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The Phoenix Imperative
An Alternative Maturity Model for Systems Engineering Service Providers

Tom Roberts

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Abstract

Providers of systems engineering services and their employees are not always able to be the masters of their own destiny. When working in staff augmentation roles under the auspices of another company, they are typically forced to operate within the corporate culture from which they derive their livelihood, following "foreign" processes and procedures, responding to orders and directives. This situation calls for an alternative maturity model for those that provide systems engineering services. While a client organization might be maturing according to any of several proposed models (SEI 1993, SEI 1995, EPIC 1995, ISO 1990, IEEE 1994), the services contractor cannot necessarily be said to be achieving a similar status. This should not, however, preclude significant maturation goals on the part of the service provider. The *Phoenix Imperative* is both a business model and maturity model that has worked effectively in several corporations providing system engineering services. It was developed in the context described above and honed over a period of several years with several customers. It provides not only an alternative to the other organizational maturity models that have been proposed, but also delivers the potential for adoption as a personal maturity model for individuals interested in increasing their effectiveness within the context of employment with a service provider.

Introduction

Background

The 1990s witnessed an unprecedented event in both the Space and Telecommunications technology sectors: Motorola developed the world's first global, space-based telephony system boasting service anytime, anywhere on the planet. The system was dubbed IRIDIUM™ because the initial plan called for 77—the atomic number of the element Iridium—satellites in low-earth orbit. Prior to this announcement, cellular telephony systems in the U.S. were beginning to stabilize but still offered only spotty (mostly urban) coverage, and the idea of anytime, anywhere was compelling.

At the announcement, however, it was immediately clear to large systems engineering firms (e.g., SAIC, Booz-Allen-Hamilton), who were regularly employed in large government programs that this would be a target rich environment for their wares: system engineering services. This was because those of that ilk knew that Motorola had absolutely no experience specifying, designing, building, deploying, operating, and maintaining a system of this magnitude. At the time, Motorola's "comparative advantage" (Ricardo, 1817) was in designing and developing small devices: radios, phones, pagers, microprocessors. For their own government jobs, they'd sometimes deploy communications "systems" to outfit a large van or armored personnel carrier, but that's about as big as a Motorola system got. They simply didn't know how to engineer a complicated system like IRIDIUM. Only those in the firms who had done this regularly for large U.S. government systems knew how to accomplish such engineering feats. And when the system engineering firms heard the plans included a space-based segment (which astronomically increases system complexity) we nearly broke each other's fingers reaching for the nearest phone (remember, most of us still used analog phones back then). Motorola would need assistance in this endeavor. And they'd need a lot of it.

So it was, then, that dozens of system engineering service providers were brought aboard the IRIDIUM system team, each contributing their experience, and each hiring as fast as it could to meet the demand of this huge development effort. Many were mere flashes-in-the-pan, others were enduring. Those that endured and remained effective team members were those that developed a business model that worked on that landscape. Those that endured to the end, and then moved onto subsequent projects were those that adopted the *Phoenix Imperative*.

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[1] This is an abbreviated summary of the original work released in 1997.

The IRIDIUM program provided not only the opportunity to employ a large staff of systems engineers in staff augmentation roles, but it also allowed for observation of other vendors attempting to do the same. It was in this program, its follow-ons (e.g., IRIDIUM-NXT, Teledesic nee Celestri nee M-Star), and other similar efforts—both commercial and military (e.g., Spaceway, SkyBridge, AFWA-SWAFS, SBIRS-LOW)—that the *Phoenix Imperative* was born.

Maturity Models

Several organizational maturity models have been offered (SEI 1993, SEI 1995, EPIC 1997), each achieving a following and a degree of success in a particular area of emphasis (software, systems, etc.). Unfortunately, these models have omitted a very important portion of the systems engineering industry: the provider of engineering services. Only recently (SEI 2009) have the model makers even considered these organizations that provide niche expertise that ensures the success of their clients. Unfortunately, these models are mechanical and uninspired. For example the recent SEI offering for service providers proposes a structure that is nearly identical to that proposed for software vendors. This does not recognize the important distinctions of a valuable service provider. It is now time to fill in the remaining gaps.

While there has been some recognition of need, current maturity models ignore these providers of systems engineering services that specialize in concept development, specification, design, modeling, management, even process improvement. Sometimes called a "consultancy" and often confused with a "job shop" (which does not offer complete services, but simply people), systems engineering service providers maintain a cadre of exceptionally skilled people that specialize in the architecture and design of systems (or parts thereof) in various domains. These organizations tend to keep their hands off the physical production of the system since they rarely provide production infrastructure. They don't cut metal. Instead, they perform analyses, author specification and design documentation, supervise and manage the engineering process, and deliver management consulting. Typically, specification documents, methods, intellectual property, patents, etc. are their products.

The model proposed herein describes the way such an organization conducts itself and how it evidences itself within a client organization. This model provides a context for the maturation of an organization. It's not so much about the particular tasks performed, though this is of interest. It is more about how they go about providing their services and ensure the perpetuity of the organization. Obviously, the worth of a service provider lies at least in part with the manner in which they can be hired to perform certain tasks and be ultimately "let go." Since this reality does not evoke images of longevity and job security, the question stands: "why would anybody enlist in a company like that?" The answer is simply that if it's done properly, the service provider can typically offer a wider range of opportunity and will be invited to participate in the customer's *next* system development effort as well—usually before the current one is finished. Maturity in this type of organization guarantees growth and a future; it guarantees exciting work for its employees and opens the doors for broader growth opportunities. Often, the service provider can offer better work than its customer base. This is what the *Phoenix Imperative* ensures.

Why another maturity model?

Extant maturity models have done some good, but their structure and implementation often results in an over-emphasis on documentation and a consequent neglect of the creative side of the systems engineering effort. They tend to focus on leaving a paper trail, and, at the risk of minimizing their important goals, there can be a tendency to stress box-checking instead of actually performing quality work. These models ignore the creative process that defines a dynamic and living organization (indeed, organism) and sets it apart from a dead one. They neglect the importance of creating what Peter Senge calls a learning organization (Senge, 1994). Existing models also ignore the dynamic of the inventor and the invention process, and discount the energy it injects into an organization. The *Phoenix Imperative* strives to correct these deficiencies.

The SEI CMM (SEI, 1993) philosophy is to orchestrate stepwise progression toward organizational maturity. In many cases however, the goal of maturity has been swamped by focus on the very processes that are alleged to evolve the organization to the next level. The CMM's initial goal of measured and documented incremental improvements leading to maturity has been lost in the very acts of measuring and documentation. Instead of maturity being the goal, measuring and documenting tend to become the goal, the means becoming the end. Often, a particular model's hoped-for product—mature organizations—has been replaced with the model's eventualities: bureaucracy built around "getting there," checking boxes, and demonstrating "measures" or metrics. The model proposed herein outlines an alternative maturity scale; one that is more focused on the engineering organization and less on the product. To be sure, there are products, but they come from the people—recognizing that a good deal of organizational maturity will boil down to personal maturity evidencing itself in a particular kind of corporate culture. This is, in part, why one of the inventors of

the SEI CMM has taken the next step and invented the Personal Software Process (Humphrey, 1995). This is an admission that organizational maturity is really up to the individual engineer.

The Phoenix Imperative

Overview

To be everything it can be, a system engineering services provider must progress through the following (cumulative) roles and levels on its way to maturity:

- *Responsive* – the provider does what it's told,
- *Anticipating* – the provider does what is necessary before it's told,
- *Generalized* – the provider knows what is necessary across multiple domains and customers,
- *Inventing* – the provider knows what is necessary because it invented it, and
- *Leading* – the provider is driving the processes by request of the client.

