# International School of Management

## Instructions DBA Professional Assessment Evaluation 1

## AMD: A Customer-Centric Approach to Innovation

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Outcomes Assessment Committee

**Professional assessment Evaluation 1**
**AMD: A customer-centric Approach to Innovation**
**Abstract**

*This very first Professional Assessment Evaluation (PAE) is based on a 2007 case prepared by the Harvard Business School (Ofek & Barely, 2007). It aims at assessing how the Sunnyvale, California-based Advanced Micro Devices (AMD) Corporation could expand successfully, and sustainably, its presence on the "microprocessors for the computing, communication and consumer electronic markets", while fighting against the, at that time ever dominant, former patents licenser, Intel company.*

*Since the recruitment of Hector Ruiz (2000), and its appointment as AMD's President and Chief Executive Officer (CEO) in 2002, from the Digital Equipment Corporation (DEC), where he ran the Alpha 21064 and 21264 microprocessors programs, further to a 22-year career with Motorola, the AMD company transformed itself, up to a level where in 2006, after four years of reinvention, Dell Inc (DELL), committed to the purchase of Opteron, AMD's server microprocessor for its highest-end server line. AMD was in a position of being a "laggard[i]" (Coad, 2011), no Tier-One OEM server, workstation, desktop and mobile manufacturer would "dare" to "trust with their most sensitive, mission-critical applications", as stated by Ruiz, AMD's CEO. AMD wanted to reach methodically for a larger place and visibility on the markets, consecutively enticing key OEM and associated players to go for AMD, expanding its ecosystem and offer, dragging end-users into the quest for more "critically" efficient microprocessors, while shifting AMD modus operandi from a traditional "waterfall" (Royce, 1970) approach to a more "agile" one (Royce, 1970). Ruiz's "MAID" strategy on the 64-bit front was bearing fruits, which collaterally got Intel into the newer position of being the market challenger, which consequently forced it to react and conduct drastic changes both in their products portfolio and their model of organizational structure.*

*This PAE has four parts, dealing successively with AMD's craving for creating a new paradigm in early 2000, its campaign for customers' awareness and vision sharing, while offering a better cost-strategy proposal to the market, Intel's thorough reaction to this "boat rocking" competitive market shift, and finally the way AMD could iteratively work with key customers, gaining insights, agility and business edges, while aiming at sustaining its renewed forefront presence in the microprocessors businesses.*

**Introduction**

Back in 2006, Dell's decision to opt for the Opteron chip for its highest-end line of servers, crowned a long standing effort from AMD (Advanced Micro Devices) to dramatically close the gap with Intel, on the server and high volume personal computer (PC) main chips markets, while undermining exclusive ties within the industry between Intel and Tier-one Original Equipment Manufacturers (OEM). Indeed from a non-existing share of the market in early 2000, AMD succeeded to raise to about 28 percent in mid-2006, while seeing Intel drop from 100 to 72 percent market share during the very same period, on the server side, and 18-82 percent up to 25-67 percent, respectively for the desktop market, at the exception of some short "troublesome" periods, as shown in Exhibit 1 (McCarron, Mercury Research). A de facto duopoly (server wise and to a bit shorter period of time, desktop wise as well), still to these days (Goettler & Gordon, 2011), it took though a series of innovative and ambitious steps from AMD to achieve such a claim and rival with Intel on the high end segment of the microprocessors markets. Those steps were encapsulated into the so-called MAID project, a four letter acronym standing for Microsoft, AMD, IBM and Dell, initiated by AMD's management in 2003 with the aim of offering the industry a new "crossroad of choices" for the future.

