A SERVICE SCIENCE PERSPECTIVE

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ABSTRACT

A shift from production orientation to a service perspective has been occurring in business disciplines over more than a century. During the last decade, that shift has provoked the emergence of significant and fundamental changes in the traditional means of adding economic value. Those changes are pressuring academia to provide commensurate professional education. This paper examines important aspects of these advances and their implications for curriculum development.
Key words: service science, curriculum, Living Systems Theory, innovation, traditional value stream, service value stream.

INTRODUCTION

Perspectives have limits. Recently, my granddaughter asked, "What does *customer* mean?" My reply was, "You know that. It is the person or company that buys your goods or services." "No, Papa, this is about lions eating antelope." I took the book and, to my amazement, the subject was environmental science instead of economics. As I read, I realized that the passage in question concerned the food chain–and the participants give their all. Service *ad absurdum.*

Notwithstanding the plethora of absurd perspectives masquerading as science, perspective is an essential element of discovery. Recently, the deterioration of a satellite designed to provide perspective made the news. It had been positioned in relationship to the Sun so as to give us the data to construct a three-dimensional view of our solar system. Multiple conceptual perspectives are every bit as important. It is in the conceptual realm of perspectives that paradigm shifts occur in science and in other disciplines of human inquiry.

This paper considers the service aspect of the shift of perspective from a *supply push* paradigm to that of *demand pull.* The fundamental shift is not new. It began to occur as the industrial revolution gave way to the preeminence of market and has accelerated since. That which is new is an emerging prevalence of the service perspective in the management and administrative literature. And, that prevalence is pressuring curricular change in professional education.

TRANSITION FROM TRADITIONAL BUSINESS VALUE STREAM TO SERVICE PERSPECTIVE

The traditional perception of the business value stream is supply push. While the terms used to describe the stream differ somewhat among disciplines, those of Figure 1 are

typical. The process starts with research and development and ends in customer service. The value stream describes an economic value added progression. The progression inures in the material systems. Each of the elements represents complex networks of the matter-energy subsystems described by Living Systems Theory (LST) (Miller, 1978).

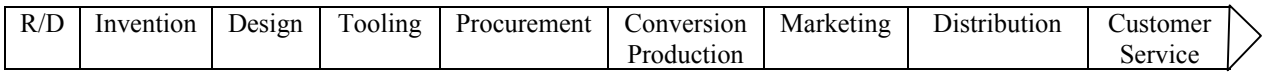

Figure 1
Traditional Value Stream

The service perspective of the business value stream is demand pull. Every business, and in fact every organization, is concerned with supply and demand. In the old perspective, production and distribution push demand to increase that which is being supplied. In the service perspective, demand pulls supply. The art of service is that of anticipating, forecasting, and supplying that which will be demanded. A science of service advances the propaedeutics of the art. That science begins with invention and design from a functional perspective.

The difference in the old perspective and that of service is both perceptual and actual. Both perspectives concern all of the typically included value-added elements in the value stream. In the service paradigm, however, the initial emphasis is on discovery and prediction. The focus is the market and the customer. The service stream begins with customer service. The old value stream *begins* with research and development (R&D). The change of emphasis, of focus, from R&D to customer service coupled with a spiraling into organizational extension constitutes a significant paradigm shift. It is a shift from input-throughput-output perception to that of symbiotic relationship. Figure 2 illustrates a service value stream. A transition from the traditional value stream may be conceived to start with *customer service* and spiral through continuous improvement and materials recycle loops of *the process of servicing customers*.

Figure 2 distinguishes among six pairs of related terms.