These maturity levels are evidenced in cumulative, ever widening swirls or spirals that perform two specific functions. First, their *centrifugal* motion tends to jettison ideas, concepts, and tools into neighboring parts of the provider organization, supporting the important aspects of technology transfer and cross training within the provider organization. Second, the swirls have an energy that attracts ideas and people—their *centripetal* trajectory draws these ideas and people into the service provider. It is vital that both effects are occurring.
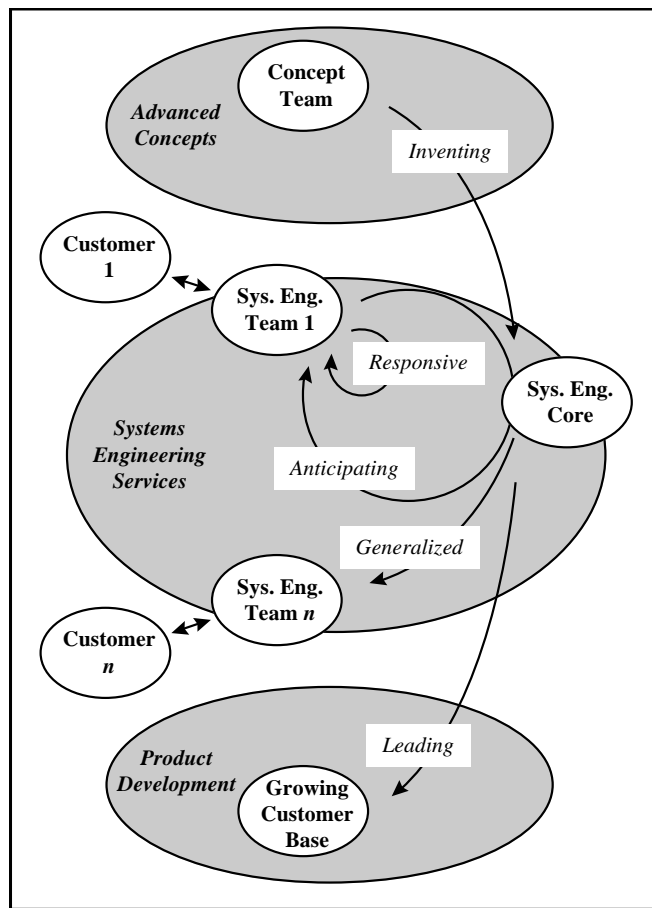

Figure 1. The Phoenix Imperative

Figure 1 illustrates *The Phoenix Imperative* within the context of a business model, a context that most closely matches the business concept of a maturing service provider. Usually, there is a large, core talent pool (Fig. 1, center) supplying system engineering services that comprises between 50 and 80 percent of the staff. Sometimes dividing into

teams, this "core" tends to remain closely associated with the current customer base and provides a vital link to the money-making work of the organization, i.e., providing services in staff augmentation roles. In a maturing organization, there is usually also a talent pool comprising between 10 and 15 percent of the staff whose primary tasking is coalescing and developing advanced concepts (Fig. 1, top). These concepts are shown being injected into the systems engineering core and being applied to the customer base to improve the quality of the services provided. In the most mature organizations, products (including new concepts, tools, and innovative services) are being developed and sold in the marketplace by a staff that comprises between 10 and 35 percent of the corporation (Fig. 1, bottom). It is these concepts and products that tend to set an organization apart as *Leading*.

Figure 2 illustrates how the implementation of the three-tiered business model provides the platform for maturation.
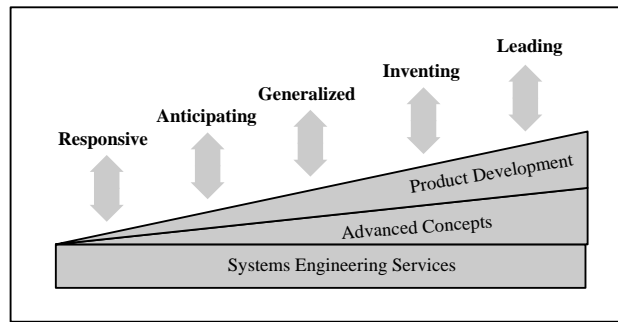

Figure 2. Maturity Foundations in Vision

Once a firm system engineering services platform is established, the initiation of advanced concepts teams and products propels the organization forward in maturity. It is important that these groups build on each other. It is also important that maturation starts in the services arena, proceeds into the advanced concepts arena, and finally reaches product development. Until a concept has proven its worth in actual work with a client, it cannot legitimately be developed and productized.
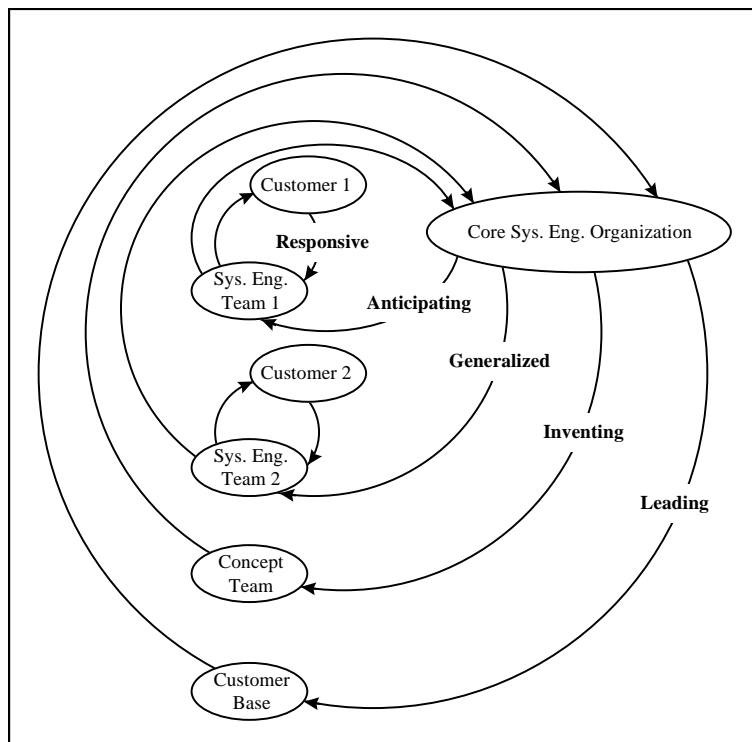

Figure 3. The Phoenix Imperative (Alternative View)

Figure 3 provides an alternative view of the model that is not overlaid on the three-tiered business concept but attempts to demonstrate the ever-widening character of the maturity. As ideas and tools are created within the three groups—which are frequently intermingled to ensure cross pollination and technology transfer—they accelerate the swirl, broadening its scope and reach. Eventually, the organization starts emitting ideas, processes, methods, tools, papers, patents and the like—perhaps even exerting influence on an industry segment or two. Ultimately, as the organizational energy builds, it can be focused in the context of a well-defined vision, which tends to direct the energy into appropriate growth.

Level 1: RESPONSIVE

A responsive service provider is a boon to any client organization. Responsiveness is measured in many ways ranging from simply following directions in the execution of a task to bringing appropriate talent to bear on a particular problem in a timely fashion. An organization that has mastered the art of responsiveness has achieved the first level of maturity.

A responsive organization is procedural in focus. Its employees are executing the day-to-day tasks that are necessary to engineer a system using the procedures of the client. The services provider is beginning to develop an understanding of the needs of the client and beginning to capture their vision. This may include unlearning habits and practices developed within another client. The provider must adapt to the particulars of the customer or it will cease to be responsive. Employees of a responsive organization are participating in the culture of the customer and are, in fact, becoming indoctrinated.

