A Framework to Model and Analyze the WHY and the HOW of Coopetition: Application to the Coopetition in the PowerPC Case

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Abstract. Coopetition has been defined as an approach to managing that combines competition and cooperation. IT transcends the traditional paradigms of competition and cooperation in an effort to achieve the advantages of both. As an inter-organizational relationship that is of a higher complexity than either simple competition or cooperation, coopetition presents both conceptual and practical challenges for business managers and researchers in the strategy field. In this paper we present a systemic approach to modeling coopetition between firms that provides a methodology for analyzing the strategic incentives for enterprises to engage in coopetition relationships and the organization design required to address the complexities inherent in such multi-faceted relationships. Our approach comprises a modeling technique called Systemic Enterprise Architecture Method (SEAM) that incorporates important conceptualizations adapted from competence-based management (CBM) theory. We illustrate our approach by applying it to the case coopetition between IBM and Apple in the development of PowerPC CPU.

Keywords: Coopetition, Competence-Based Management (CBM) Theory, Modeling, Syetemic Enterprise Architecture Method (SEAM)

1. Introduction

Coopetition is a multi-faceted inter-organizational relationship that transcends a single focus on cooperation or competition in order to achieve the advantages of both. Although coopetition is not a new phenomenon, the term “coopetition” was first coined by Raymond Noorda in early 90's to characterize Novell's hybrid business strategy. In 1996, Brandenburger and Nalebuff elaborated the coopetition concept in their seminal book, Co-opetition: A Revolutionary Mindset that Combines Competition and Cooperation [1].

Coopetition is now a topic of increasing interest in business and strategy research, leading to a growing body of research and theorizing (for various perspectives in coopetition research, see [2, 3]). Coopetition researchers have invoked insights from theoretical frameworks as diverse as the resource based view (RBV) of the firm [4-6], resource dependence theory (RDT) [7], transaction cost economics (TCE) [8,9], social network theory (SNT) [10, 11], and game theory (GT) [12] in describing and explaining different aspects of coopetition and related strategies. (See for example [13-15].)

Thus far, however, relatively little attention has been paid to developing models, methods, and techniques to provide managers with practical means for analyzing the potential advantages of coopetition (i.e. the why) and developing organization designs (i.e. the how) that will be effective in supporting multi-faceted coopetitive relationships. Doing so requires a shift in the focus of theory building from a positive mode of research that aimed at describing various aspects of coopetitive interaction to research focused on developing normative recommendations for initiating and sustaining coopetitive strategies.

In this paper, we present a framework for representing, modeling, and analyzing the various activities of an enterprise, including those involved in coopetition. Modeling instrumentalizes theoretical insights by providing a means to apply theory in a functional context to enlarge our understanding of a theory and improve our ability to make predictions or retrodictions based on the theory [16]. In researching coopetition, modeling can contribute to our understanding of both strategic incentives for engaging in (i.e. the why) and organizational processes for managing (i.e. the how) coopetitive relationships.

The modeling process begins when a modeler observes some aspect of reality referred to as the "universe of discourse" (UoD) [17]. Employing a set of conceptualizations, the modeler then tries to distinguish entities that compose the UoD and the relationships between them. A conceptualization is a means of formally representing what is known about an entity and potential for interaction that is relevant in the context of the inquiry. Thus, conceptualization is an abstract, simplified view of the world that we wish to represent for some purpose [18]. In effect, the conceptualizations employed in a model form a lens through which the modeler observes phenomena of interest in a UoD.

Next, the modeler develops a model, in what is referred to as the representation domain that is composed of a set of entities called modeling constructs [19]. The conceptualizations employed in representing the entities enable a "mapping" between the modeling constructs in the representation domain and the entities observed in the UoD—and thereby grounding the modeling constructs in specific interpretations of the "real world." Figure 1 represents this conceptual progression in the process of systems modeling.

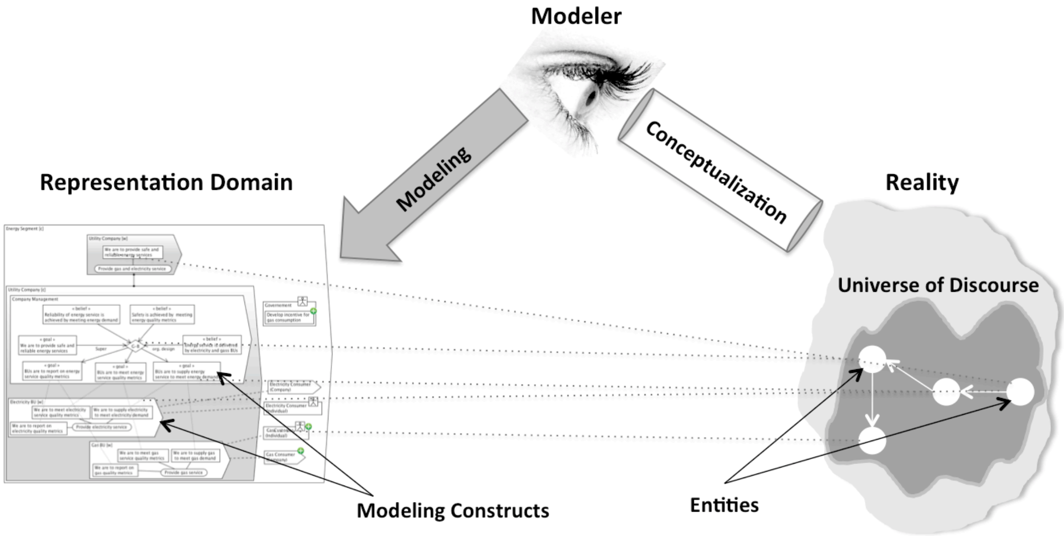

Figure 1- The modeling process

In the modeling process reported in this paper, the coopetition between Apple and IBM in the PC industry circa 1991 constitutes our universe of discourse. The case describes the development of PowerPC (Performance Optimized With Enhanced RISC Processor Chip) CPU by an alliance formed between Apple, IBM and Motorola, known as the AIM alliance. While Apple and IBM were head-on competitors in the PC Market, they were in close cooperation to develop the PowerPC chip. The data for the case is gathered through interviews with industry experts as well as books and papers such as [20, 21].

We draw on conceptualizations of firms and processes developed in competence-based management (CBM) [22-24] a theory to describe and represent various aspects of Apple and IBM coopetitive relationship. CBM conceptualizations embody theoretical insights from General Systems Thinking [25], organizational cybernetics (in particular the work of Stafford Beer [26, 27]), and other perspectives on the “dynamic, systemic, cognitive, and holistic” nature of organizations. CBM conceptualizations are presented in three categories; Business Concept, Market Concept and Core Processes.