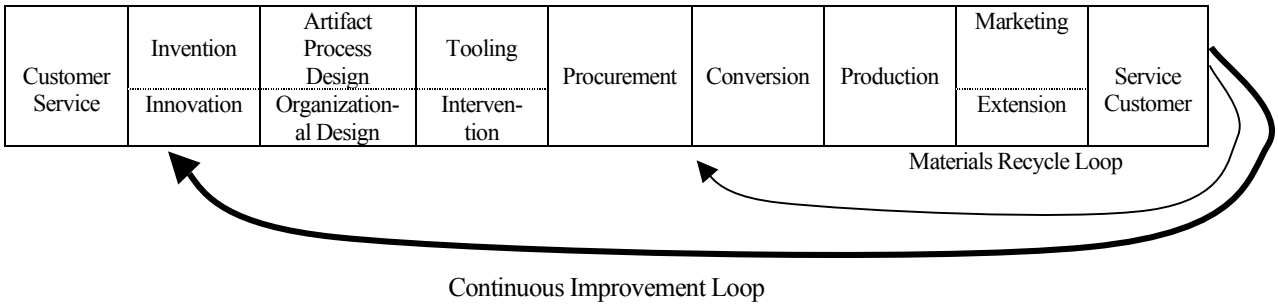

Figure 2
Service Value Stream

1a. Invention – to originate a device or process; as a practical matter, anything

that may be protected under patent, copyright, or trademark.

1b. Innovation – to originate a pattern of change in organization, such as in groups, organizations, and societies.

The term *innovation* as employed here, perhaps, requires the greater explanation. It is both more and less limited than that developing in current discussions. It is limited in its scope to social organization while being extended from conceptual to informational systems as defined by LST.

A wide body of literature is developing around the idea of innovation. The treatment ranges from means of inciting the dream, the science fiction that anticipates future technology, to the introduction of more analytic conceptual systems such as *mediating spaces* (Güney, Ing, and Simmonds, 2004), introduced as incubators of innovation and change. The theme that innovation may be enhanced by networking, synthesis, and even symbiosis runs through many of the discussions. Generally, the approaches rest on the two fundamentals that innovation progresses from the mental to the material and that the insight, the inspiration associated with its inception, is a process.

Innovation is mostly examined as a thought process, as conceptual systems. That is the case, even though the objects of concern are the advancing technology and complexification of human social organization. The approach reminds me of a statement that I believe is attributed to Queen Elizabeth I: "Life is but a bog. Those who trip lightly pass best." The discussions are occasionally dirtied with the shortcomings of communication. But mostly, the discussions trip lightly over them. Perhaps we should consider that innovation may be as easily viewed to progress from the material to the mental. There, science may more directly contribute to the conversation.

The elevation of networking, synthesis, and symbiosis to causal process subsumes that harmony is a default position of human interaction. IBM's *Global Innovation Outlook 2.0* (2006) presents an almost transcendental vision of cooperation within and across organizational boundaries in quest of innovation. "Forget about free enterprise. Think enterprise free." I wonder how many parents of more than one child would accept the harmony proposition at face value.

Despite their transcendental bent, the discussions are not esoteric or detached. They are an important aspect of the unfolding of a progressive understanding of innovation. The term *innovation* as a definitional element of the described service value stream, however, includes benefits, limitations, and consequences of dirtying origination with material informational actuation processes. Innovation feeds organization design as invention feeds artifactual design.

2a. Artifactual Design – to plan or delineate an original product or process.

2b. Organizational Design – to plan or delineate an original change in any social organization.

3a. Tooling – to fit out conversion and production processes with the infrastructure by which the process occurs.

3b. Intervention – to come in to modify or influence organizational process and structural change.

The elements of conversion and production are seldom clearly distinguished. Their distinctive meanings are important for understanding the service value stream. I, consequently, use Miller's definition of each to clarify the distinction.

4a. Conversion – to change "certain inputs to the system into forms more useful for the special processes of that particular system" (Miller, 1978, p. 3).

4b. Production – To form "stable associations that endure for significant periods among matter-energy inputs to the system or outputs from is converter, the material synthesized being for growth, damage repair, or replacement of components of the system, or for providing energy for moving or constituting the systems outputs of products or information markers to its supra system" (Miller, 1978, p. 3).

5a. Distribution – to divide and give out products and services.

5b. Extension – to stretch or to reach as to extend products and services. Extension may also be conceived as the extending of an entity's boundary to take in the function of another entity that is being serviced.