A responsive organization may perform ad-hoc development and application of concepts and processes for the benefit of the client in an effort to become *more* responsive. These concepts are typically informal and perhaps minimally supported by ad-hoc tools and procedures, but are sometimes important enough to share with other members of the provider staff, who are perhaps supporting other clients. This sort of cross-pollination is vital in a maturing organization.

Engineers in responsive organizations, once safely entrenched in a customer organization, sometimes feel no need to look outside their immediate customer's day-to-day work. As long as the customer remains pleased to have them aboard, they feel there is little point in learning what else is occurring within their own provider organization or in other customer environments. This kind of internal focus, while initially rewarding for both teams, tends to impede the future effectiveness of the provider organization and limits growth. A maturing provider organization will have a much broader vision and be aware of business development opportunities. It is here that the management must step in and encourage the principles of "systems thinking" (Senge, 1994). If each employee of the provider organization is not seeing how they relate (or could relate) to other parts of the organization, the provider can be crippled.

Business development by a responsive organization is done mostly via word of mouth within a client organization. Work performed well is its own best marketing tool and tends to lead to follow-on work. Growth enables investment that leads to maturity. More staff means more revenue for the provider organization and (hopefully) more profit. Hence, there is typically more ability to invest profit or overhead dollars in advanced concept development, tool development, authoring white papers, etc. These efforts contribute to the provider's ability to mature into an *Inventing* or *Leading* organization.

One of the major struggles faced by any engineering service provider is fighting the "body-shop" mentality. Incidentally, this mentality can usually be observed in the staff of both the service provider and the client and is especially prominent when the provider is at the *responsive* level. Staff augmentation roles tend to resemble job-shop positions, beltway-bandits, or even "temp" hires no matter how hard the organization tries to overcome such stereotypes. The maturing organization strives to attack these issues on several fronts and continue growing. First and foremost is having a clear, well-documented, and broadly published vision that demonstrates that the provider organization offers more than what is currently observable in the current customer landscape.

A service provider organization should do more than inform its employees that they are not a body shop. Company sponsored luncheons, corporate golf shirts, bonuses, awards, and other such "stock" team-building approaches are only a part of the required formula. A clear vision must also be established so all can understand and work toward it. The management of the provider must offer its employees direction and training in business development tactics for specific business landscapes.
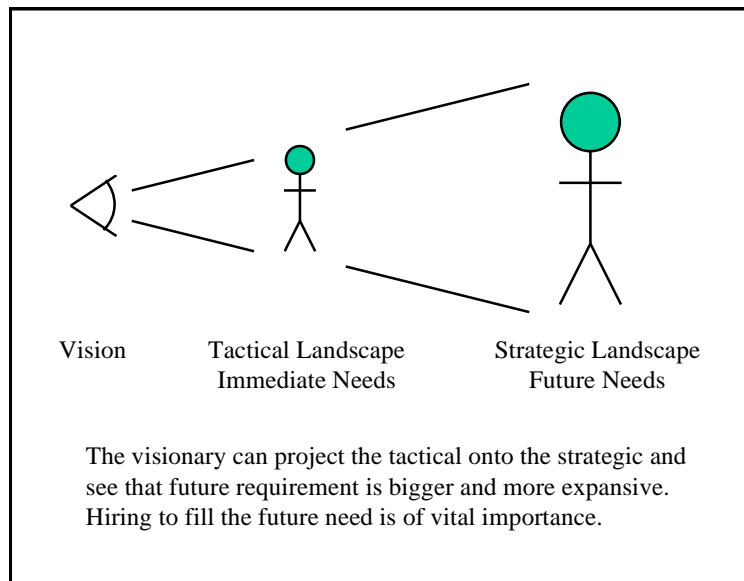
Figure 4. Critical Balance of Tactical and Strategic

Here also the balance of the strategic and tactical is important. Managers within the maturing provider organization must hire to meet the anticipated tactical needs of the customer, while at the same time keeping in mind the strategic goals defined by the vision of their own organization. For example, a client may need a software engineer or C++ developer, but the service provider—based on the vision for growth and knowledge of future goals—hires a C++ programmer with a background in, say, artificial intelligence or imagery. This kind of maneuver not only satisfies the immediate need of the client but also anticipates the future of both the customer and provider organizations. This concept is depicted in Figure 4. The new hire can be briefed that he is part of the strategic growth goals of the company and can be challenged to participate in that growth. Usually, this information will be provided during the interview process so the new employee joins with the expectation of this growth challenge.

The Kano Methodology

An aspect of a maturing and dynamic organization which is first evidenced at the *responsive* level is implementation of the Kano Methodology (Boar, 1993, p. 210). Using this methodology as adapted for the *Phoenix Imperative*, the service provider partitions customer satisfaction drivers into three categories:

(1) *Threshold attributes* are those basic and important things that a service provider offers which quickly reach a saturation point for the customer. Threshold attributes are used to open doors of opportunity. Their immediate payoff is high but additional focus on these areas offers little return on investment. Though it varies from project to project, an example might be a quick turn-around on new hires or experience with particular tools. While early in the customer/provider relationship the customer might appreciate this provider benefit, later it might be less important as its own staff grows or becomes accustomed to the tools. Threshold attributes can open the door but unless the organization provides more substance, growth and longevity cannot be guaranteed.

(2) *Performance attributes*, evidenced more in an *Anticipating* (level 2) organization, are those attributes of a provider that deliver linear return on investment to the customer. The more the service provider delivers in these areas, the more satisfied the customer becomes. Investment in performance attributes guarantees customer satisfaction and future growth for the service provider. Continuing with the examples above, the consistent delivery of the correct domain expertise at the right time and right price illustrates a performance attribute. Delivering quality work products on time and within budget tends to fall into this category as well, though is less easy to quantify. Frequent exercise of these attributes makes the customer-provider relationship self-perpetuating. The customer becomes comfortable that the provider knows what is required and will "be there" with a quality solution.

(3) *Excitement drivers*, clearly seen in *generalized* and *inventing* (level 3 and 4) organizations, deliver exponential return on investment to the customer. They have extraordinary impact on the customer and tend to more than satisfy customer expectations. Investment in these drivers has supreme payoff *when the service provider can successfully reposition them as threshold attributes that its competitors simply cannot deliver*. Hence, the cost of entry

(the ante) has been raised to such a level that the service provider enjoys a position difficult to equal. Examples of excitement drivers might include tooling, automation, cycle time reduction, and innovative solutions. These concepts are summarized in Figure 5.
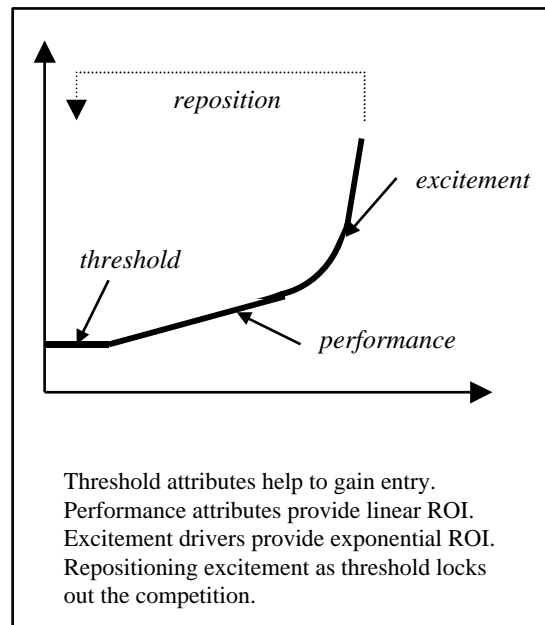

Figure 5. Kano and the Service Provider

Clearly, responsiveness is a vital step in the maturation process for an organization, but it is only a first step. Solid delivery of quality work products, clearly enunciated vision within the provider organization, hiring practices that focus on the strategic goals while satisfying the tactical needs, and understanding the Kano methodology drivers is vital for an organization desiring to step up to level two.