Under Ruiz's leadership, the "causation" logic driven microprocessors market, where the "Moore's law" (Moore, 1965) was of the (undisputed) essence, leading to the ultra-dominance of Intel for years, was to be challenged by a more "effectuate" logic, as reinforced by an "economic inevitability to entrepreneurial contingency" (Sarasvathy, 2001). Indeed, focusing more on a causal "less for more" (e.g. less space, heat, cost per watt, mechanical and software needs for redesign, in favor for more scalable, efficient, powerful, compact, economical single/dual/multi core, upward compatible, processors), than its effectuate "more for less" Intel counterpart (e.g. more power, higher frequencies, extended capabilities, for smaller footprint, thinner wafers), AMD was also left to find a way to differentiate itself and move away from being a sole "catch-up" player on the markets. It was furthermore necessary to ensure a broader recognition and awareness in the end-users minds, fighting against Intel's "competitive advantage and cost leadership" (Porter, 1980), and protect its place on the market. Indeed, Intel's dominance could have them implement any "aggressive" price, any foolproof processes of "manufacturing prowess", as well as any acute "product obsolescence" strategies, as a sole retaliation against an increase of AMD share "in any particular market segment". Doing so, it could vehemently oppose as well resistance to any possible alliance with any Tier-one OEM manufacturers or associated partner (i.e. Microsoft).

1.    **AMD necessary market leap**

In the early 1990s, claimed by large corporations as a response to their needs for "memory intensive and complex tasks" requests, the 64-bit Reduced Instruction Set Computer (RISC) proprietary architecture was developed by key OEM players (namely Sun with SPARC plus IBM, Apple and Motorola with POWERPC), to which Intel (in association with HP) offered an alternative 64-bit processor, the Itanium, aiming at getting access to the "higher-end server" market, of which Intel was absent. By doing so, Intel chose to depart

from the 32-bit architecture, emphasized by the x86 processor, and left its huge installed base with a Cornelian dilemma (Corneille, 1636), of having either to run 32-bits applications at low speed or to move to 64-bit architecture and fill a tremendous (and onerous) technological gap.

As such, Intel's departure from the X86 marketplace, and the role AMD was led to play as a second source for Intel in the period 1981 to the late 1990s, was to be followed by a drastic decision from AMD, in 1999, to answer the "closed" move from Intel toward the 64-bit computing (Itanium architecture) and concurrently see to reshape itself through the implementation of a comprehensive and ambitious "Virtual Gorilla" strategy, as stated by Ruiz. At that time, AMD was much smaller (9.7 percent the revenues, 19 percent the size, 20 percent the R&D budget), loss maker for the last four years (as compared to a 24.9 percent net income/revenue ratio for Intel), and highly less efficient than Intel (about 1 to 1.96 revenue/employee ratio in favor of Intel), as shown in Exhibit 2 ("Selected Financials Statistics"). AMD could be defined as "a team of motivated, talented and enthusiastic... just willing to kick the ball... and in the need of some discipline... a rallying cry to try a different path... was needed" (Ruiz).

In agreement with Goettler & Gordon (2011), assessing that "industry innovation is higher in the duopoly than in the monopoly when quality preferences are high and price sensitivity is low" and Schumpeter (1942), asserting that "the temporary monopolies are necessary to provide incentive necessary to develop new products and processes", one can see that the motivations for AMD to "break away" from its current model (1999), were quite high, and the timing adequate. The most favorable way for AMD to ensure a viable future in the overall microprocessor business, was indeed to radically rethink its global strategy and push upward its (many) limits. AMD reworked almost everything it stood for, from the way its products were to add value to its customer businesses, a radical move from "me too" product designs traditionally developed in the name of higher (megahertz) speed, to the leveraging of key OEM players on the market in AMD's favor (and against each other), while expanding its Opteron offer toward a more sustainable ecosystem. The codenamed Hammer 64-bit processor, since renamed Opteron, was the necessary catalyst for AMD to attain higher sustainability on the overall microprocessor markets, move up on the computing ladder from servers toward corporate desktops and notebooks, and ascertain its visibility and claims for higher, AMD-preferred, purchasing likelihood.

Consequently, the needs for "scalability" and "upward compatibility", whereas the same components could bridge, in much less time and required adaptation, the transition phase between the current 32-bit and coming 64-bit computing technology, were to become the necessary opening for AMD to respond, reposition and reinvent itself. Even though the cost to market and potential backlash (from Intel and large OEM players not willing to bet on an unproven business model or fearing Intel's reaction) could hamper its very future, the market situation (and lack of real alternative, as being a second source to Intel was not an option) forced AMD to take the decision to go for the server business, with its Opteron processor, and implement with it a (multifold) radical strategy (figure 1). The A (for AMD) from the RAID

project was reinvigorated and customers were to be moved back to the centrum of AMD's attention, through a "customer-centric" mission.