6a. Customer Service – intermittent service provided to a customer.

6b. Service Customer – Continuous service provided to a customer.

The shift to service should not eliminate the older perspective. The service value stream by itself would eventually stalemate in current technology even against its symbiotic advantages, if the input-throughput-output perspective does not continue its contribution. That will happen because research and development (R/D) is not conveniently included in the continuous loop of Figure 2. R/D drives the traditional value stream. It is a costly and inconvenient add-on to the service value stream.

TRANSFORMATION FROM *CUSTOMER SERVICE* TO *SERVICE CUSTOMER*

The traditional value stream is transformed to a service stream by the introduction of innovation, organization design, intervention, extension and increased emphasis on conversion. Figure 3 illustrates the spiraling effect of those introductions.

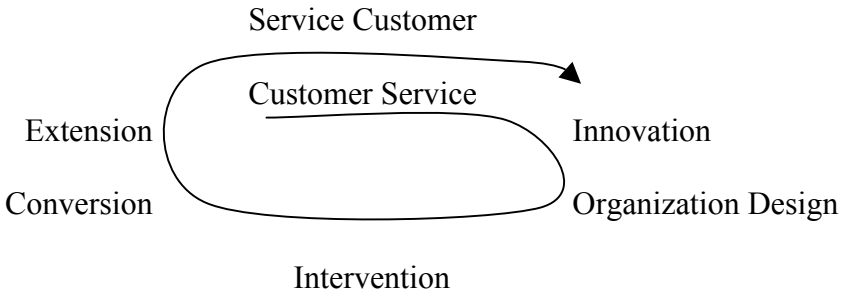

Figure 3
Service Value Stream Transformation Spiral

TRANSFORMATION FROM PRODUCTION-DISTRIBUTION TO SERVICE

Some organizations deliver products; some deliver services. Products and services may be idealized as the extremities of a continuum from matter-intensive to energy-intensive processes.

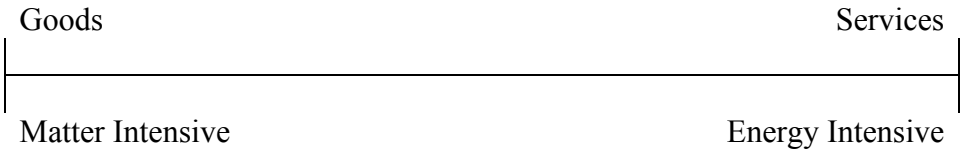

Figure 4
Products-Services

Even more abstractly, the extremities may be viewed as *form utility* to *place and time* utility (Figure 5).

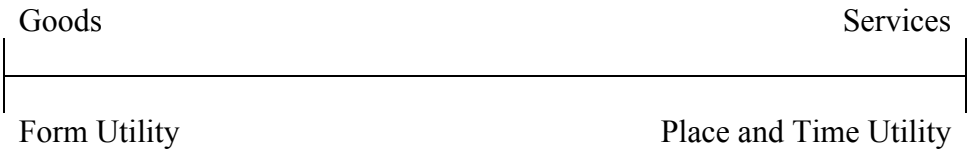

Figure 5
Products-Services

However the goods-services continuum is conceived, we must admit that there exist a lot more goods-services combinations than goods or services when they are defined in any objective or abstract space. Our concern is clearly with a continuum.

Given that universal relationship between products and services, the inevitable question should be asked. *Is there a universal transformation from products to services?* At least one exists.

Potentially, any product may be transformed into a service by taking the entire life-cycle of the product into the service process. For example, IBM's early leasing policy and the commercial carpet leasing of Interface Incorporated (Anderson, 1998). Such

transformations both gain the symbiotic advantage and aid environmental sustainability by recycling damaged and worn products.

While the life-cycle approach to products may provide a universal transformation, the grand expansion of service undoubtedly lies in another relationship. That relationship is between *energy* and *information.* The relationship may be idealized as a transition of meaning between the terms *negentropy* and *information*. The direct transition (negentropy_information) is the acquisition of knowledge and the reciprocal (information_negentropy) is power of organization (Beauregard, 1961). These transitions form a cycle of service (Figure 6).

