler [3] have described this reaction a person has to getting an idea. This intensely physical, emotional, and intellectual experience seems to mark our fundamental recognition that a profoundly advantageous change has taken place in our thinking. The image below attempts to explain this model.



1. A flashlight has been chosen for the model as an analogy for our perception of a problem. The surface below represents all the things anyone could ever do. The area of the surface illuminated by a flashlight signifies the set of ideas that fit the problem statement. If the flashlight represents a problem statement or intention like "raise the bridge" the illuminated circle represents all the various actions that might raise the bridge.
2. A second flashlight represents a new formulation of the problem, such as "increase the gap between the bridge and the water" or "get tall boats past the bridge." The surface area that its pool of light illuminates includes all the ways to accomplish that goal. In successful creativity, some of the alternatives illuminated or made obvious by this new viewpoint are better than the best of the ideas made obvious by the old perspective. The advantage of the new perspective can be as profound as shifting your calculations from Roman numerals to Arabic notation. Problems like multiplication and division that are basically impossible in Roman numerals are simple (though sometimes tedious) in the new representation. This shifted perspective can be a simple assumption about the situation or as profound as a basic paradigm of a discipline or culture.

3. The lightning bolt labeled "insight shift" represents the shift to the new definition. Although getting such an insight might take years, when it happens, it seems as fast as that lightning bolt.
4. The cloud above represents the "real" problem, the complex interaction of wants, wishes, and reality that is only approximated by our viewpoints and problem statements. Locating the second flashlight of the new viewpoint closer to that cloud represents our perception of the closer fit of the new perception to the total problem.

Lets discuss some of the implications of this model:

1. The strength of the AHA or Eureka experience is directly related to the perceiver's image of the problem, not the broad quality of the idea. The better the fit of the perceiver's knowledge to the breadth of issues involved, the more relevant the AHA response. For example, if we are having a casual conversation with a new acquaintance, and we mention a problem we are facing, that person may get a great AHA reaction to an idea about what we should do, an idea that fits their misunderstanding of the problem. On the other hand, if their comment or idea triggers a shift in our perception to a point that better fits our perception of the problem and makes obvious some new and useful alternatives, our AHA reaction is relevant, especially since we are the ones to act on the new perception.
2. Our AHA response to someone else's idea or suggestion, an "Appreciative AHA", is a measure of the value of that idea or perspective as to the problem as we see it. It is entirely possible for a non-expert to trigger such a response in an expert, a relevant AHA which indicates the potential of an idea, but the relevance of the response depends on the breadth of understanding of the perceiver.
3. It is important to note that the problem as perceived, the context of our AHA reaction, includes our values and wishes as well as our knowledge and experiences. So, for example, if there is a person at work that has really irritated you, and a new perspective or idea occurs to you which not only seems to fit the problem, but also really punishes your opponent, your AHA will have more energy. The same is true of your good wishes for others. So if you hate or disrespect your customers, the ideas that really light your fire will be those that punish your customers. For this reason, cross functional teams that appreciate each other's perspectives, even when they disagree, would seem more likely to get AHA's that meet the needs of more perspectives and stakeholders.
4. Satisficing is another important aspect of this creative process. Simon [4] used the term to describe our tendency to decide to accept less than optimum solutions because the improvement to optimum was not worth the effort to gather and analyze additional data. One of the things which happens to a person who participates in an AHA experience is that their expectations and perceptions of the situation changes. We often talk of the "Not Invented Here" syndrome because it seems that organizations and departments refuse to accept ideas developed by outsiders, but would accept it if they developed it themselves. Note that after you shift to the new perception the new ideas seem obvious, but if you are still back at the old perspective, the new ideas are ridiculous. A good example of this phenomenon would be planning a family vacation. If you sat down, gathered all relevant data, and effectively planned the absolutely best possible vacation for your family given the conditions, they would all complain and be dissatisfied, because your plan is pretty poor in their individual perspectives. On the other hand, if they had been in on the planning, the process would have had an effect on their understanding and expectations, and they would have shifted to a perspective in which your plan is quite good.

So we can see that the knowledge background, beliefs, intentions, and other mental processes all impact an individual's creativity and their reactions to the creativity of others. Deliberate efforts to improve the creative complexity must find ways to impact these factors.