Level 2: ANTICIPATING

The anticipating organization has first been successfully responsive for some time. So responsive, in fact, that they can begin to execute the client's policies and procedures with little thought about the mechanics. They can put the nuts and bolts execution of tasks on automatic pilot and begin to think about the bigger picture, predicting and anticipating needs of their client instead of simply responding to direction. Note that this doesn't necessarily imply extended tenure with the client although usually that is the case. Sometimes a responsive organization comes up to speed quickly and begins to anticipate due to its broad exposure to similar processes and procedures with other customers (see *Generalized*).

The anticipating organization can usually be considered *automating* as well, because it anticipates ways in which policies and procedures can be automated, improved, or streamlined through application of information technology. In fact, successful automation often becomes an excitement driver to the customer and allows the provider to move along the Kano curve. Sometimes the anticipating organization has so thoroughly adopted the culture of the client that it can predict their next steps and be ready to develop tools to make the mechanics of those tasks easier or more effective. Further, because they have anticipated the move, they can help the client do what's right, instead of what seems expedient at the time.

An anticipating organization is often viewed as a more capable provider than other contractors. This organization is approached first when needs arise because, since they have historically anticipated similar needs, they at least will not be surprised by an issue and might already have a solution in their toolbox. Usually their opinion is highly regarded in these cases since they had anticipated the issues.

Rapid turn-around on solutions is important. An anticipating organization is noted to be "a cut above" the rest because they are improving the client's processes or reducing cycle time. This kind of contribution is "over-and-above" being responsive. The provider is usually anticipating needs and solving problems before they become major issues, or, they are simply surfacing issues that would have been neglected until it was too late to manage effectively. This allows

the customer to solve problems quickly, and sometimes even circumvent them. The anticipating organization is a team member, not just a contractor.

The anticipating organization also participates in concept formalization and development of formal tools to support and automate the methods, procedures and processes of the customer. The provider's teams formalize concepts to the extent that a product concept can be developed and a tool concept launched. This is often accomplished with already available development tools, on uncompensated overtime (see *Redemptive Subversives* below), in a rapid application development (RAD) fashion to reduce cost and maximize utility. The focus is on making the customer successful.

The anticipating organization relies much more on tools than does a responsive organization. It has first determined there are ways in which processes can be automated or facilitated via readily available system engineering tools and then has gone the extra mile to develop additional tools in support of these well established processes. It is in an anticipating organization that the performance attributes of the Kano methodology are clearly evidenced.

It should be noted that an anticipating organization starts to tread the uncomfortable waters of "showing-up" the customer and runs the risk of being stymied in its efforts because of fear, pride, etc. For this reason, it is important that anticipating organizations keep attitudes in check and master the diplomacy of redemptive subversion—a characteristic that begins to appear in anticipating organizations.

Redemptive Subversives

The anticipating organization must discover the concept of performing as redemptive subversives within a customer organization. This is a key feature—a Kano "performance attribute"—of the anticipating organization. Redemptive subversives are simply trying to improve their lot by improving the practices and procedures of their client; however, they do it behind the scenes and without fanfare. First proposed by Robert Henderson (1986) as a means of bolstering the sagging spirits of lay people in religious organizations, this concept has much broader application, especially for providers of systems engineering services who are well along the path to maturation. The anticipating organization is hopeful—within reason—that with diplomacy it can propel the client along a path they may not have envisioned, but will certainly want to walk down once they see it. The service provider is "redeeming" the client, but without them knowing it. This means that as a redemptive subversive, the provider is assisting in the maturation process of the client.
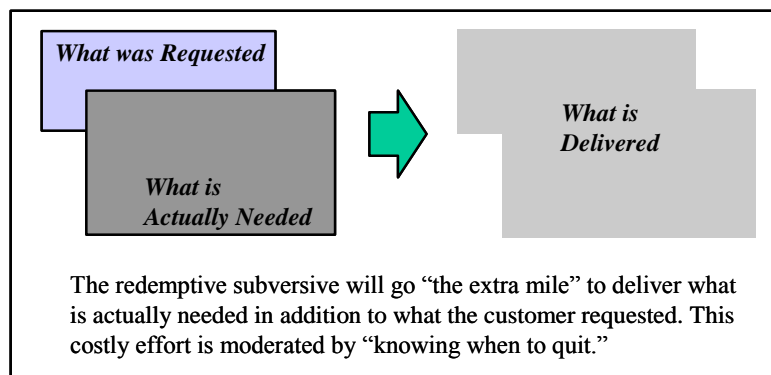

Figure 6. The Redemptive Subversive Concept

The concept is simple and depicted in Figure 6. A redemptive subversive knows what a customer needs, sometimes better than the customer. Why might a service provider understand the need better than a customer? It has to do with their tenured exposure and expertise and, frankly, often that is why the provider is hired in the first place. Upon receiving customer direction to perform tasking that ultimately will not provide the customer what it needs, the redemptive subversive will go the extra mile (usually on uncompensated overtime) to deliver what is really necessary. Why would the provider do so much extra work? First, it is important that a project is successful. If the customer fails then the service provider fails as well. Second, the anticipating service provider is a "cut above" the rest. They are known to go the extra mile to provide exemplary services. The question arises then, how long does this go on? How long will the redemptive subversive "take it out of his own hide" to redeem the customer? As you might expect, it depends on the situation. What we have discovered is that with some tact and diplomacy, the customer can be quickly brought along to agreement on the appropriate approach.

In summary, the redemptive subversive must remember the following principles when attempting to redeem the customer:

1. The customer is always right, so you must provide what was requested.
2. The customer is sometimes wrong, so you must provide what is really needed.
3. Humans have limited energy, so you quickly try to "convert" the customer, and know when to quit.

All this must be done with tact and diplomacy and without arrogance or offense.

Delivering on expectations before they are expressed sets the anticipating organization apart from the rest. From the "anticipating" step, the service provider organization can clearly see the path to the next level of maturity.

Level 3: GENERALIZED

A generalized organization has learned from its past customers that new customers will need similar or slightly different support. The key performance attribute at this level is the ability to discern which tools and techniques to reuse and which to discard. In a generalized organization the system engineering teams formalize and generalize tools and processes such that other customers can benefit from their use. Reuse of tools and concepts by a new customer requires the help of a team within the service provider organization—another self-perpetuating aspect of the provider because, while the concepts have proven beneficial and worthy of replication, the tools and processes are typically not polished enough to be used or applied without those experts that developed them. That is, the service provider organization is benefiting from internal cross-pollination. It is important, however, that some of the rapidly developed and deployed tools and prototypes developed by the anticipating organization have solidified sufficiently to be trusted in another customer shop. They need not be ready for "shrink-wrap sales," but they must have proven utility.

The generalized organization is characterized by expansive thinking. It begins to think outside the box established by the current client and considers the *next* customer. By coordinating with other customer teams they begin to display the characteristics of Senge's learning organization: "Within organizations, team learning has three critical dimensions. First there is the need to think insightfully about complex issues... Second there is the need for innovative, coordinated action... Third, there is the role of team members on other teams." (Senge, 1994, p. 236). The generalized service provider is constantly assessing application of best practices used elsewhere. They are also attempting to carry these practices to the next logical level, generalizing solutions through the extraction of timeless principles (Figure 7).