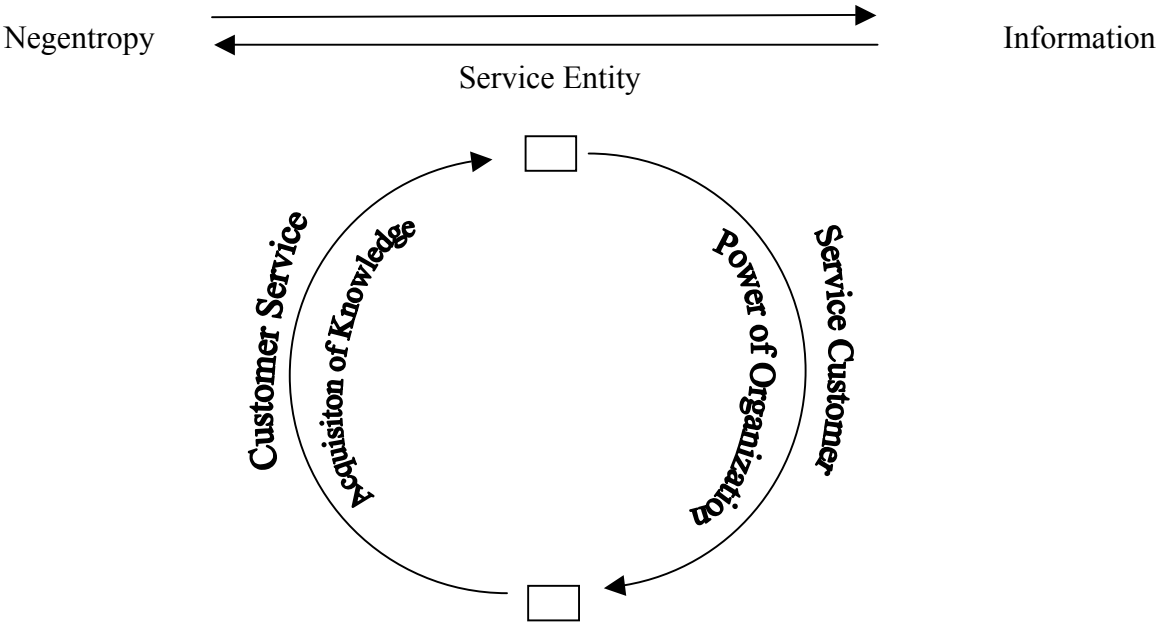

Figure 6
Energy, Information, and Service

Given the service value stream, with its continuous improvement loop, the cycle spirals into multiple layers of service. Take, for example, the function of gate keeping in a public transportation system (such as that in Tokyo, Japan,) that incorporates privately owned as well as publicly owned segments (subsystems).

The function of gate keeping most basically involves a porter who obstructs entry to the vehicle until payment of fare is received. That function is labor intensive on a certain skill scale. The basic function may be modeled as an exchange (according to Swanson, 1993) as follows:

$$CM^{C}_{1.0}\ CM^{TC}_{1.0}\ \ S^{TC}_{1.0}\ \ S^{C}_{1.0}$$

where the main terms are CM = Currency Money and S = Service, the superscripts are C = Customer and TC = Transportation Company, the subscripts indicate objective value on

a monetary scale, and the chain begins with outflow from an entity followed by inflow to the other, followed in turn by the outflow of the reciprocating transaction followed by its inflow to the initiating entity.

At least two levels of skill are needed by the gatekeeper – physical obstruction and money-handling. The higher money-handling skill aspect of the function may be specialized with the introduction of prior ticket purchase. This allows the employment of lower skilled porters with a reduction of the number of workers at the higher skill level. That specialization divides the money-handling process from the service process by introducing a different type of information–a receipt (ticket). Now there are two exchanges:

$$CM^{C}_{1.0}\ CM^{TC}_{1.0}\ R^{TC}_{1.0}\ R^{C}_{1.0} \quad R^{C}_{1.0}\ R^{TC}_{1.0}\ S^{TC}_{1.0}\ S^{C}_{1.0}, \text{where R = Receipt}$$

As it is discovered that the remaining skill needed by the gatekeeper is more mechanical than social, a machine is invented to accept the receipt and give access–relieving the porters for more socially productive work.