To achieve the very goal of gaining a significant market share of the desktop and notebook (high volume) processors market, that is landing the longtime Intel exclusive Dell as a higher-end customer, and grow from there, AMD had carefully crafted a four years strategy plan, which it indefectibly executed through the combination of "leveraging" (key players against their antagonists), "surrounding" (getting direct access to Dell, only as an end result of its MAID strategy) and astute implementing of a far fetching "marketing mix" (McCarthy 1960), all aimed at leaping AMD forward, as illustrated below in figure 1. A direct (read frontal) access to Dell was unthinkable, due to the above mentioned reasons, and the most adapted strategy was to gain momentum within the industry, in a "surrounding" move around Dell, before gathering the right "credentials" to see the then (2006) desktop and mobile worldwide market share leader (in Unit) committing to partnering with AMD. In that setup, IBM (AMD former ally) and Microsoft were targeted first, with the common interest of seeing a lesser "presence" of Intel in their product and program offers, and for AMD to have two heavy weight "sponsors" for its nascent Opteron chip. Once endorsed by IBM and Microsoft, it became a bit easier to expand the ecosystem around the Opteron chip, launch a communication campaign directed at raising "Power Management" awareness, the well know performance-per-watt "Power Campaign", attract larger volume players (e.g. HP and Sun), and place key customers (customer-centrism) and commercial channel (council) at the "center" of AMD efforts. All the while going upfront against archrival Intel, by filing a federal antitrust complaint (2005), for abuse of dominant position, with the purpose of leveraging this juridical (risky) move to boost OEMs' confidence in AMD capability and determination. The last "controversial" move was to go for a Royalty-free licensing of the Opteron's "HyperTransport" technology to key corporate customers, a bold move which AMD management was certain was going to bring medium to longer term benefits, in ways of closer relationships with highly visible customers on the markets and an enhanced customer-centric culture within the AMD corporation. It may eventually succeed in "changing the industry", as Ruiz envisioned.

Figure 1: AMD "Virtual Gorilla" Strategy

**Fig 1.** AMD « Virtual Gorilla » Strategy  ⬩⬩⬩ Surrounding  ◆—◆ Leveraging  – –→ Marketing Mix
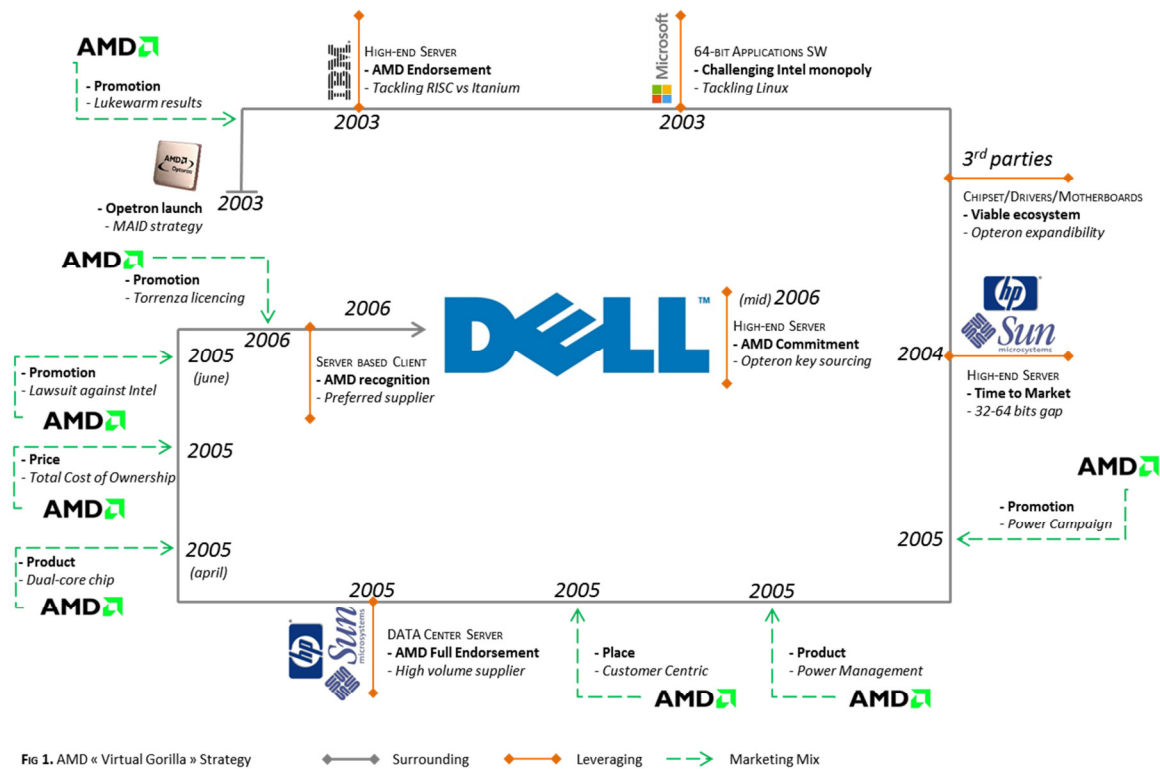
The Opteron led the way to reinvent AMD, increased its visibility on the market and allowed the company to expand its reach to newer (higher volumes) market segments, while opening the door of Dell and future further collaborations.