In the representation domain, we apply the Systemic Enterprise Architecture Method (SEAM) [28, 29] to model various aspects of the coopetition between Apple and IBM. Based on CBM conceptualizations, we develop two kinds of SEAM models: Enterprise Model and Market Model. The Enterprise Models of Apple and IBM before and after their coopetition help us gain an understanding of the changes in their organization design to accommodate their coopetitive relationship. The Market Models of PC Industry before and after the existence of AIM alliance provide us with insights into the strategic incentives behind Apple and IBM coopetitive relationship.

Our discussion is organized in the following way. In Section 2 we present some key CBM conceptualizations and related theoretical principles that we employ in building our model. In Section 3, we present SEAM models based on the conceptualizations developed in the previous section, and we explain the underlying theoretical concepts, notations, and modeling principles applied in the development of the models. Section 4 applies our SEAM models to represent and analyze the "why" and the "how" of the coopetitive relationship between Apple and IBM in the development of PowerPC chip. We demonstrate how the modeling framework presented in this paper enables development of insights into the incentives that drive this coopetitive strategy, as well as the changes in organizational design undertaken by IBM and Apple to enable the implementation of this multifaceted relationship. Section 5 presents our conclusions and suggestions for future research.

2. CBM Conceptualizations

In CBM theory an organization is represented as a goal-seeking open system. Explicitly elaborating organizational system effects within and across the boundaries of organizations, CBM theory provides a set of concepts for identifying essential system elements of organizations as goal oriented human systems for sustainable value creation and distribution [23, 24].

CBM theory seeks to define a coherent and intellectually rigorous conceptual foundation for theorizing in the field of strategy. An important aspect of CBM theory is providing precise and consistent definitions of the primitive entities which serve as the building blocks of its conceptual foundation for theory building about markets, firms, and their cooperative, competitive, or coopetitive interactions [24]. In this section, we explain the conceptualizations adopted from CBM theory and incorporated into our SEAM model. CBM conceptualizations are grouped into and discussed three main categories: Business Concept, Organization Concept, and Core Processes.

2.1 Business Concept

The Business Concept defines the strategic focus of an enterprise that sets boundaries around and delimits the activities the enterprise will undertake. It defines the market segment(s) targeted by the enterprise (i.e. *who* will be served by the enterprise) and the product offers it will create for its targeted segment(s) (i.e. *what* will the enterprise offer its intended customers). The Business Concept also enables analysis of *how* a product

offer is intended to impact the customers' perceptions of cost and value by integrating the net delivered customer value (NDCV) framework developed by Philip Kotler [30].
We now define the concepts that comprise the constituent elements of the Business Concept.

Market. A market is a process through which demand for goods and services to meet human needs is supplied. Markets are characterized as being composed of *market segments*. A market segment is a grouping of potential customers with relatively similar preferences for specific kinds of goods and services to satisfy their needs.

Product offer. A product offer is the bundle of benefits and costs that an enterprise presents to targeted market segments when it offers its goods and services. A customer's willingness to pay is determined by the value delivered by the enterprise through the product offer features.

Net delivered customer value (NDCV). NDCV, a framework developed by Philip Kotler [35], refers to the net value that customers in targeted market segments perceive in the bundle of benefits and costs to be derived from the goods and services offered by an enterprise. NDCV includes all the benefits and costs a customer expects to experience during the full life cycle of the product, including learning about, purchasing, taking delivery of, using, maintaining, repairing, upgrading, and retiring a product. Customers will prefer a product offer that delivers the highest available (and positive) NDCV (i.e. the greatest excess of perceived value over perceived cost). In Table 1 we present the four sources of perceived value and four sources of perceived cost of a product offer recognized by the NDCV framework.

Sources of perceived value	**Sources of perceived cost**
Product benefit is the perception derived by the customer based on what the product offer enables him/her to do.	*Financial costs* are the monetary costs that a customer experiences during the life cycle of the product.
Service value is the perception of the usefulness of the activities that the enterprise performs to assist its customer throughout the lifecycle of the product.	*Time costs* are the costs associated with the time the customer has to spend to learn about, purchase, use, maintain, and retire a product.
Image value is the value a customer perceives when he/she imagines how he/she will be "seen" by other people while using the product offer.	*Energy costs* refer to the energy the customer expects to expend in the product life cycle in becoming a customer for and user of a product.
Personal interaction value is the positive feeling a customer may derive from the interaction with the enterprise's employees.	*Psychic costs* are costs attributed by a customer to the product when the customer worries or has feelings of anxiety about his or her involvement with a product at any stage of the product life cycle.

Table 1- Sources of perceived value and cost in the NDCV framework (Source: Philip Kotler [35]).

2.2.Organization Concept

The Organization Concept defines the essential organizational building blocks needed to implement a Business Concept. The Organization Concept provides the organizational framework through which the enterprise's (operational) management processes will work in leveraging the organization's current competences. An Organization Concept answers the following questions about the organizational building blocks that will compose the enterprise and enable its processes:

- What *resources* will be used by the enterprise to develop and deliver its product offer(s)?
- What *organization design* should the enterprise use to coordinate its resources?
- What *control mechanisms* should the organization use to monitor its implementation of the business concept in an enterprise, and what *incentives* should the organization use to motivate performance by the resources in the organization?

In the following discussion we elaborate the building blocks of the Organization Concept.

Resources. Resources are any assets that a firm can access and use in developing and realizing its product offers. (Assets are defined, though not indicated in Figure 4, as anything tangible or intangible that would be useful to a firm in developing and realizing product offers.)

Skills, capabilities, competence. CBM theory has developed a hierarchal representation of the abilities of individuals, groups, and organizations to use resources. At the most fundamental level of this hierarchy are the *skills* of individuals in applying their knowledge and energy (as resources) to the performance of specific tasks. Groups and teams may then develop *capabilities* in coordinating various uses of the skills of individuals. Capabilities are *repeatable patterns of action* in using the skills and other resources (machines, information, etc.) available to an enterprise.[1] At the highest level of the hierarchy is the *competence* of an organization -- defined as the ability of an organization to sustain coordinated deployments of its resources and capabilities in ways that help an organization achieve its goals.

[1] In CBM theory, capabilities meet the general definition of *resources*, because they are useful in developing and realizing product offers. However, capabilities are recognized as a special kind of resource because they operate on other (tangible and intangible) resources. Thus, CBM theory is always careful to refer to an enterprise's resources *and* capabilities, and does not equate capabilities with other resources, as is commonly done in the Resource-Base View (RBV).

Competence building and leveraging. In order to sustain its value creation and value distribution activities, an enterprise must both leverage its existing competences and build new competences for use in the future. *Competence leveraging* refers to the use of an organization's existing competences to create product offers and carry out other activities that do not require qualitative changes in the resources the organization uses or in the way the organization coordinates its resources. *Competence building* is any process through which an organization creates or accesses qualitatively new kinds of resources and capabilities and/or develops new ways of coordinating and deploying new or existing resources and capabilities.

Value Network. An enterprise relies on resource inputs from other enterprises to sustain its competence building and leveraging activities. We use the term Value Network to describe a group of companies that collaborate (i.e. exchange resources) to create value for the customer.