The generalized service provider takes (non-proprietary) lessons-learned, concepts and ideas developed for various customers, combines them, and makes them available to other customers. As appropriate, the generalized provider feeds this collective wisdom back into the current customer base.
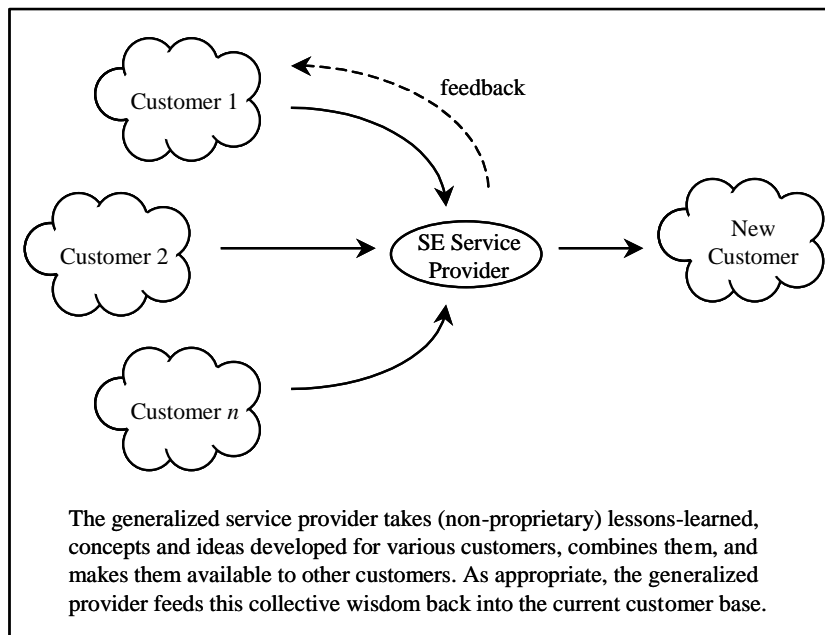
Figure 7. The Generalized Organization

Further, the generalized organization is constantly comparing customers, attempting to see the current customer in the light of the others (past, present, and future). Constant attention is paid to determining which practices and tools apply and which do not. Filters and biases are applied to ensure the future applicability of candidate concepts. How is this constant vigil managed? How can each system engineering team keep an eye on the others? It is by understanding the need to manage personal capacity. The benefits are fully evidenced by organizations that have reached the *inventing* level, but it is at the generalized maturity level that the ideas begin to take shape.

Personal Capacity

An engineering services organization must pay close attention to the personal capacity of each employee. It is this capacity which the organization exploits for maturity, future growth and business development. Again, Senge admonishes: "Individuals learn all the time and yet there is no organizational learning. But if teams learn, they become a microcosm for learning throughout the organization" (Senge, 1992, p. 236). A provider organization that takes ownership of individual personal capacity can ensure team learning.

Figure 8 depicts a simple, notional model of a business landscape, and hence, an environment for idea exchange. It shows notional *personal capacity* (Roberts, 1995) areas representing what a person can manage emotionally, intellectually, physically, etc. These capacity ovals tend to define each individual's reach and show the extent of their impact on the world around them. *Occupational drain* indicates the portion of a person's "whole" that is consumed by their occupation (note that for simplicity the *personal drain*—the impact of the personal life, family, friends, etc.—is not shown). While an individual *can* exert significant personal control over their occupational drain (e.g., a workaholic's occupational drain atypically consumes far more personal capacity than a more typical employee) the occupational drain can be largely controlled by the organization and the tasking it levies on individuals. Senge would call this "removing the factors limiting growth" (Senge, 1994, p. 95).
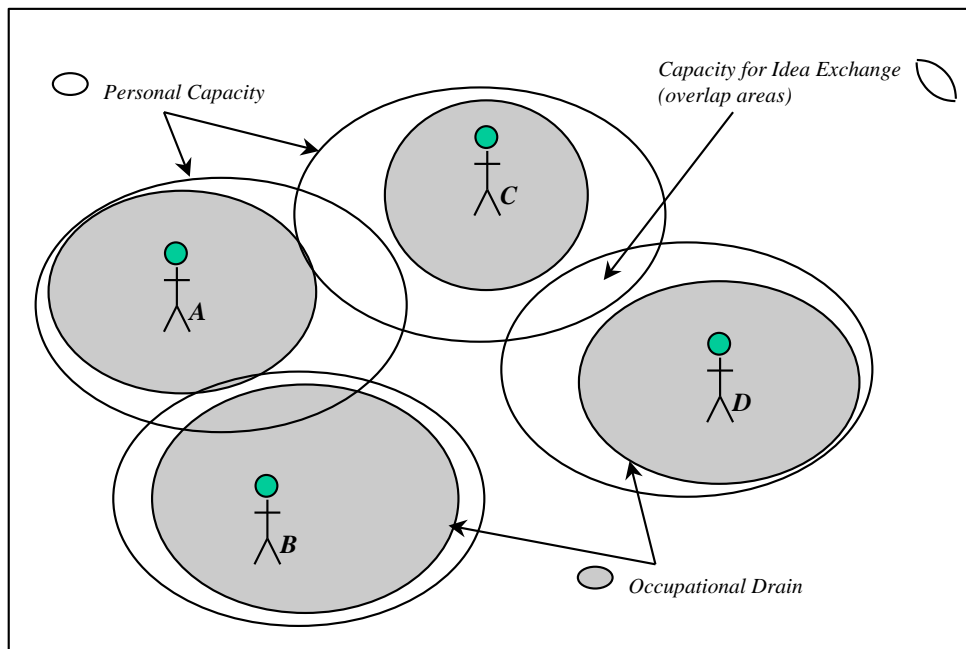

Figure 8. The Environment for Idea Exchange

Overlaps in personal capacity areas indicate areas where individual worlds collide. It is here that ideas are exchanged, honed, solidified, discarded, extended, etc. The extent to which the occupational drain *consumes* personal capacity is the extent to which an organization *impedes* idea exchange, growth, etc. Hence, an organization *can* foster *generalizing* and *inventing* (level 3 and 4) behavior by ensuring appropriate tasking. Overwork tends to limit the sharing of ideas (or elicit some bad ones like "let's quit!") while, often forgotten, under-utilization or misappropriation of talent may cause regression in personal capacity. In these cases management must encourage growth toward personal mastery (Senge, 1994, p. 141). In all cases, the generalized organization will not neglect to develop the ability to *expand* the personal capacity through exposure to journals, stretching experiences, training, etc.

The generalized organization also begins to evidence the excitement drivers of the Kano methodology mentioned above. It is because of the leverage of past successes that the organization can begin to offer tools and services that set it apart from others (including "job-shops" that provide high quality individuals, but no true service package with accompanying toolbox).