## 2.    Valuing the AMD "Power Campaign"

Third leg in AMD's conquest for larger volume and enhanced sustainability, coming after initial endorsements by key OEMs and associated partners, and third parties ecosystem expansion, the "Power Campaign", was based on the two-folded results of a consumer survey AMD had been sponsoring. Partly, the issues of "power consumption and cooling" were perceived as being well identified by customers, yet lacking commitment in their undertaking. Consequently, the campaign was aimed at leading, and associating AMD with, professional end-users and decision-makers' perception toward a broader consideration of the Total Cost of Ownership (TCO). The campaign should as well succeed in building a larger AMD "brand equity" (Wood, 2000), in its "consumer-oriented definitions", and more especially in its "description of the associations and beliefs the consumer has about the brand" (Feldwick, 1996). To have Business to Business (B2B), non-IT managers, decision makers moving away from the undisputed Intel's "brand equity" (Pitta & Katsanis, 1995), which "increases the probability of brand choice, leads to brand loyalty and insulates the brand from a measure of competitive threats", was becoming a necessity for AMD, in order for them to build and strengthen their corporate brand, distance their campaign from a pure product branding, and be perceived on the markets as the "compelling" alternative brand.

Furthermore, considering how "Business to Consumer (B2C) can influence the B2B component, in the B2B brand recognition" (Pfoertsch et al, 2007), as Intel famously did with its "Intel Inside" campaign, AMD was to create a "new paradigm", that is a *New pattern or method of investing, which results in changes in business* (retrieved June 1, 2013, from http://www.businessdictionary.com), that could help add value and confidence into the perception of the AMD brand, while conveying the message ("push") to end-users and consumers, that microprocessors' choices, could more holistically impact on the environment (waste of money and energy), and should be seen at the key to lower (otherwise increasing) operating costs, beside their sole function of computing efficiencies.