The function of gate keeping is complicated when the tracks or routes of two companies are connected; a new informational layer is needed. Four exchanges are now required.

$$CM^{C}_{1.5}\ CM^{TC1}_{1.5}\ R^{TC1}_{1.5}\ R^{C}_{1.5} \quad R^{C}_{1.0}\ R^{TC1}_{1.0}\ S^{TC1}_{1.0}\ S^{C}_{1.0}$$

$$R^{C}_{0.5}\ R^{TC2}_{0.5}\ S^{TC2}_{0.5}\ S^{C}_{0.5} \quad R^{TC2}_{0.5}\ R^{TC1}_{0.5} CM^{TC1}_{0.5}\ CM^{TC2}_{0.5}$$

Both receipt information and money-information are exchanged among customers, transportation company one, and transportation company two. The more exchanges required, the more potential for information service exists. All service requires in some degree labor, materials, and energy facilitated by money-information. Consequently, that which seems at first to eliminate labor simply moves it to a higher level of service.

Consider when multiple transportation companies are added to the system. For each additional transportation company, the following two exchanges are added:

$$R^{C}_{0.?}\ R^{TC3}_{0.?}\ S^{TC3}_{.0.?}\ S^{C}_{0.?} \quad R^{TC3}_{0.?}\ R^{TC1}_{0.?}\ CM^{TC1}_{0.?}\ CM^{TC3}_{0.?}$$

Since all transportation companies sell the tickets with transfer privileges, the customer initiated exchange and the initial service exchange plus all subsequent exchanges are performed by all companies. They, consequently, must each provide more and more specialized accounting and finance subsystems. That specialization provides the opportunity to introduce another level of service. A ticket agency can sell the tickets and distribute the money to each transportation company eliminating the duplicate subsystems and allowing the transportation companies to concentrate on their areas of expertise. In that specialization, no receipts and money are exchanged between transportation companies. The exchanges occur only between the ticket agency and the transportation companies.

$$CM^{C}_{5.0}\ CM^{TA}_{5.0}\ R^{TA}_{5.0}\ R^{C}_{5.0} \quad R^{C}_{0.5}\ R^{TC1}_{0.5}\ S^{TC1}_{0.5}\ S^{C}_{0.5\ldots}$$

$$R^{TC1}_{0.5}\ R^{TA}_{0.5} CM^{TA}_{0.5}\ CM^{TC1}_{0.5} \quad \ldots, \text{where TA = Ticket Agency}$$

Consider now the customers of the transportation companies. The customers transit among the companies in different patterns in their daily or weekly travels. Obtaining tickets for specific routes becomes complex and confusing. That complexity provides another opportunity to introduce another level of service. Tickets denominated in money value can be issued to customers to gain access to the amount of service desired without regard to which transportation company is providing it. This, of course, also requires a new layer of machine gates with information loops relaying the value of the service rendered by each transportation company to the ticket agency and reciprocating loops of payment. Notice that the exchanges being serviced remain the same as the previous level.

$$CM^{C}_{5.0}\ CM^{TA}_{5.0}\ R^{TA}_{5.0}\ R^{C}_{5.0} \quad R^{C}_{0.5}\ R^{TC1}_{0.5}\ S^{TC1}_{0.5}\ S^{C}_{0.5} \quad R^{TC1}_{0.5}\ R^{TA}_{0.5}\ CM^{TA}_{0.5}\ CM^{TC1}_{0.5}$$

Advancing technology drives this higher level of service.

Another level of service may be provided by expanding use of the money-valued receipts to obtain products from vendor machines and even subway mall outlets. A further level is introduced with automatic banking through implementation of debit card systems, and still another level through the introduction of credit through credit cards.