Strategic Logic. The Strategic Management defines the Strategic Logic of the organization, which is defined as The Strategic Logic is the enterprise's operative rational for achieving its goals through coordinated deployments of resources. The Strategic Logic determines the strategic balance between competence building and leveraging within the enterprise by specifying the competences to be built; the ways to build them and the ways to leverage current and the new competences. The Strategic Management thereby, defines the Operational Management processes that work through an organization design in order to carry out the competence leveraging activities of the organization.

Organization Design. To coordinate the use of resources in carrying out the Core Processes[2] of an enterprise, managers must define *task allocations* (who will *do* what), *authority distributions* (who will *decide* what), and *information flows* (who will *know* what) – the three classic dimensions of *organization design.*

Control systems. Control systems provide the mechanism through which managers may monitor the performance of the various tasks allocated within the organization. Incentives may (or may not) provide a system of rewards and punishments that serve to motivate performance by the human and organizational resources (employees and suppliers) used in the organization's value creation processes.

[2] The Core Processes are explained in section 2.3

Procedures. Procedures specify the step-by-step sequence of actions to be followed in a specific situation or to achieve a given objective.

Policies. Policies are rules or guidelines that express limits or boundaries within which action should be taken.

2.3.Core Processes

The current Business Concept and Organization Concept of an enterprise will determine the specific objectives and nature of the value creation and distribution activities undertaken within the enterprise. CBM theory characterizes an enterprise's current value creation and distribution activities as fundamentally consisting of three "Core Processes:" Product Creation, Product Realization, and Stakeholder Development [22].

Product Creation. Product Creation includes all the activities an enterprise performs in defining, designing, and developing new product offers. The activities may include marketing research in various forms, and developing or acquiring new technologies to use in new products, among others.

Product Realization. Product Realization refers to all the activities an enterprise undertakes in producing, shipping, and providing customer supporting for product offers.

Stakeholder Development. Stakeholder Development includes all the activities an enterprise undertakes to attract, retain, and develop the best possible resources for use in and support of its value creation activities. Such activities may include recruiting employees with special knowledge and skills, developing effective supplier relationships, managing relationships with financial markets to improve flows of financial resources, and building supportive relationships with host communities.

3.Systemic Enterprise Architecture Method (SEAM)

SEAM is an enterprise modeling methodology based on the principles of systems thinking [25]. SEAM was developed at Ecole Polytechnique Fédérale de Lausanne (EPFL) to assist in the analysis and design of business and engineering strategies, and has been used extensively in teaching, research, and consulting since 2001 [31, 32].

In order to represent various aspects of an organization and its interactions with other entities in SEAM we develop three types of models; Enterprise Model, Market Model and the SAR (Supplier Adopter Relationship) Model. Figure 2 is a SEAM Enterprise Model.

The Enterprise Model embodies Organization and Core Processes from CBM theory conceptualizations, the classic systems analyses of Stafford Beer, and other systems frameworks [26, 27]. Figure 3 illustrates a SEAM Market Model. The Market Model is derived from the Business Concept, outlined in the CBM conceptualizations and finally, the SAR connects the Enterprise and the Market Model by specifying a mapping between the following concepts: resources provided by the resource providers in the resource market; the product offer features; and the value created for the customers or adapters of the product offer in form of the NDCV framework. Figures 5 and 7 are examples of a SAR. In the following discussion, we explain the underlying concepts, notations, and systemic and modeling principles required for gaining an understanding of the SEAM models.

3.1.System and Observer

The concept of an observer is central to SEAM. A system is defined as a set of interacting entities leading to correlated actions, as detected and identified by the observer [25]. The observer invents the system by perceiving a purposive unity among the entities within a universe of discourse. In this context, observation is therefore the act of choosing a set of entities (believed to be systemic in their interactions) from among a set of all possible entities that are observed by the observer. The selected entities comprise the system to be modeled, and the remainder of the entities observed constitute the elements in the environment of the system. The Enterprise Model broadly decomposes an enterprise into a set of Operational Systems and a Management System. Operational Systems carry out the Core Processes within the enterprise. In the Enterprise Model in Figure 2, Operational Systems A and B and the Management System are denoted by block arrows. These basic enterprise systems may then be elaborated in various ways deemed appropriate to the universe of discourse. Figure 2 indicates how the basic systems included in the Enterprise Model may be elaborated through CBM conceptualizations.

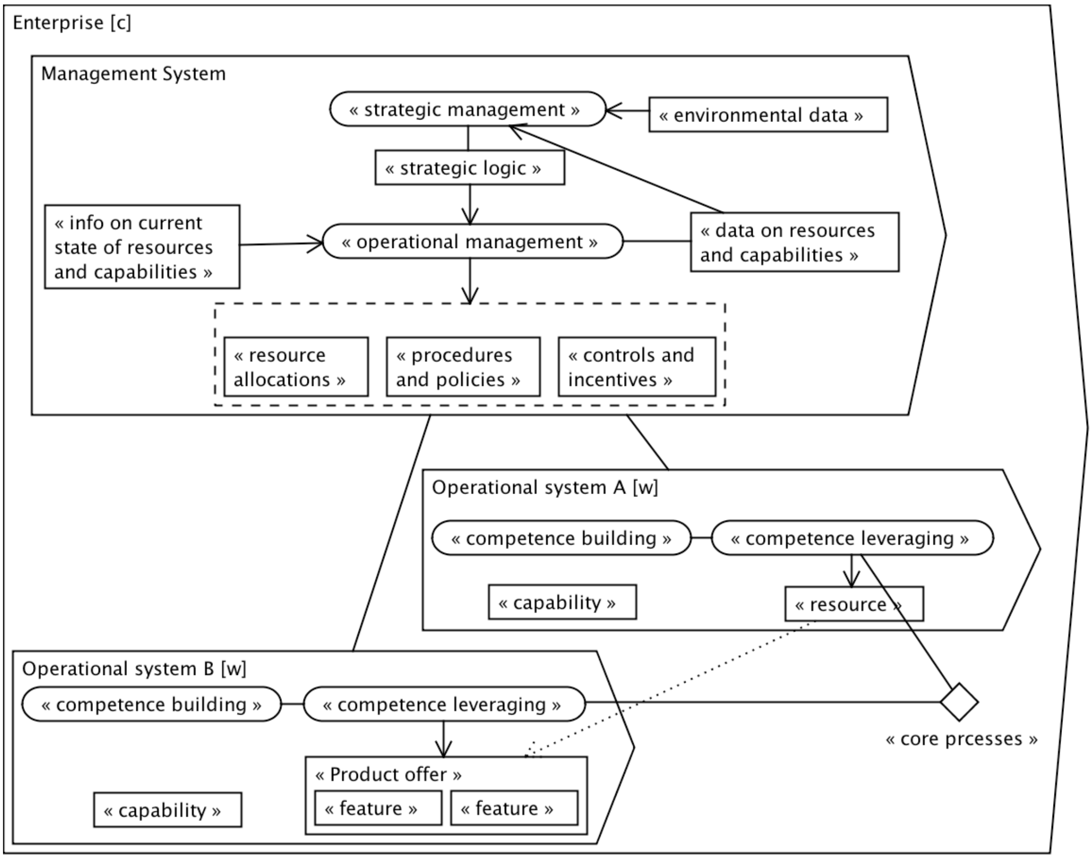

Figure 2- SEAM Enterprise Model

In the Market Model, we model the market segment within which an enterprise is embedded, the resource providers that contribute to the product offer of the enterprise in its value network, and the NDCV for the customers within the segment. As a resource provider can provide an enterprise with more than one resource, we specify the role of the resource provider in parenthesis in front of its name in the all SEAM models including the Market Model. In Fig. 3 the Enterprise A along with Enterprise B and C are modeled in its Value Network. As illustrated, in the Enterprise A Value Network, "Enterprises B and C provide the resources needed by Enterprise A to create a product offer for the customers.