Finally, a generalized organization will determine to purposefully bring different groups together to force idea exchange. Figure 9 exemplifies a fairly diversified system engineering services organization. This is depicted by numerous small clusters of employees working in specific domains of expertise and with different customers. Note that each is appropriately responsive to their customer, but that no two teams are really "going in the same direction." At some point, either precipitated by an event like a customer request for proposal (RFP), or purposefully driven by management (e.g., business plan update, vision statement review, internal research project, etc.), the organization convenes groups of employees to work toward a common goal, hence exploiting the corporate web-of-influence (Roberts, 1995). This grouping provides at least three benefits. First, employees are given opportunity to work directly with other employees of the service organization. Often, the current tasking does not permit this due to the expansive customer base, or domain-of-discourse differences. Second, employees are given the chance to feel a part of the larger organization. One of the chief problems with service organizations is that they can begin to resemble body shops if care is not exercised to share the vision (Senge, 1994, p. 211). This purposeful coming-together can assist in the feeling of the corporate mentality and can be a crucial team building exercise. Third, a side effect but no less planned, is the incredible attraction that a dynamic learning organization has for new talent. When the vision is clear, dynamic and energetically communicated, word gets out and talent is attracted. People *want* to work for a maturing service provider.
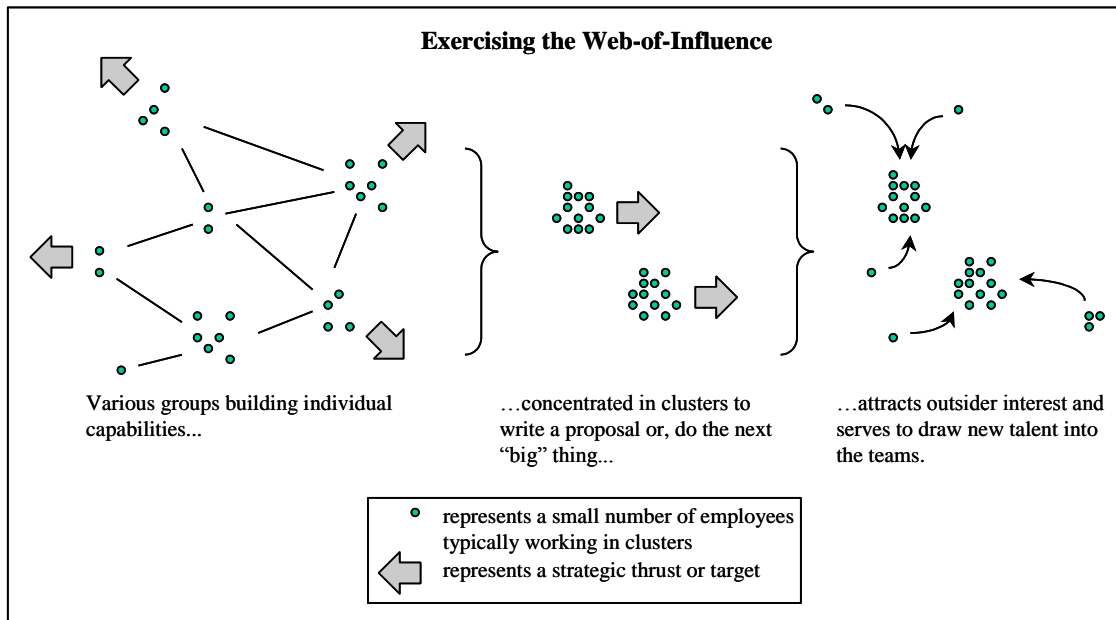

Exercising the Web-of-Influence

Various groups building individual capabilities...

...concentrated in clusters to write a proposal or, do the next "big" thing...

...attracts outsider interest and serves to draw new talent into the teams.

represents a small number of employees typically working in clusters

represents a strategic thrust or target

Figure 9. The Web-of-Influence in a Generalized Organization

Our experience shows that the generalized service provider will likely receive frequent requests for hiring from personnel of providers with which it interacts and competes. Other contractors will consistently contact a generalized provider when they feel the absence of a clear vision in their company. An exciting and dynamic service provider may actually experience customer employees requesting work when the vision of their corporation fails them. Often, such job-seekers directly attribute their interest to the dynamic discussed above. Usually, vision and clear segues to the future are some of the underlying features that draw them.

Tenure with a single customer *is* important. If the service provider has been successful in "infiltrating" the customer organization, it often collectively knows more about the customer than many of the mid-level managers within the client (Roberts, 1995). Further—and very important to a customer who feels they may have been "taken over" by the service provider—the service provider supplies a vital link between sub-organizations within the parent that typically would not communicate. It is arguably, a free service they provide to the customer. Essentially, the service provider creates a more productive personal capacity landscape for the customer. Note in Figure 10 how service provider

employees (red circles) can be found in many parts and many levels of the customer organization. If this provider is generalized, it can provide connections that are not supported by the customer, offering benefit over and above the assigned work. This dynamic has been witnessed on numerous occasions.
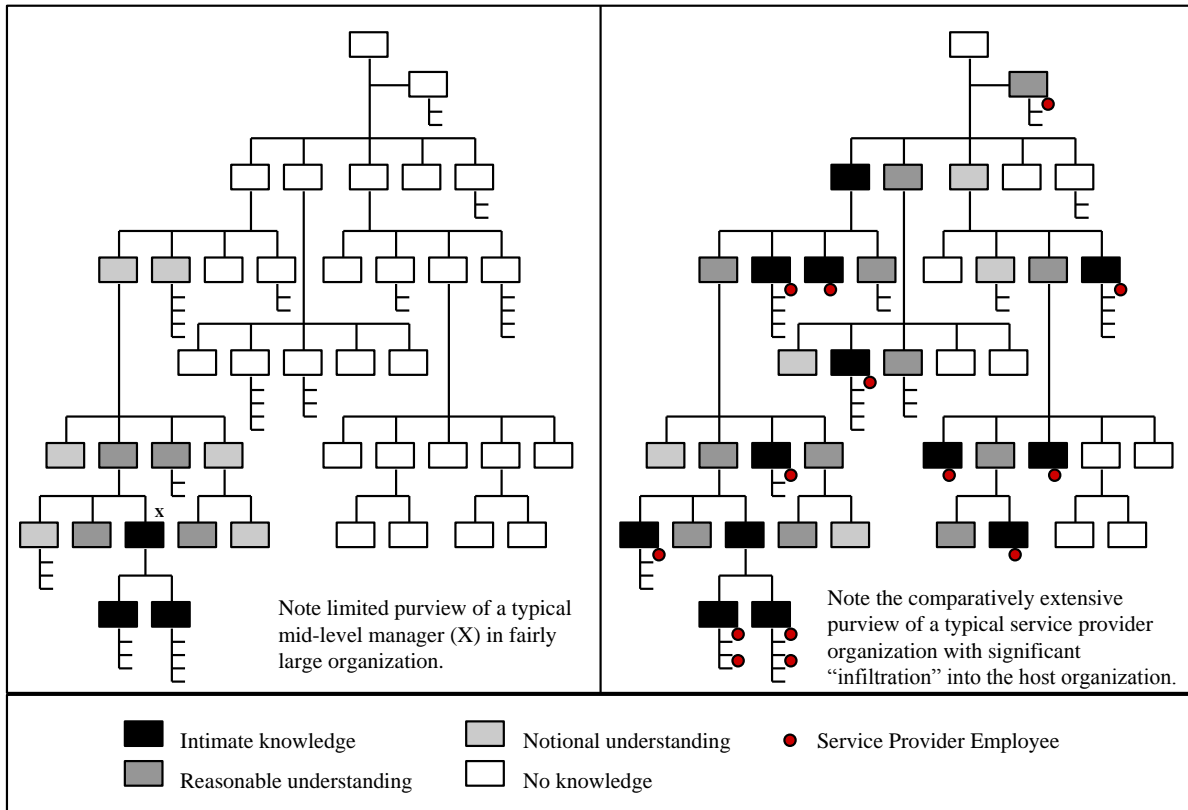

Note limited purview of a typical mid-level manager (X) in fairly large organization.

Note the comparatively extensive purview of a typical service provider organization with significant "infiltration" into the host organization.