The Curse of Mental Success

One problem faced by many people who have been successful in technical fields is that they always got high grades in school. When they took a test, they rarely made an error. As a result, they have had the consistent experience that every time they felt really good about an idea, the idea was right. Of course, the point they missed was that the tests they took were deliberately designed to be single domain problems with correct answers. Unfortunately, the real world is full of messy, multiple domain problems with no single clear answer. With such real world problems the poor students have a definite advantage. Throughout their academic career, whenever they felt good about an answer, they were wrong about 35% of the time. So they never trust their own judgment and instincts, they check with other people to make sure they understand the full problem and its possible solutions.

Full Spectrum Design

One of the best descriptions for the problem of complete design is the old story of the blind men and the elephant, in which each of the blind men encountered a different part of the elephant, then argued about the true nature of the elephant. What is interesting to note is that each blind man is right about their part, yet wrong in their total perception. Each has had a powerful AHA experience which explains what they know about the elephant. Until they can let go of their conclusions, share their information, and experiment with different perspectives and models, they cannot understand the elephant.

A great example of dealing with this issue was the design project for the Ford Taurus. Lew Veraldi, leading the project, mapped out every organization and type of individual who had an interest in the final design of the car, whether repair shop mechanics, legislative bodies, or production workers. Each stakeholder group was approached and a list of their "demands" was created. Each demand was dealt with, although often in a way different than the suggestion. For example, assembly workers demanded that they get rid of plastic bumpers. Instead of accepting the idea, which would have caused real problems in their fuel efficiency, they asked why. It turned out that the original implementation of plastic bumpers had endcaps to go around the corners of the car which were almost impossible to align. To solve the real problem more completely, they found that they could mold plastic bumpers that would go around the corners, thus keeping the weight down, eliminating the alignment problems, and improving the appearance. The went through all the requests of all the stakeholders and dealt with them in a similar fashion. The resulting design won many awards and captured a very large market share.

Several other cases of team design are given by Nonaka and Takeuchi [5] such as the Canon personal copier, bread making machines, and automobiles. Interestingly, in a time when middle managers are being eliminated from companies and replaced with macro's in distributed databases, Nonaka argues that only middle managers are equipped to lead and manage the collaboration among functional departments which is the knowledge creating engine of organizations. In the medical and health care system, these players probably do not even work for the same organization. Unfortunately, most of these managers have only been trained to act as individual data processing links, and, like most engineers, have little preparation for the kinds of leadership and management necessary to make team collaboration effective.

MAKING THE PROCESS WORK BETTER

A manager needs different skills and abilities to deal with this more complex task. For example, one of the key questions in establishing a collaborative design process is how to increase the probability of "relevant AHA's". How do we make sure that every part of the "elephant" is included in the discussion. One aspect is selection of participants, the other is the guidance of a process in which each can both affect the discussion with their knowledge and be affected by the discussion, reformulating their own perspective on the problem. It is important to note that for most problems, the players do not all belong to the same department, and often not even to the same corporate organization. It may be useful to partner with customers, suppliers, even competitors and regulators to build a more effective collaboration. Of course, getting them into the room, as hard as it is, is the easy part. Helping the interaction flourish is quite difficult. Because each participant has different perspectives and goals, as well as a history of conflict and interaction, creative conversation is often difficult, beyond the skills of most managers. For example, since most have been trained in rational decision-making with well-structured problems, they think that all problems are like that. Classic decision making starts with clear agreement upon and consensus about the problem, the facts, and the criteria. But real design problems are ill-structured, with constraints and criteria in so many conflicting domains that a clear decision is impossible. And most are actually of the type called "wicked": even when we clearly understand the problem, the players disagree about the ultimate goals and values. Even when the most successful, complex, diverse team has designed and accepted a course of action, there are still strong disagreements about the goals, facts, and criteria. The trick is to work together in relative disagreement, seeking out all the clarifications and simplifications possible, but accepting that consensual clarity is impossible.

Barlow [2] discovered that some techniques seemed to have very strong contribution to these multi-perspective design efforts. In this analysis ideas are seen as more creative when they involve more disciplines or require so much of a shift in the problem definition that the problem must be re-explained to management. One surprise of the research was that ideas which are more creative in this sense are more likely to be accepted by the organization, leading to the possible conclusion that many ideas are rejected simply because they are not creative or complex enough. The strategy of separating the benefits from the attributes and realizing that attributes cost money, but customers pay for benefits is extremely powerful. This strategy is often referred to in systems design as "black box" thinking, and is called "function analysis" in the field of Value Engineering [6] [7] [8]. Even more powerful is a technique where a team analyzes the cost for each increment of benefit the customer is buying, as well as the price the customer is willing and able to pay for that increment. [9]

A second technique which strongly related to creative team success was the use of the criteria decision matrix in which each alternative is evaluated against each criteria. Although these techniques would be seen by many as too confining and analytical to allow creativity, they seemed to lead to a deeper, more complex understanding of the situation, allowing more complexly creative ideas to emerge.