3.2.The Principle of Recursion

The principle of recursion holds that any system contains (sub)systems, and at the same time is contained within a hierarchy of larger systems. When a system is decomposed into its component (sub)systems, the component systems can in turn be decomposed into their component systems, and so on. Thus, in SEAM systems are represented as nested hierarchies. Figure 2 illustrates the highest level of recursion of an enterprise. In order to go down one level of recursion, Operational System A or B would be decomposed into their constituent Operational (sub)Systems with their own Management (sub)Systems, and so on.

3.3.States, Properties, and Actions

In SEAM a system is represented by properties and actions. An *action* causes the state of the system properties to undergo a transition from a pre-condition to a post-condition. In SEAM, actions and properties are denoted by ovals and rectangles, respectively. In the Enterprise and Market models, properties and actions are assigned different names depending on how the states they relate to influence a system. For instance, in the Enterprise Model, the Management System is modeled by "Strategic Management" and "Operational Management" actions and properties such as "Strategic Logic" and "Environmental Data".

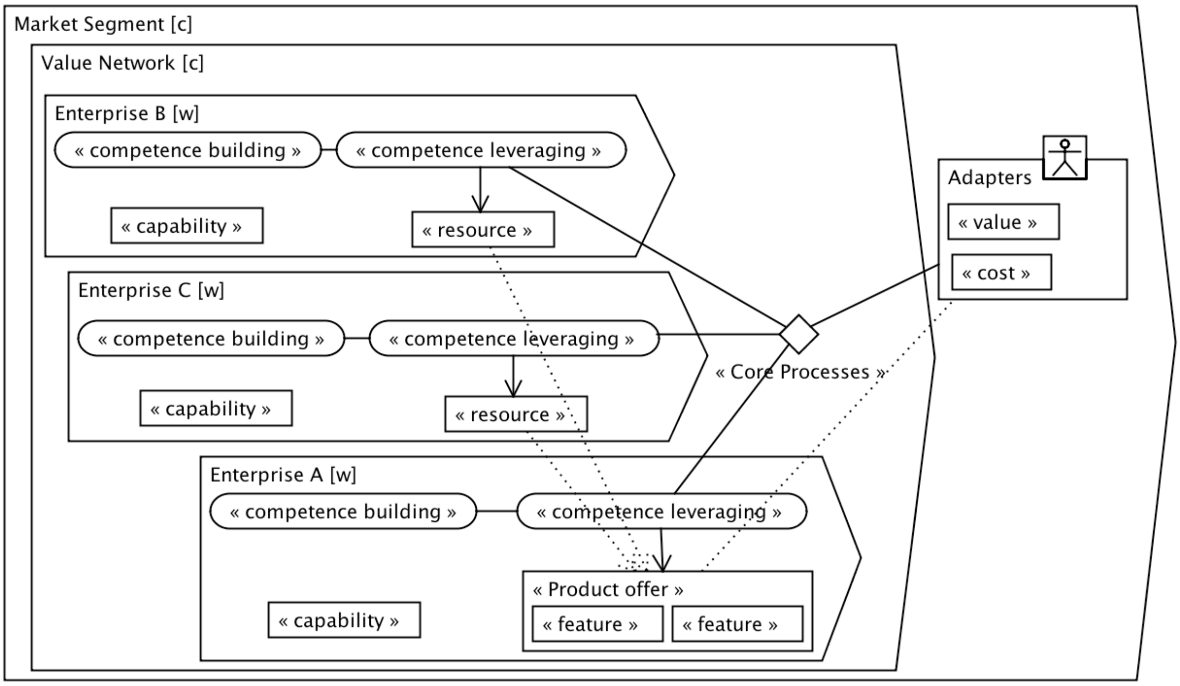

Figure 3- SEAM Market Model

3.4.Whole-composite Principle

An observer can view a system as a whole (i.e., adopt a "black box" view of a system) or as a composite (i.e., a "white box" view that reveals the subsystems and inner workings of a system). When a system is seen as a whole (the "black box" view), the system's subsystems and their interactions are ignored. Instead, the overall system's emergent actions and properties that result it the overall behavior of the system are observed. On the other hand, when an observer adopts a "white box" view of a system as a composite, its component (sub)systems and their interactions are observed directly. Applying the whole-composite principle assists in observing the hierarchy of recursive systems that obtains in any universe of discourse and enables setting boundaries that delimit the system and subsystems of interest.

In the Enterprise and Market Model, whole and composite views of the Enterprise and the Operational Systems are denoted by [w] and [c] respectively. As illustrated in Figure 2, the Enterprise is represented as a composite, and therefore we can observe its Management System and Operational Systems. The Operational Systems A and B, on the other hand, are represented as wholes, and therefore we can only observe their emergent actions and properties.

Modeling an Operational System or an Enterprise as a whole, we represent competence building, as the actions the Operational System takes to modify its resources and capabilities as in order to output a new resource, and competence leveraging as the actions the Operational System takes to use its current resources and capabilities in order to output a current kind of resource. A resource output may be a product offer by the enterprise as a whole to the market, or an intermediate resource that serves as an input to another Operational System in the enterprise. When modeling a product offer we represent its features.

3.5 The Mappings in the SAR Model

As explained earlier, in the SAR provides four types of mappings:

- The resource providers and the resources and capabilities utilized in developing the product offer.
- Resources and capabilities and features and functions of the product offer. Such mappings are simply
- Product offer functions and features and the value created for the customer in the product market.
- Value created for the adopters of the product offer and the perceptions of the adopters.

We use “R” and “P” to denote “responsible” and “partner” when mapping the resources to the resource providers. For mapping the resources to the product features and functions and the mapping between such features and functions we simply put an “X” mark. Finally, pluses and minuses show the positive or negative perceptions of the customers with regard to the value created by the product offer. In SAR, in some cases we model the partners to the customers, in order to gain insights into the value that the product offer can create for the partners of the main customer. For the purpose of this paper we have limited our observations to the customer and have not thus represented the partners.