For corporate users, especially IT "within compute-intensive segments of large corporation", this message helped AMD differentiate itself dramatically from Intel, especially in the light of how Intel used their abundant "profit dollars" to convert Original Design Manufacturers (ODM) and Non-Recurring Engineering (NRE) players, to "market and promote Intel systems", all the while the "Intel Inside" campaign was aimed at (mainly) involving consumers into the very decision of buying Intel-powered computers ("pull"). While on a corporate level, Intel branded itself as the "reliability" and "leading technology" supplier of choice to its users (figure 2a), its "disruptive" fast pace setting of changes was not without consequences for its B2B customers, and led many of them to start focusing on the search for "more efficient power for lesser troubles", that is alternative solutions where upgrades were not necessarily synonymous with "disruptive" evolution, and where the overall environment (e.g. computing power per square meters, cooling and consumption efficiency, ease of scalability and upgradability), was taken into consideration. As such, being for a long time the undisputed leader, Intel felt "free" to set the pace of change within the industry, matching it with "product development dollars" and "manufacturing prowess", until AMD increased its brand awareness to a level where it was able to position the debate on a different paradigm and effectively assert its leadership on the "performance per dollar" and "performance per watt", as gathered below (figure 2b).

Its campaign was articulated around a focused scope of B2B "targeted" media (business and economic newspaper, multiple touch-points and street structures advertising in key area), while carrying a set of "accessible" values (e.g. less consumption, higher saving) spread across "impacting" messages to the very end-users. Lingering on "green" values (whether US Dollar or environmental oriented), the AMD campaign gave power to the consumers to enquire as well ("pull") toward their "computer brands" (tier-one OEM manufacturers, retailers), about their position on such sensitive issues.

Figure 2a: Intel value proposition | Figure 2b: AMD value proposition
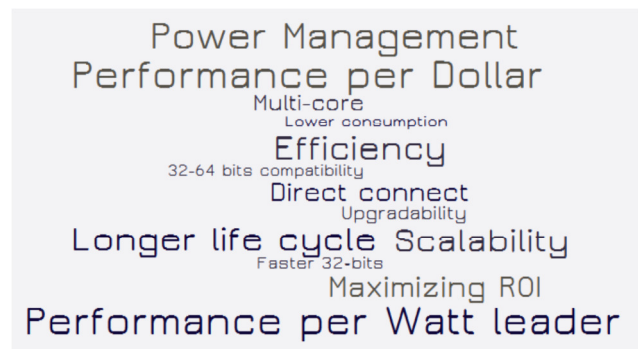


AMD answers to more "economically responsible", yet "technologically evolutive" requests from the IT fringe of their customers, and their translations into the "Power Campaign" was to be seen as a first step toward a broader "customer-centric" approach and tantamount to AMD's corporate philosophy.

## 3.    Intel hampering plans

At that time (2005) still quite smaller than Intel (15 percent the revenues, 10 percent the size, 22 percent the R&D budget), barely profitable for the last two years (2.8 percent net income/revenue ratio for AMD to be compared with a 22.6 percent for Intel), AMD was much more efficient than Intel (about 1.52 to 1 revenue/employee ratio in favor of AMD), as shown by the 2005 figures in Exhibit 1 (McCarron, Mercury Research). The figures show that AMD had been expanding (revenue, R&D budget and employee wise, but for the year 2005) and catching up with Intel, due mainly to the Opteron effect. However "net income" figures showed a relative small gain in the last period of time, which dramatically contrasted with the positive income Intel has been enjoying along the years. This emphasized the fact that access to available cash flow, and thus financing of new product plans, was still supposedly easier for Intel than for AMD in the medium to the long run.

However, the ill-fatted Itanium project (and reversely successful Opteron one), brought to the market at a tremendous cost (over $1 billion), a decade in development, and several years late, symbolic of Intel's misfortunes on a large span of other underperforming and technologically outpaced products, was undoubtedly leaving a dent on Intel unchallenged ability to "lead the game", to the dissatisfaction of many of its customers, and consequently, shareholders. From an undisputed market share leader position, Intel "experienced the inevitable erosion and dethronement of market share leaders over time" (Scbumpeter, 1934, 1950), to become a challenger to AMD and for the first time in the industry, was perceived as being singled out.