■ Intimate knowledge   ▨ Notional understanding   ● Service Provider Employee

▨ Reasonable understanding   □ No knowledge

Figure 10. The Helpful Parasite

Typically, a manager (marked "x" in Figure 10, lower left) will have nearly intimate insight into what's happening both up and down one level on the organizational hierarchy. At a distance of two organizational levels, there is significant insight, but not nearly as intimate as those relationships that are close to or controlled by that manager. The insight and influence begins to wane at three organizational levels away (both down and up), and by about four levels, it is gone. The generalized service provider, who understands the dynamics of *redemptive subversion*, *personal capacity* and *web-of-influence,* can provide vital links within the client, making connections and instigating communication that would not exist in their absence.

This concept is illustrated in the world of nature with the crocodile and the crocodile bird that acts as its maid— a helpful parasite. The crocodile (the customer) could at any time indulge in a tasty snack, but instead allows the bird (the services provider) to clean its teeth because of the benefit both derive. This concept of mutual benefit must be understood and acknowledged by *both* the management of the client and provider organizations. Maturing and progressive organizations will understand that *the whole is sometimes greater than the sum of the parts*. The service provider need not be viewed as a threat, but as an important part of the team.

Level 4: INVENTING

A *generalized* organization has purposefully collated successful processes and ideas from several customers and applied them to a new customer. This kind of reuse is required before the next level of maturity can be reached. At the *inventing* level, the provider organization is not only taking best practices from one or several customers and making them useful to new customers, but they are inventing new ideas and injecting these concepts into their customer shops (refer back to Figure 1). This ability to perform concept injection is similar to Senge's "reinforcing feedback" and can be

a significant "engine of growth" (Senge, 1994, p. 79). Concept injection demonstrates several things. First, it reveals the provider's depth of experience and exposure in the field. Second, it shows the need for these ideas in the workplace. Third, it demonstrates a fundamental trust of the provider by the customer organization (otherwise the ideas would be rejected before they were applied or instrumented). Finally, it shows the ability for the provider organization to take some risk in offering the ideas. Obviously, they could be rejected outright (correctly or incorrectly) or even "stolen." Here again, the service provider is interested in perpetuating its work and extending its client base. To a certain extent, the provider can take some risks in sharing such technology in hope of getting more work.
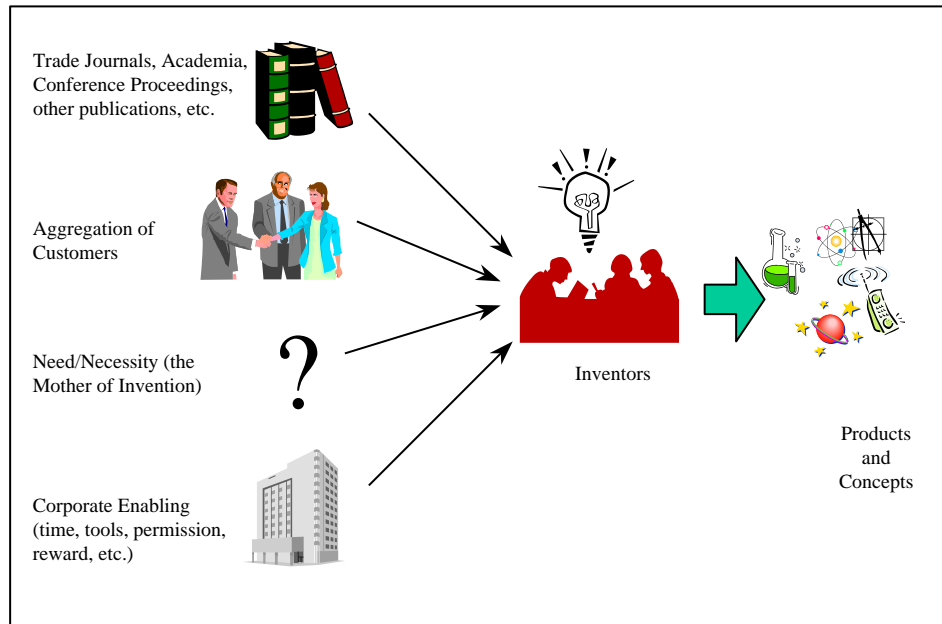

Figure 11. The Inventing Organization

The well-understood invention process is not covered in detail herein. Figure 11 provides a notional depiction. For our purposes it is sufficient to say that the system engineering service provider has matured to the extent that it is feeding the organizational development spiral (Figures 1 and 3) with new ideas that are originating internally (concept injection). Typically, these ideas are not directly derived from the needs of an immediate customer nor are they (necessarily) directly applicable to the current customer base, but they must have some commercial relevance or salable value in the marketplace.

Within the inventing organization, Kano excitement drivers are being developed as the service provider brings significant inventive energy to the client organization. These ideas truly "sell" the provider organization into new business areas, both with current and new customers. They set the organization apart from the rest. The provider must also learn to reposition these invented ideas as threshold attributes to ensure that competing organizations are clearly deficient, leaving them as the only organization that can provide the required solution.

Through management of personal capacity and by creating a learning organization, the provider organization fuels the creative process. It must support creative employee thinking. It must reward the development of new concepts, and better ways to implement solutions. This is a clear indication of a progressive and maturing organization. Often, these concepts can be and are organized into preemptive strikes that must be exercised at opportune times in both marketing and productization endeavors. Obviously, this demands corporate attention. If they fail to be exploited at the proper time, these ideas could miss their market window.

The inventing organization understands that the process requires some corporate investment. The provider organization must not only support the invention process with tools and financial resources, but it must also commit to "freeing up" the personal capacity of the individuals involved in the invention process. This includes overhead expenditures and, often, significant efforts to extract a qualified employee from a paying customer account. If the hiring practices discussed above are followed (see Figure 4), these employees are *already* in the organization, and it is simply a matter of freeing them to perform the inventing tasks. Obviously, the service provider need not take unnecessary risk in allowing employees to do whatever they want. Formal approval procedures can be established to ensure that the best ideas are funded.

A major concern for an inventing service provider is a very human tendency to become arrogant or have delusions of invulnerability or indispensability. Sometimes the service provider, knowing more about the customer organization than the customer itself (refer back to Figure 10), falls out of favor due to poor diplomacy or political faux pas. Hence, as the provider matures beyond the client, care must be taken in the exercise of influence. Also, over-marketing may garner unwanted exposure or responsibility. Blame will tend to be assigned by the customer whether or not it is warranted.

As a provider of services grows, there is very real potential for sub-organizations within it to spring up and start maturing on different paths, or into different engineering disciplines. This is a wonderful eventuality. However, there may be a tendency for other sub-organizations within the service provider to assume a "been there, done that, doesn't work" posture in relation to their brothers-at-arms. For whatever reason (e.g., petty politics, jealousy, fear of overlap or intra-organizational conflict of interest, financial issues) this tends to dampen the spirit of the maturing sub-organization and leads to relational strain in the overall organization. This must be prevented by clear lines of communication, shared decision making processes, and ensuring that the inventing organization is supporting the corporate vision. Very simply, this is a management challenge.

Often, there will be a tendency for higher levels of management within the provider organization to "wait and see" instead of exercising the preemptive strikes that are required to be first to market. An inventing sub-organization can legitimately be required to "prove" (within reason) their concept is salable and profitable prior to garnering the support required to develop the concept. Obviously, this becomes a "chicken and egg" conundrum and is not easily solved. Experience shows that some level of trust must be built and earned by the sub-organization prior to the promise of any investment from the upper level management. Some amount of risk must be incurred, however, or nothing will ever come of the inventions. This balance must be struck and is another management challenge.

Marketing approaches change at the inventing level to become more "organizational" in nature. Ideas are noted for their individual merit (in both industry and academy) and attributed to the organization. Corporate name recognition begins to become key and the emphasis on individual résumés starts to wane. This is fully observable at the next maturity level (leading), but starts to be evidenced in inventing organizations.