4. Modeling and Analysis of Coopetition between Apple and IBM in the Case of PowerPC

In this section we apply our modeling approach to the case of coopetition between Apple and IBM in the development of PowerPC (Performance Optimized With Enhanced RISC Processor Chip). Developing a Market Model of the PC industry circa 1990 we represent the value networks of Apple and Wintel (i.e. computers with Microsoft Windows operating system and Intel x86 CPU) as well as their product offering. The accompanying SAR models provide useful insights into the strategic incentives (i.e. the "why") behind the coopetitive strategy between Apple and IBM. Next, we develop the Enterprise Model capturing the organization design (i.e the "how") to accommodate the multifaceted relationship between Apple and IBM.

4.1 The "Why"

In 1990, Macintosh sales were eroding due to the increasing dominance of wintel based PCs. This significant loss of market share was mainly due to the users' perception of Apple machines, in terms of performance and price. The high interdependence between Apple's hardware and its operating system (tightly coupled system architecture) while leading to high performance of Macintosh machines particularly in the graphics intensive tasks, had made it extremely difficult for Apple to implement changes in its machine. For instance, any upgrade in the CPU (Motorola 680x0 processor) architecture would require a number a changes in the operating system (system 7) and as a consequence the applications by the third party developers needed to be modified or redesigned. As illustrated in Figures 4 and 5 while the image value due to the customized components and the design increases NDCV, the high price and the limited availability of third party software applications lead to a negative perception of the product benefit and thereby reduce the NDCV [20].