This new situation challenged Intel to its core, which was then forced to react and initiate in April 2006, a drastic $1 billion restructuration plan. Still a behemoth by all financial standards (i.e. revenue, operating and net income, company assets), Intel's R&D capability ("the industry standard") was contested as well by AMD relative efficiency (much shorter time and costs to market), and its "customer-centric" approach. To this situation, Intel chose

to answer in a dual, almost contradictory, behavior, that is a refocus on its core activities (i.e. processors) while streamlining the company ("causal"), and expanding its reach and weight at customers, posing itself more than ever as a "single stop shop" partner for the mobile processing market ("effectuate"). On the one side, "less for more" (e.g. staff, businesses, bringing "faster time to market" products), while on the other side "more for less" (e.g. features, suitability, safety, through the building of "platforms"), were to define the revitalized Intel.

To my opinion, not enough elements at this stage have been made available in the Harvard Business School (HBS) case, to see that indeed Intel could "reinvent the desktop" as stated by its CEO. However, since AMD gained a sufficient momentum, to make inroads at key OEM manufacturers, it appears clearly to me that since the market could witness that an "agile" alternative (to Intel) microprocessor partner was to be found, going afar from Intel was now assessed as a sound possibility. As such, and as illustrated (figure 3), AMD "customer-centrism" aimed at seeing them playing more of a role of "highly differentiation – larger volumes (niches market)" than previously, which forced Intel to expand its "platforms" approach while keeping a (relatively) "low differentiation – large volumes (volume market)" approach to the markets.

Figure 3 : AMD & Intel new paradigms (revenue wise)



Fig 3. AMD & Intel new Paradigms (revenue wise)  ---▶ « Platforms »   - - -▶ « Customer-centrism »
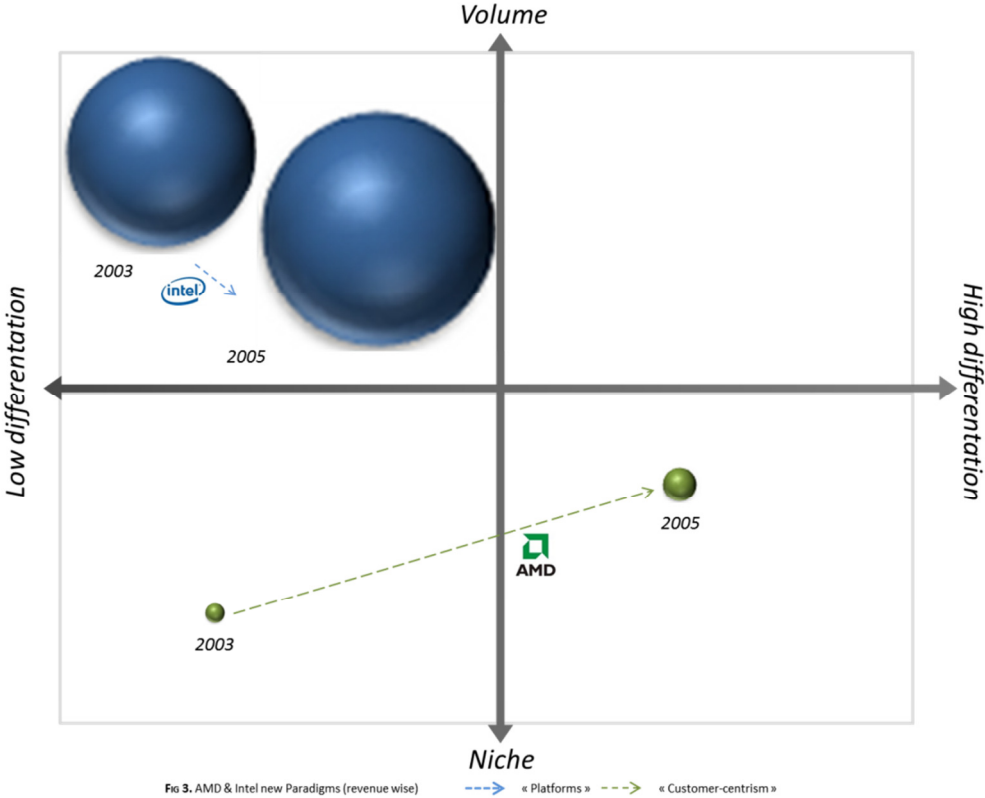
Intel's reaction does appear to me, more of the "damage control" kind, as it does not dramatically depart from its historical view on its role and weight on the markets, while for AMD it seems more obvious that the paradigm change is more of a permanent "transformational" kind, here to stay. Having said that, Intel's might and weight on the

markets, will still allow it to "lead the game", even if a slightly smaller one at it, for the foreseeable future.