As logical as these approaches seem, it is difficult for most people to shift their perceptions from the tried and true, especially when interacting with others. Building a climate and culture of interaction in a team which allows and encourages people to move away from these more acceptable perceptions can be a very difficult process, but it is possible. There are many resources on teamwork and facilitation which can be helpful here, but it is often possible to find someone trained and experienced in this area to help a team or interaction. Basically, it involves building a culture of trust in which exercising flexibility of thinking is seen as success, not deviance. And the best indicator of the success of such a culture is laughter and good humor as the team plays with various outrageous concepts.

The critical point is that while most engineers and managers are poorly prepared to lead or work in such multi-perspective creative teams, it is possible to get more people involved more effectively in design discussions, developing designs which normally might have taken several market cycles to correct.

OTHER PERSPECTIVES TO SATISFY

Of course, even a failed technology is often the basis for further development. The lessons learned and the people trained by the endeavor creates the ability to do the next design. Engineers and programmers at Xerox's Palo Alto Research Center tried to invent a paperless document system and produced no profitable products. Apple took the ideas and the people and invented the Lisa computer, another market failure. Taking the best talents from that project and the lessons learned allowed the development of the Apple Macintosh. Copying the best features and strategies resulted in the Windows operating system which is today's market leader and the de facto standard.

Understanding the Market

In his whole life, Vincent Van Gogh is said to have sold one painting, basically relying upon funds from his brother to buy bread and paint. But few modern creators have the same luxury (or are willing to live in such poverty). So our efforts must not only be great creativity, they must trigger a flow of funds from the market economy which allow us to indulge our passion for design and creativity.

In art, there is an advantage to uniqueness, but in products and technology there is often a strong advantage to being the same as everyone else, thus sharing the costs of support services. Therefore, most technological marketing is either about becoming the market dominator or fitting your product to the market dominator. QWERTY is the market dominator. Kids in school are taught the keyboard. Anyone who has ever taken typing classes knows that keyboard. When you hire a temporary worker, they know that keyboard. It is hard to imagine any of the technically superior keyboards which have been developed ever gathering enough usage to justify investment in support and training.

Management of the approach to the market can be critical. Sony's Betamax and Apple's Macintosh are two technologies with a lot of lonely fans, frustrated as technologies they consider inferior dominate their marketplaces. It may be as simple as these two firms overestimating the premium they could charge in the market, a little too confident of their technical advantage. For example, while Betamax gave superior visual quality, most people were taking family films or converting various 8mm films to video to play through their older, lower quality televisions, places where Betamax's video fidelity gave little or no added benefit, so the customers simply would not pay the premium. On the other hand, while lacking visual fidelity, the VHS design had a robust simplicity that might be more tolerant of consumer errors as well as a length which could hold a whole movie. If first run movies had been made available more quickly to the video market, and if people's home televisions had larger and clearer screens, Betamax probably could have gotten away with the premium. If they had better understood their market position, they might have "given away" their technical advantage to customers and competed on equal price with VHS, obliterating that technology and funding the development and improvement of many video products.

Apple charged a similar premium price for the Macintosh because of its quality of graphics and ease of use. This was great for artists and teachers, but there were so many people who only needed word processing and spreadsheets, and who felt empowered, not frustrated by the openness of the DOS based systems, that the volume went to the IBM compatible market. As hardware costs plummeted in a large (and growing), available DOS marketplace, Microsoft could afford to develop Windows to match many of the benefits of the Macintosh, and at lower cost per machine. Microsoft's market dominance now makes it easy to generate additional cash with various upgrades and new releases, cash which can fund new developments.

It is often dangerous to count on your own employees or the earliest adopters of technology to guide development of products for the masses In the early 1950's at General Electric, management began to realize they had problems in the design of kitchen appliances for the consumers. For example, they noticed that to the well educated electrical engineers they had hired to design electric ranges and cooking stoves, a superior design was one which most efficiently converted electricity to heat, which was not the concern highest in the consumer's mind. So they hired a chef to come in and teach the engineers to cook on those ranges. After this experience they began to make improvements to design which actually helped the homemaker. Of course, it never occurred to them to hire some housewives to be designers. And if you have ever owned one of those General Electric ranges from the late 50's and early 60's, it is obvious that the engineers never had to clean a stove, especially after several years of use.