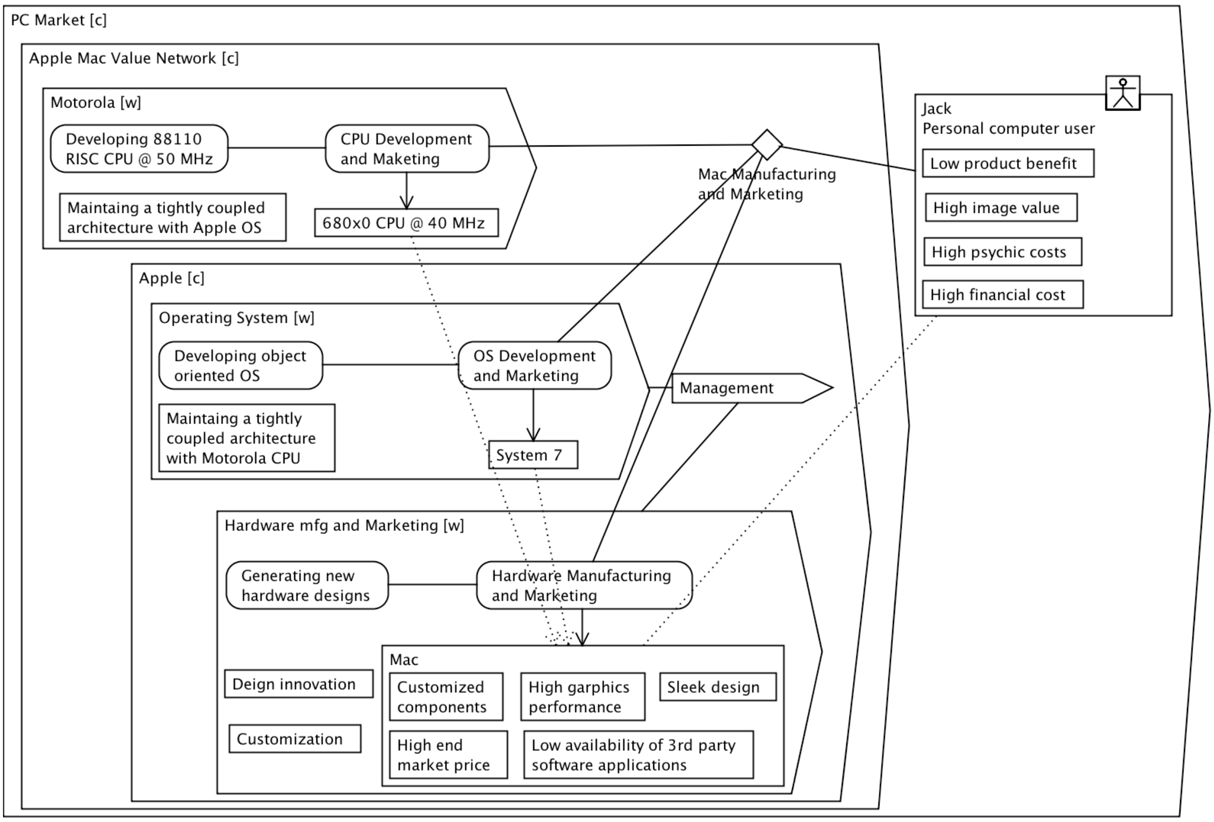

Figure 4- Apple Market and Enterprise Model Circa 1990

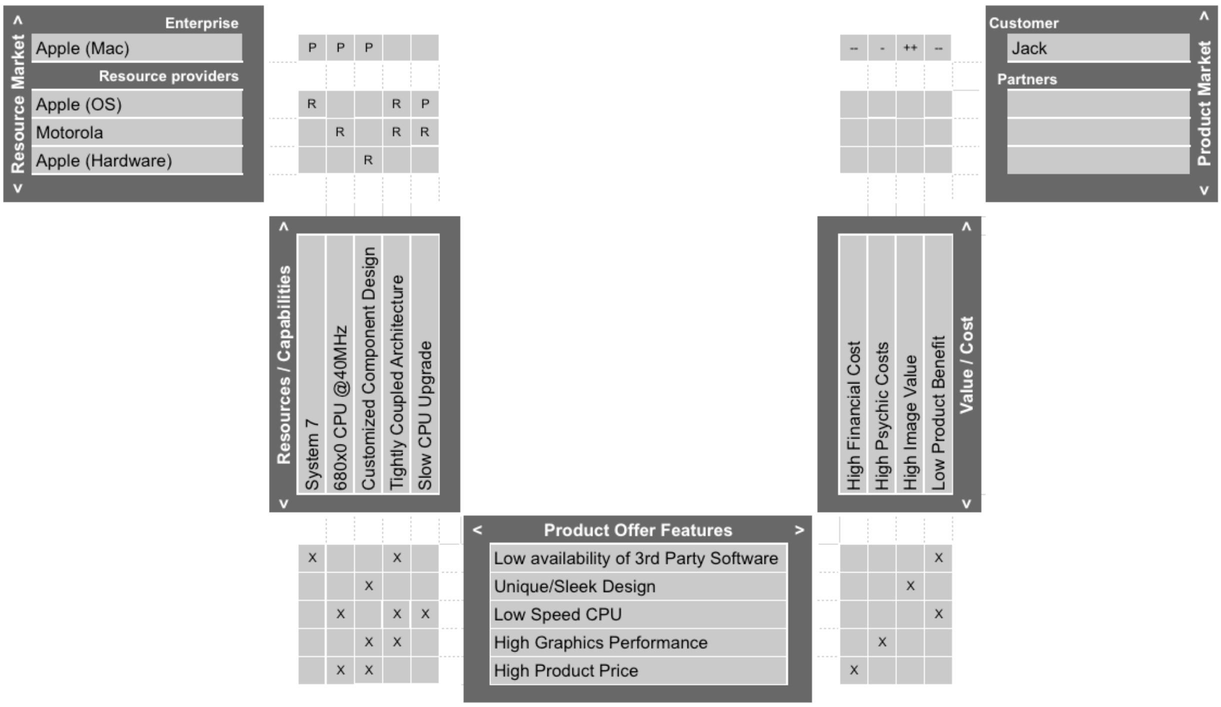

Figure 5 – Apple SAR Circa 1990

Contrary to Apple and Motorola, as illustrated in Figure 6, the collaboration between Intel and Microsoft had led to a loosely coupled architecture between Windows 3 and Intel 486 processor in IBM PCs and compatibles. Hence, Intel could design and use faster chips without requiring Microsoft to redesign the operating system. As a result, the users were able to notice a significant change in the speed and the performance of Wintel based machines whenever they upgraded their machines (e.g. from machines with 386 processors to 486). This interoperability had also led to the high availability of third-party applications for the Wintel platform, and thereby increased the product benefit for the adapters.

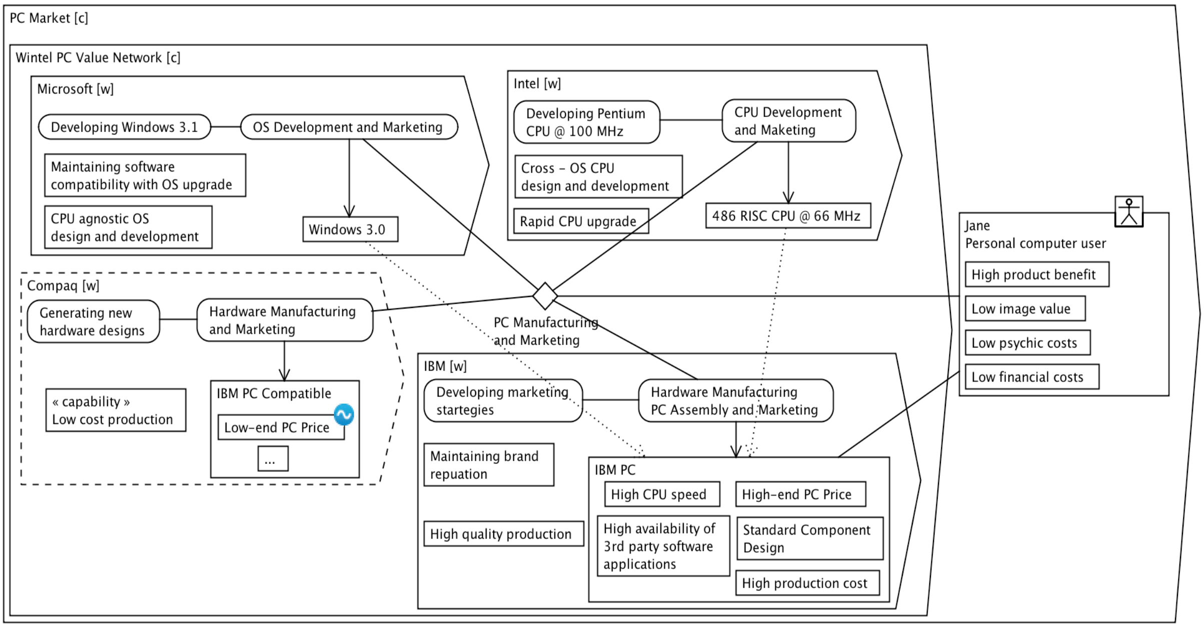

Figure 6 – IBM in Wintel Value Network

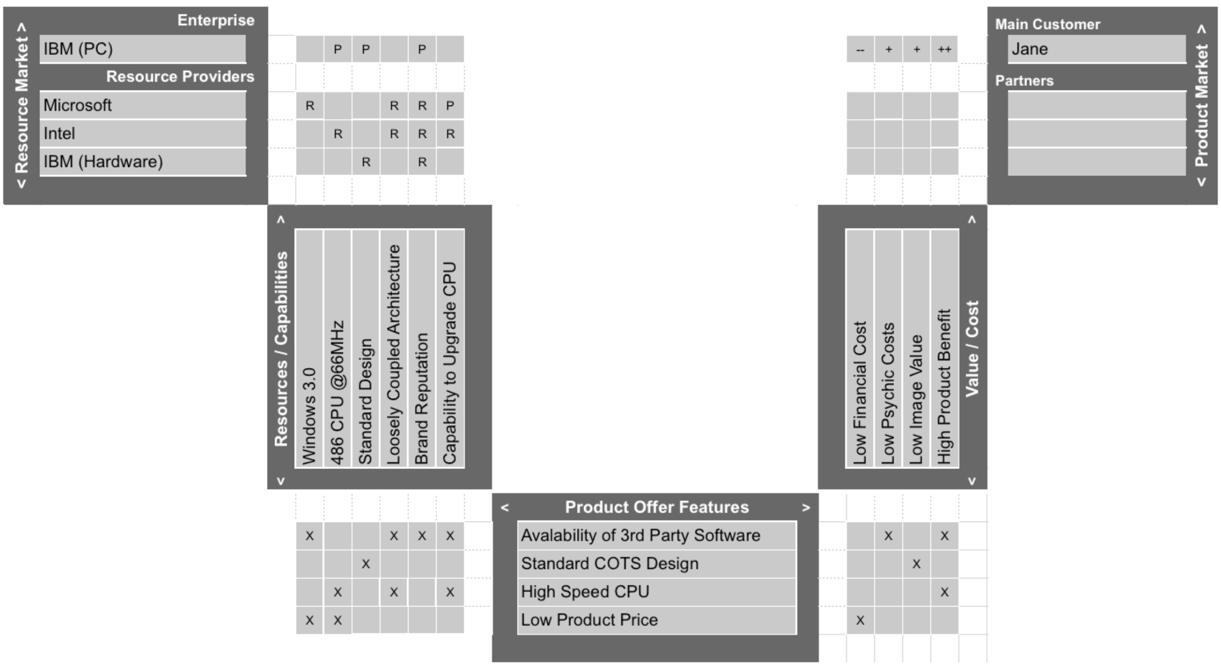

Figure 7 – IBM SAR

Microprocessor designers believed that Motorola 680x0 processor was technologically superior to Intel's x86 architecture, and Macintosh machines outperformed Wintel based PCs in particular for running graphic intensive applications. Wintel PC users, however, did not see any reason to switch from their machines with 66MHz Intel processors to Macintosh with a 40 MHz Motorola CPU that cost double the price of their machines. Surprisingly most of the Wintel PC users had not even actually seen a Macintosh to date. So Apple had not managed to win the price/performance fight against Microsoft and Intel [20].