PEDAGOGICAL CONSIDERATIONS OF THE SERVICE VALUE STREAM

Davis and Berdrow (2008) provide an interesting overview of progress toward a service science orientation made over the last decade in business school curricula. While the progress is significant, it is not yet beyond an incubation stage. They conclude: "We therefore need to take service science to the next level and include academics who previously had not considered the study and teaching of service science to be within their respective realms of research or teaching" (p. 38).

The Master of Business Administration (MBA) is widely accepted as the standard of professional education for the traditional business value stream. The question of its adequacy for the service value stream may be raised. It may be that the spectrum of knowledge exposure required for the MBA is necessary but not sufficient.

It is likely that a Master of Science in Service (MSS) should provide insight into the various elements of the traditional business value stream (the focus of the MBA)–research and development, design, tooling, procurement, conversion-production, marketing, distribution, and customer service. The depth of such insight, however, would have to be diminished to make room for special insight into the service value stream. The MSS should provide special professional insight into service customer, innovation, organization design, intervention, and extension. Systems science and methodology provides a promising foundation for this significant core of knowledge. Significant systems literature concerns innovation, organization design, and intervention.

Glushko (2008) references the discussion of "T-shaped people." That discussion attempts to get at the need to educate individuals to varying depths of insight in several disciplines. He cites Brown's (2005) definition of principal skill (e.g., engineering) as the vertical leg of the T and an ability to "explore insights from many different perspectives . . ." as the cross-bar (Glushko, p. 16). Glushko contrasts Brown's view with that of IBM (2007) which defines the cross-bar as deep business skills and the

vertical leg as technical understanding. Brown's positioning of technical understanding with deep knowledge (principal skill) cannot simply be tethered with IBM's deep business skills in the frame of master-level education. Only 150 semester hours are available. Brown is correct as to the requirement for deep insight into the technical understanding of the functional processes that are to be serviced. That leaves only the cross-bar to be defined. There, curricular space dictates that the insight be something less than deep. I suggest two levels of insight be assigned to the cross-bar–general and specific.

The MSS and the MBA are structurally similar in that they both require an integrative core of knowledge. The two degrees, however, have very different content. The MSS provides three distinct classes of knowledge exposure. They are: (1) general insight, (2) special insight, and (3) deep insight. General insight roughly approximates that of a Masters Degree Minor (or Track). Special insight approximates that of an MBA core emphasis. Deep insight equates to that of business and engineering entry-level education requirements. General insight is provided into the traditional value stream processes. Special insight is provided into the service value stream processes. Deep insight should be obtained mainly through entry requirements. A baccalaureate degree providing deep insight into special processes should be a prerequisite to the MSS program. For example, an MSS with a major in *design* should require a *BS in engineering design* or other related undergraduate degree. Additional specialization should be introduced to the design major by requiring course work in *research and development* and *customer service* as part of the special insight provided at the Masters level. Another service target might be a production process. Industrial, mechanical, electronic, even nuclear engineers may be eligible for the MSS production major. Probably the industrial engineer is the natural candidate. The special insight course work for *production major* would include *procurement* and *tooling.*

Service may be introduced to customers in any of the value chain processes (Figure 7). Consequently, MSS degrees are likely to be more specialized than MBA degrees. The possibility that a major (or emphasis or track) approach might provide the conceptual space to incorporate the insights into secondary value chain processes should be considered.

The perspective of service technology as demand pull moves in the opposite direction to the supply push production-distribution technology. The inner circle of Figure 7 shows that the demand pull service technology begins with customer service and moves back through distribution, marketing, and so on. The outer circle shows that supply push begins with research and development and moves forward through design, tooling, and so on. Generally, a need for deep insight into the process that will be serviced exists and there also exists a need for some depth of insight into the two previous processes of the traditional value stream technology. That pattern is shown in Figure 7 by the broad-band, multi-shaded arrows. Two exceptions to that general rule are *research and development* and *marketing.* Research and development reaches back one process to customer service and forward one process to design. Marketing reaches back only one process to production. Possibly it also reaches forward to distribution.