This can all sound cynical and complaining, but success requires either incredible luck or careful attention to all the details, including how the product development and production will be funded. Thomas Edison was an inventor of this type. He set up an invention factory with various successful products funding the effort to develop new and better products. But he knew that without the ability for someone to make a successful business of his products, the products would never be made available. He not only supervised the invention of the incandescent light bulb, he worked diligently to provide everything an electric utility would need to operate from generators to watt-meters which allowed utilities to bill users for actual usage. It is easy to ignore such details, or wait until some other inventor or entrepreneur finds the answer, but progress will move more quickly if the inventor accepts the need to invent a device that not only works for the customer, but for the marketplace that will deliver the product.

Pricing Free Services

What can really surprise people is the disconnect between price and benefit. Back when IBM sold mostly punch card sorters, their sorter came in two speeds, with the higher speed machine quite a bit more expensive. However, if you bought the lower speed machine you could purchase a service upgrade to convert your machine to the higher speed, for a price greater than the differential if you had originally bought the faster machine, but less than the cost of a second slow machine. As the story goes, if you purchased the upgrade the service technician showed up with all kinds of tools and spare parts, then locked the customer out of the room while doing the long, tedious upgrade. Once the door was locked, the technician opened the toolbox, spread out the tools and spare parts, took out a thermos of coffee, a magazine, and maybe some snacks and read for a couple of hours. Then he put the magazine and coffee away, opened a panel and moved a drive belt from one drive wheel to another, ran a test on the machine speed, and invited the customer in for a demonstration. Some would complain that it was unfair, or even immoral, to sell a $25 adjustment for several thousand dollars, but the added function was certainly worth the price to the customer.

This customer value per cost is the main issue in technological success. The majority of telephone switches operated by the local telephone companies in the United States have the built in capacity for services such as three way calling, caller ID, Speed Dialing, etc. In fact you cannot buy a switch today without these services. The added cost of providing these services to customers is basically zero. Yet the phone company is able to charge $3-$5 per month for each of these services. As long as this market lasts, the most valuable resource of a telephone company is gullible customers with no alternatives. This is why the road to corporate success in America's telephone systems today is to get a lot more of these gullible customers, thus leading to buying the other regional telephone companies as the fastest route to greater income.

This may seem unfair, but **if** these companies are legally able and willing to use that cash flow to accelerate the design evolution of the global telecommunication systems, it is a great process.

This high cost for free stuff also applies to software. Once a software package is written, the cost for each additional copy delivered can be as low as zero for downloaded software or $3 for a CD version. The ability to price such free goods in such a way as to fund the further development of products you are interested in is the real name of the game in managing technology.

CONCLUSIONS

So what is a designer to do in the current global explosion of health related knowledge and technology? One option is to just relax and enjoy the ride, but for those who want to be players, it is important to become more broadly aware of the business, strategy, technology, and political issues relevant to the field. More importantly, to develop relationships and collaborations which allow you to mobilize conversations which are capable of having a relevant AHA. Who do you need to know, what projects do you need to work on to be ready to develop worthwhile products?

The basic trick is humility, to recognize that you really do not understand the whole situation, and that working alone you probably never will understand it well enough to make all the decisions. It also seems important to recognize that you might not be equipped by background, experience, and values to have AHA's about your technology which are relevant to the needs of the consumer whose money you want to pay your expenses while you play with the next generation of the technology.

Designing successful technologies takes both focused work on key technical issues and broad understanding of the complex realities of the users, the distributors, the producers, and all others involved in the network of activities to deliver health to people. The broad understanding of issues generally requires a creative collaborative interaction among those who know different parts of "the elephant". Such interaction requires the sharing of goals, strategies, and beliefs among the collaborators to develop an fuzzy mess of understanding of the complex dynamics of the problem situation. Such interaction can benefit from techniques developed by other designers, such as costed function analysis, decision criteria matrix, creative problem solving, brainstorming, and various team building activities. Even covert usage of these guiding principles by participants in the collaboration can accelerate the synergy and co-creativity of collaborations, thus accelerating the design evolution, bringing more effective and efficient technologies into use sooner. The techniques and concepts are available, for those who have the will to make it happen.

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