Having lost a significant share of the PC market, it was evident for Apple that nothing but a radical shift in technology could lead to its survival. This technological change would mean a faster chip with a highly scalable and cross-OS architecture that could support computers of any size without requiring changes in the operating system. In early 90's this description would be associated with Reduced Instruction Set Computer (RISC) CPU design that required a considerably high technological capability. Furthermore, Apple needed applications tailored to RISC architecture and instruction set. However, considering that Apple's market share percentage was dropping below ten, it was nearly impossible to convince the software developers to develop applications for the future RISC-based Macs. Hence, in order to ensure the success of the new platform Apple needed to find a way to gain the support of software vendors. Finally, in order to change price perception of the users, Apple had to keep the costs of the new RISC-based Mac down. This could only be achieved by reaching high production volume, which was rested heavily upon mass production capabilities and the existence of market demand [20].

Figure 8 depicts a SAR diagram capturing the resources and capabilities required by apple in order to increase the NDCV. The changes to the SAR in Figure 5 are underlined. The major question, however, is to find the resource providers. We now assess Apple's potential partners among the CPU manufacturers circa 1990 based on the resources and capabilities required by Apple. [21]

Figure 8 – Resources and capabilities required by Apple and their impact on NDCV

In table 2, we compare and assess the extent to which the CPU manufacturers can provide the resources and capabilities required by Apple.

		Resource Providers				
		Motorola	AMD	Intel	SUN	IBM
Resources, Capabilities	Technological capability to develop single chip RISC CPUs	++	-	-	+++	++
	Established brand to ensure software developers' support	+	+	+++	+	+++
	Mass production capabilities	++	+++	++++	-	+

Table 2 – Resource provider assessment matrix

In 1990, Intel and AMD were manufacturing CISC Architecture CPUs and hence did not have the required technological capability to develop RISC chips. The minus (-) in Table 1 reflects this lack of capability. However, SUN Microsystem, was already manufacturing a RISC instruction set architecture CPU called SPARC for its workstations, which was the closest match to Apple's required technological capability. IBM servers and mainframes were manufactured with RS6000, a multichip RISC CPU. However, it was clear to Apple that IBM had the design capability to create a single chip implementation of the R/S technology. Motorola was half way through the development of the RISC CPUs. From the brand perspective, Intel and IBM had established a prominent brand identity, but companies such as AMD, Motorola and SUN were not as well-known. Finally, Intel and AMD were leading the market, due to high sales volume of Wintel based PCs which certainly meant that these companies were equipped with mass production capabilities).

Whereas, as a result of the low demand (in terms of total units sold annually) for workstations and mainframes, both IBM and SUN did not need to produce high quantities of CPUs. As Motorola was the sole provider of CPUs for Apple machines, it possessed relatively higher volume production capabilities compared to SUN and IBM.

As the comparative assessment of the partnership strategies suggests, the alternative that appears the best for Apple at that time would be to develop a partnership with Motorola and IBM. IBM had built a good image a in the software industry. IBM's RS/6000 gained quick market acceptance and support throughout the industry, despite the fact that it was brought to the market late. Hence, having IBM on board would enable Apple to ensure support from software vendors for the RISC-based Macs. However, as IBM was manufacturing RS/6000 in small quantities for its mainframes, it lacked the volume production capabilities that Apple was looking for. Hence, involving Motorola who was equipped to manufacture chips in quantities would make sense. Moreover, Apple had made a huge investment on designing system boards for the next generation of Macs, and since the design was based on Motorola's existing 88100 chip, they did want to ensure that the new chips are 88100 compatible [20].

But the main question is why would IBM collaborate with its head-on rival in the PC market? IBM had lost a more and more proportions of its market share to the Wintel-based PC compatible manufacturers such as Compaq and as the dominance of Wintel platform was getting stronger. As illustrated in Figure 6 Compaq as an IBM PC compatible manufacturer was offering lower product price as compared to the IBM PC, while keeping the rest of product features almost intact. In addition, as the desktop computer was becoming the dominant computation machine in the market the demand for IBM's mainframes was decreasing. So, IBM had plans to break the monopoly of Microsoft and Intel by forming an alliance with other players in the market to develop a CPU and an operating system that could instantly help IBM gain back legitimacy in the personal computer market.

Finally, in July 1991 Apple, IBM and Motorola came to agreement to establish an alliance. The major objectives of the alliance were;

- Apple will adopt the future single-chip implementation of IBM's RS/6000 in future Macintosh personal computers.
- IBM and Apple intend to create a new open-system software platform that will be based on object oriented technology.

These goals were formulated in order to prevent Intel and Microsoft from controlling the future of the CPU architecture and OS in desktop computers [20, 33].

4.2 The "How"

The AIM alliance gave birth to three important entities: Somerset Design Center, IBM's Power Personal Systems and Taligent. In other words the three companies were established in order to accommodate the complexities involved in the simultaneous cooperation and competition between Apple and IBM. The companies could hence separate their efforts for cooperation and competition.

Apple, IBM and Motorola established the Somerset Design Center in Texas to develop the RISC based CPUs. The facility was jointly owned and managed by IBM and Motorola and employed more than 350 engineers 50% working for IBM and 50% working for Motorola. Apple also kept a number of staff in the facility to ensure software compatibility. The design center was co-directed by IBM and Motorola.

In 1993, IBM separated its efforts for Power PC-based personal computers by establishing Power Personal Systems that was responsible for designing, manufacturing and marketing machines based on the PowerPC microprocessors. The operating system was decided to be purchased from a choice of a number of existing operating systems such as Windows NT by Microsoft, Solaris by SunSoft and etc.

Taligent was formed almost at the time of the PowerPC agreement between. The mission of Taligent was to develop an object-oriented operating system to be used on future Apple and IBM hardware.

Apple and IBM have a coopetitive multifaceted relationship in all the mentioned companies, due to the limits with the paper length, we only model the coopetitive relationship between Apple and IBM concerning the design and development of CPUs.

Figure 9 is the Market Model comprising Apple and IBM Value Networks circa 1994. The PowerPC 601 was the first generation of RISC microprocessors developed by AIM. The design effort started in mid-1991 and the first prototype chips were available in October 1992. The first 601 processors were introduced in first Apple Power Macintoshes, later known as Power Mac, on March 14, 1994 [20, 33].

In Figure 9, the solid line connecting IBM to the IBM (CPU) in the AIM Value Network denoted that the companies belong to the same financial entity. Hence, while Apple and IBM compete in the PC Market as designers and manufactures of personal computers , Apple as an OS developer [i.e. Apple (OS)], is cooperating with IBM as CPU designer and manufacturer [i.e. IBM (CPU)] in the AIM Alliance . More importantly, IBM is a resource provider of Apple by contributing to the design and manufacturing of the PowerPC 601 CPUs.