Obviously, the inventing organization must concern itself with intellectual property issues as well. Organizational ownership is important to the longevity of the service provider. If the corporation does not own its "toolbox," there will be difficulty in exploiting it with other customers.

Once concepts are developed enough to be placed into the corporate toolbox, they can persist without the need for star players to "carry" them. The trained organization—not the individual—becomes predominate. "Concept tooling" is emphasized by the inventing organization as a means to perpetuate the ideas and make them accessible to newcomers both inside and outside the organization. Eventually both methods and tools mature to the extent they can be deployed without a staff to follow them, i.e., they can be marketed as "shrink-wrap" products or concepts. Now the service provider organization can be said to be leading the industry.

Level 5: LEADING

The *leading* service provider is *publishing* its wares (concepts, tools, etc.) in forums that invite critical peer review and feedback. They are also *promoting* their services based on a history of success and strong domain experience. Further, the leading organization is *leveraging* the toolbox that has been assembled and is exploiting it in developing new business by repositioning it as the minimum entry criteria for its customers—the final, critical step in the Kano method.

Ultimately, the leading organization is a *driving* force for its customers. This kind of maturity is often requested to offer guidance and direction to the client. Not only does the provider offer domain expertise and support the traditional processes used by the client, but it is usually developing new processes and establishing new best practices within the client organization. The leading service provider is asked to play leadership roles in the future efforts of the client, often being trusted with a great deal of responsibility.
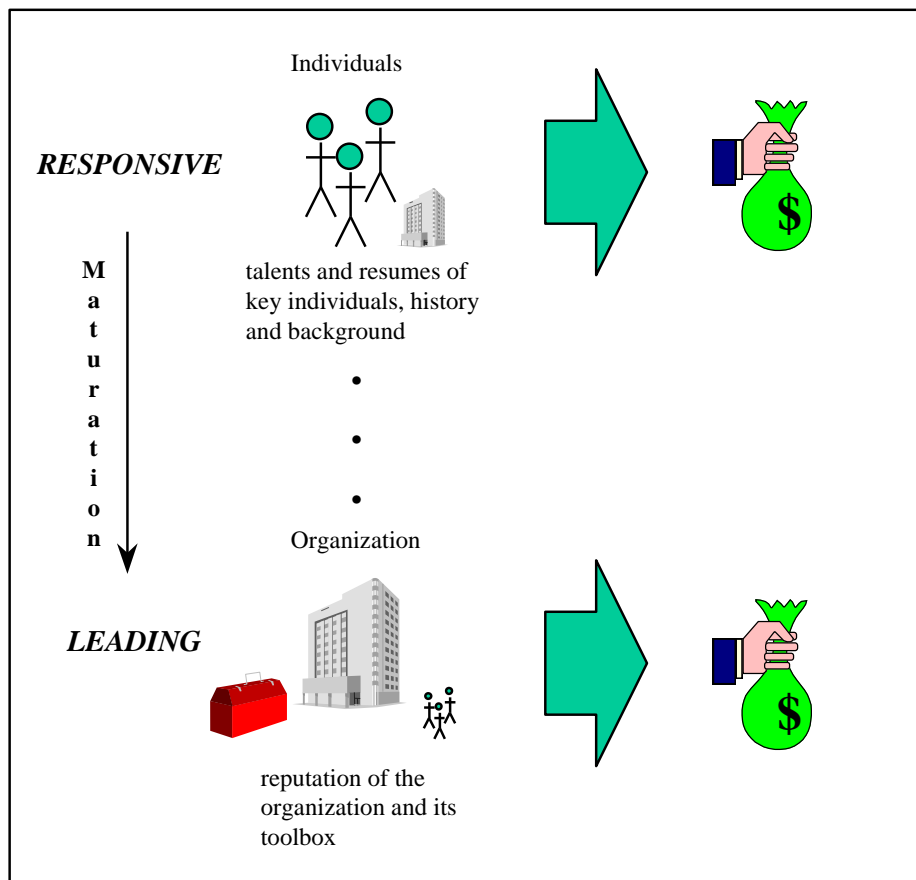
Figure 12. Progression from Responsive to Leading

Meanwhile the leading organization is busy productizing tools, concepts and processes and packaging them for shrink-wrap sales to external customers. Usually, when this occurs, the products are mature enough that they need not be supported by systems engineering teams from within the provider organization. Sometimes technology transfer itself can be the "product." Ideas can be packaged and exported through means of publication or training classes and symposia. Those trained (the new customers) can then carry the concepts back to their organizations and implement them with indigenous teams. In summary, a leading organization has matured to the extent that without further input from a customer, it knows the products it provides are useful to the purchaser in support of their systems engineering needs (within the specifically intended engineering disciplines).

The most important aspect of the maturation process from *responsive* to *leading* is discovering that "one thing" which ultimately "makes the sale" while they are executing at a particular level. This is shown in Figure 12. A responsive organization relies on the individuals it employs, their respective résumés, and their individual background and experience to make the sale to the customer. As an organization matures, individual's capabilities have less and less importance in making the sale. Instead, corporate capabilities and *the emergence of the organizational toolbox* provide the bait for the prospective customer. Note in Figure 12 the transition from individual to corporate capabilities in making the sale. Corporate capabilities include tools, history, background, reputation, and a host of other things. As a provider matures, the corporate name and the toolbox become paramount.

Conclusion

The *Phoenix Imperative* is both a business model and a maturity model for systems and software engineering service providers. Because this model focuses on the critical behaviors of a learning professional services organization—and not merely on the documentation products of the CMMI—it offers a far less sterile approach to measuring maturity. Engineering services providers targeting the strategies of this model will find they have much more to offer their clients than a simple list of documents to which they've become accustomed. Instead, they will have a wealth of generalized and practiced experience that, along with their toolbox, qualifies them to lead.

Appendix 1

Though not truly comparable, it is often helpful to view these models as depicted below in a tabular form that allows comparison. Note that the Phoenix Imperative more closely parallels EPIC's obsolete IPD CMM (see appendix 2) than it does the others (at the least at the lower levels). Once again, it must be stressed that the Phoenix Imperative shows the manner in which a service provider will develop as an organism—not simply as a documentation generation house. While the EPIC model reaches maximum maturity at Agile (where organizational behavior maps to the Phoenix Imperative's "generalized" level), the Phoenix model assumes an organization is interested in achieving far more.

Level	SEI SW CMM (1993)	SEI Sys Eng CMM (1995)	SEI CMMI (2006)	EPIC IPD CMM (1997)	The Phoenix Imperative
1	Initial	Informal	Performed	Aware	**Responsive**
2	Repeatable	Planned and Tracked	Managed	Involved	**Anticipating**
3	Defined	Well Defined	Defined	Enabled	**Generalized**
4	Managed	Quantitatively Controlled	Quantitatively Managed	Deployed	**Inventing**
5	Optimizing	Continuously Improving	Optimizing	Agile	**Leading**

Appendix 2

The Capability Maturity Model Integration (CMMI) project was formed to sort out the problem of developing multiple CMMs. The CMMI Product Team's initial mission was to combine three source models:

1. The Capability Maturity Model for Software (SW-CMM) v2.0 draft C [SEI 1997b]
2. The Systems Engineering Capability Model (SECM) [EIA 1998]
3. The EPIC Integrated Product Development Capability Maturity Model (IPD-CMM) v0.98 [SEI 1997a]

While not specifically in the charter, the CMMI also interleaved ideas and procedural input from the ISO 9000 standards for software development processes. Because of this merger, it makes it difficult to track the history of the source documents cited. It is recommended that the interested reader visits the Software Engineering Institute (SEI) website for the latest documentation.

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