The relationships discussed here are knowledge relationships. Pedagogical design is another matter. Programs could range from integrative in every course to an eclectic integration of courses.

Master of Science in Service

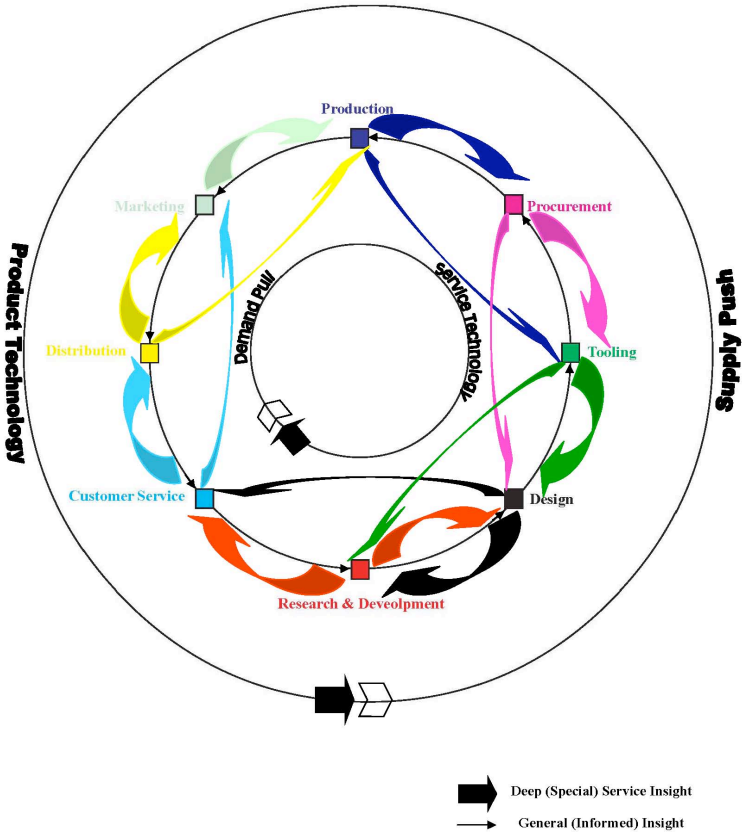

Figure 7
Master of Science in Service

MSS AND THE MBA DIFFERENCE

The MSS and the MBA are clearly different degrees. One is not simply a variation of the other. While the structures are somewhat similar, the purpose and content of the Master of Science in Service (MSS) are almost completely different from that of the MBA. The MSS is concerned with the actual functional progressions of the value stream. The MBA is concerned with the *management* of the operations and their support functions of investment and finance (Figure 8). That management is exercised through interpersonal relations, group dynamics, and accounting and management information systems. The MBA student is taught to manage the technology and innovations that rise to the surface. The MSS student should be taught how the technology and innovations originate and rise.