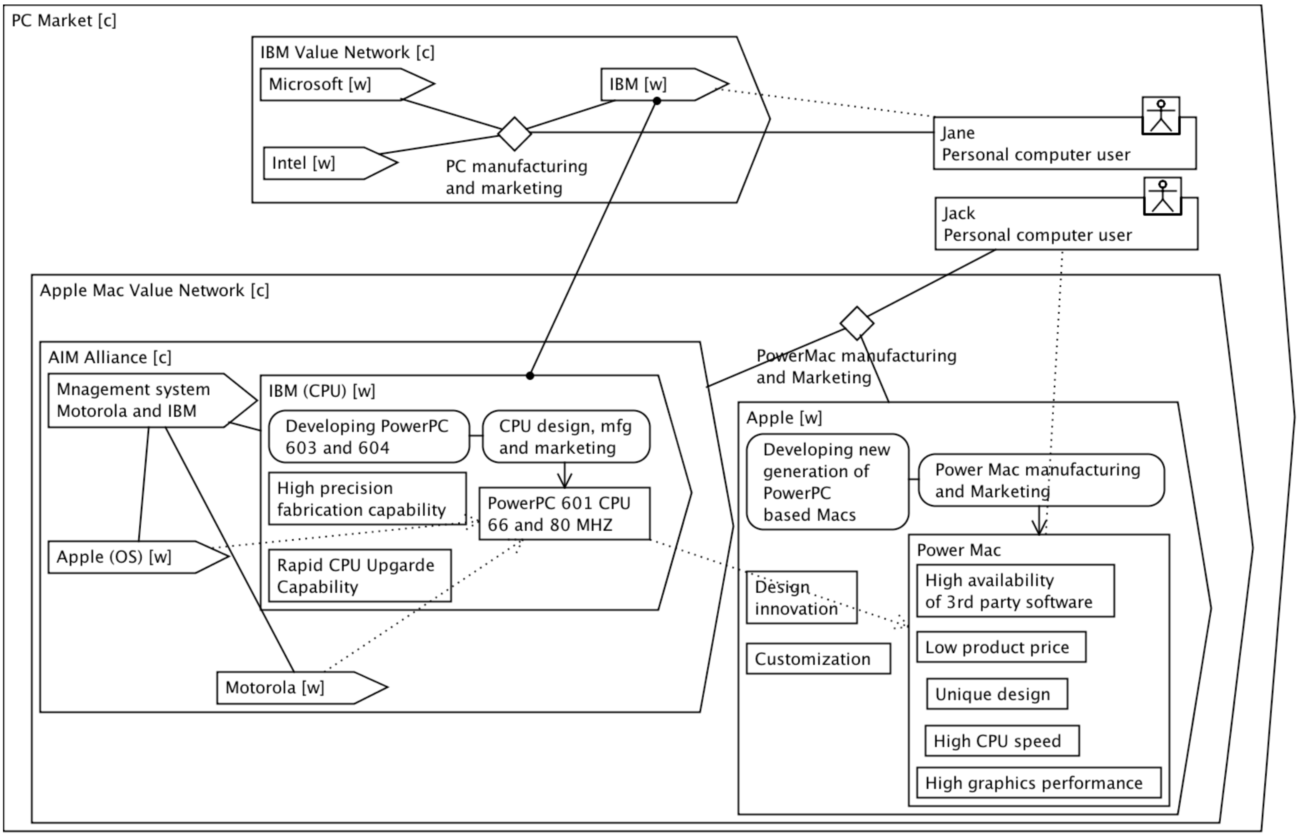

Figure 9 – PC Market Circa 1994

4.3 The PowerPC in retrospect

The RISC-based Macs received favorable reviews for their speed and excellent compatibility with existing Mac software and hardware and helped Apple capitalize on its newfound price/performance lead to expand its market share [33].

When apple first announced its intention of designing its next generation of Macintosh machines based on the PowerPC in 1991, no native software existed for this platform. In 1993 less than a year before the launch of the RISC based Macs, fewer than a dozen applications were expected. By January 1994, more than 60 developers had announced they would have PowerPC applications available before the first Power Mac shipped and the number of native applications continued to increase weekly afterwards [20].

While the PowerPC chips continually tried to outpace offerings from rival Intel in personal computer market, it did not become an industry stand. In 2004, Motorola span off its chip manufacturing business as an independent business unit called Freescale Semiconductor. Around the same time, IBM focused on designing chips designs for PowerPC CPUs towards game console manufacturers such as Nintendo's GameCube and Wii, Sony's PlayStation 3 and Microsoft's Xbox 360. In 2005 Apple announced they would no longer use PowerPC processors in their Apple Macintosh computers, favoring Intel produced processors instead.

5.Findings and Conclusion

Studies on the drivers of inter-organizational refer to resource exchange as one of the primary incentives behind establishing and inter-firm relation. Through such relationships, firms gain access to both supplementary and complementary resources and capabilities in the attempt to create and realize product offers that increase the net delivered customer value. Several studies support the proposition that cooperation between competitors contributes more to creating completely new products than cooperation between non-competing firms [34,35]. In [36], Ritala and Hurmelinna-Laukkanen express that commonality between the competence building and leveraging activities of competing firms can lead to the ease and fluency of sharing and transferring the resources and capabilities that the parties require for a coopetitive product development process. Such theoretical assertions can also serve to shed light on the drivers of coopetition between Apple and IBM based on the explanations in the case.

Concerning the organizational structured required to accommodate the complexities of a coopetitive relationship, our findings from the case are in line with the theoretical perspectives developed in the coopetition literature. Based on the outcomes of [13,37] companies have two basic choices for dealing with this multifaceted inter-organizational relationship; avoidance or adaptation. If companies are to adapt themselves with the complexities inherent in coopetition they need to departmentalize or divisionalize their organizational structure so that different departments deal with different aspects of the multifaceted relationships. It can be concluded that an organizational structure capable of addressing and accommodating the challenges and the complexities inherent in a coopetitive relationship is the one wherein the coopeting enterprises co-establish subsidiary companies that comprise divisions of departments from their existing organizational structure. As illustrated in the case of the AIM alliance Apple and IBM established separate entities that comprised some divisions (i.e. Operational Systems) from their organizational structure.

In this paper we presented Systemic Enterprise Architecture Method (SEAM) as modeling method for representing, modeling, and analyzing various aspects and activities of an enterprise. SEAM embodies conceptualizations from competence-based management (CBM) theory and is based upon systems thinking principles. We showed how SEAM can contribute to our understanding of the strategic incentives for the enterprises to develop a coopetitive relationship and the organization design required for accommodating and addressing the complexities and dynamics of such a multi-faceted relationship. We demonstrated the applicability of the framework by modeling coopetition between Apple and IBM that gave birth to PowerPC circa 1991.

Our future work focuses on assessing the applicability and usefulness of the modeling framework developed in this paper by applying it to a prospective business case. As the next step and in order to make the framework prescriptive, we intend to explore the possibility of translating the SEAM models to system dynamics stock and flow simulations models so that the impact of various resource configurations of the net delivered customer value can be quantitatively assessed.

6.References

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