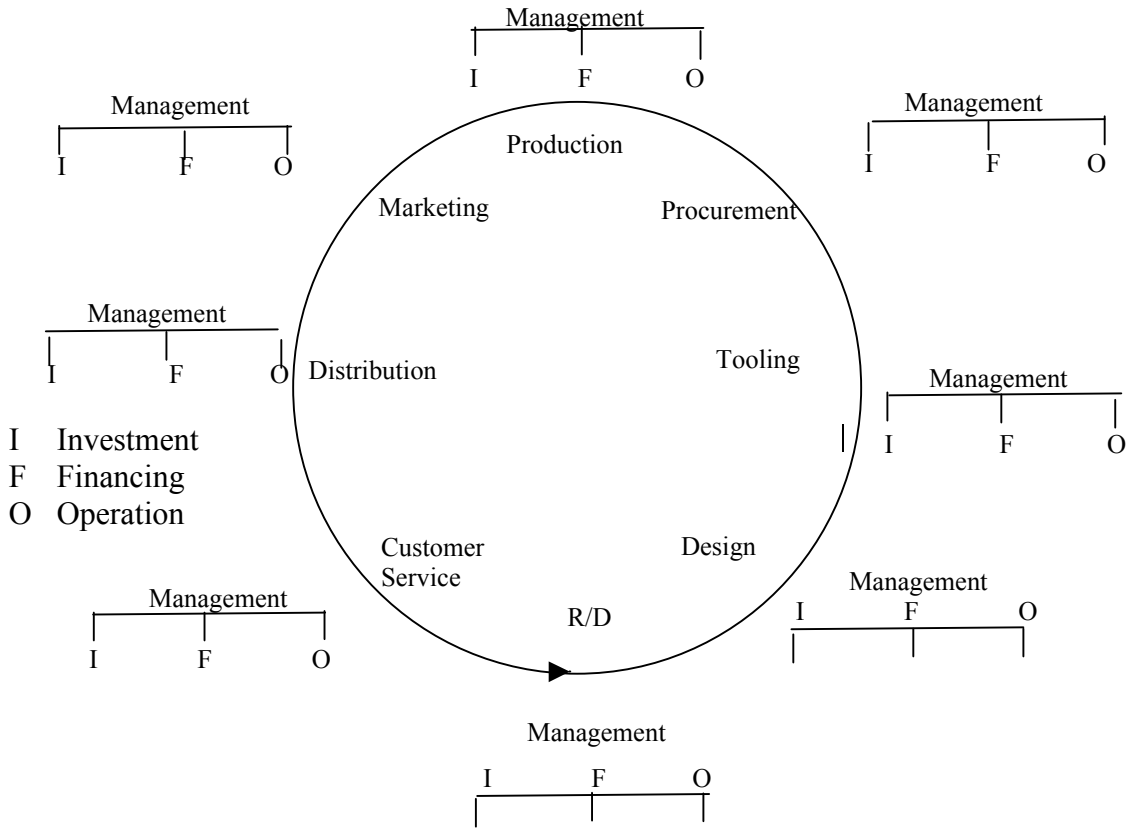

Figure 8
The Domain of the Master of Business Administration (MBA)

The increasing specialization and the resulting complexity of economic processes have influenced the introduction of "tracks" in many MBA programs. Such tracks attempt to provide some depth of knowledge and understanding in a particular functional area. Most such tracks concern the support functions. Other MBA programs are being targeted at specific industries. All, nevertheless, continue to emphasize management as they should.

While some MBA programs have migrated somewhat from the general to the specific, development of the MSS should be a migration from the special to the general. The center of gravity of the MBA is the "core subjects." The benefit of specialization is evaluated against its core costs. What general knowledge is surrendered. The MBA core is well policed by the interacting disciplines that provide content. The development of the MSS requires almost the opposite dynamic. It requires movement from the special to the general.

That process progresses in the following steps:

1. Identify the depth of knowledge required to function in each of the elements of the value stream.
2. Search systems science for bridging concepts, methodologies, methods, and techniques.
3. Structure core curriculum (or course) in systems science.

4. Structure extended curriculum of courses that state the special knowledge of deep disciplines in system terms. These courses should provide a certain depth of special knowledge associated with each of the elements of the service value stream.
5. The prerequisite of the MSS should be an undergraduate degree in one of the deep disciplines required to function in one or more of the elements of the value stream.

The MBA certainly provides general insight into the traditional value chain. Many engineers, computer systems specialists, management information system specialists, marketing majors, etc. have obtained MBAs. Those people should be prime prospects for matriculation into the MSS.

The question of where the MSS should rest in the traditional disciplinal turf of the university does not have a clear answer. The involvement of college of business seems necessary. Some specialties such as production might be better located in engineering while availing their students of certain business courses.

CONCLUSION

A significant transition in the way we think about business processes is taking place. The perspective is being drawn away from product to service. This transition reverses the perception of the structure of market from supply push to demand pull and transforms customer service from intermittent to continuous. In that transformation, innovation, organizational design, intervention, and extension are added to the traditional value stream. These changes significantly impact professional education requirements, so much so that a new class of master level degrees may be required.

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