## 4.    AMD customer-centric yield

As illustrated above, the main motives for Ruiz to implement a "customer-centric" approach, along with the Opteron momentum, was to position AMD afar from Intel on the product differentiation axis, while acceding to larger volume customers with (typically) unanswered needs, all the while securing AMD's positions on the markets. Prior to that, the awareness on the markets grew that AMD was able to provide scalable chips, and was an able performance-per-watt leader, yet the dominance and leverages of Intel within the industry, were such that it first hampered AMD, and did not permit it to move rapidly, higher up toward the desktop and mobile volumes.

As the "power campaign" did unravel, the debate was to move away from pure computing speed, toward broader concerns, for consumers as well as for partners, of which AMD was to position itself as the most appropriate answers' provider. To do so, AMD needed also to convince key customers about its commitment to satisfy their needs, "go beyond faster, cheaper, better" and turn its newly broadcasted philosophy into something "valuable" for them. Resisted at first, for lack of understanding and (Intel ingrained) highly directive habits, AMD's partners grew accustomed to be called into advisory panel and business groups, voice their expectations, and see that AMD was here, willing to partner. Interdependence (Levine & White, 1962) was created and nurtured for the mutual benefits (e.g. in the form of product differentiation, better margin, or larger commercialized volumes) of both sides, whereas the ultimate goal for these alliances and partnerships was to gain competitive advantages on the markets (Bleeke & Ernst, 1991).

Second step in the "customer-centric" approach, a bit as it has been made with third parties and the sustainability of AMD ecosystem, AMD enlarged its scope of business interactions to encompass key influencers, for instance Value-Added Resellers (VARS), which were notably selling notebooks and desktops on the markets. To them, AMD opened its own marketing and support organization, though the "Commercial Channel Access Program", and shared many sales and support tools, increasing "collaboration and innovation within the AMD64 ecosystem" as well as allowing AMD to free resources and focus on meeting deadlines and fulfill customers' expectations, which were paramount to them.

Further to that, listening to large end-users allowed AMD to spot very early on, new market trends, which could have a huge impact on the way the business was moving, which for instance allowed AMD to have a feel for a future where all computing power will be centralized on servers, while distributed on "idle" monitors throughout the end-users networks. Ironically, this very notion was foreseen many years before by Moore (1965), at that time Director, Research and Development Laboratories, Fairchild Semiconductor division of Fairchild Camera and Instrument Corp., whereas he announced that "at least terminals (will be) connected to a central computer".

Indeed, more than just changing the business model of AMD, Ruiz's decision was also made on the premise of "transformational leadership" (Northouse, 2007). The situation he encountered when joining AMD, let him understand the potential of the AMD people and allowed him to put a frame around it, while "providing challenges and follower engagements towards shared goals" (Northouse, 2007), as the "customer-centric" approach stood for. To Ruiz, the next logical step was for AMD to propose bespoke solutions to key customers, opening its Opteron's architecture, in a bold move labeled Torrenza, which was to license for free its "HyperTransport" technology, rendering the access and further development on it much more accessible and accepted.

Reminiscent of what is well known within the software industry as "agile methodology" (Royce, 1970), the Torrenza initiative saw key customers coming closer to the heart of product developments, becoming an active and involved part of the project requirements, their management and extended teams, which at turn kept forcing AMD to iteratively improve, and abide by, its platform offer. "Agility" comes as an antonym of the more traditional "waterfall" (Royce, 1970) sequential developments which rapidly appeared as being non adapted to the peculiar requirements of the software development, where iterative communication and intermediary milestones are a full part of the development process of the finished application. AMD was getting "agile" inputs, translating into multiple dedicated, well suited, products ("outputs"), while Intel continued managing both the "inputs" and "outputs" in its positioning toward customers, putting its large R&D budget and overall weight into the balance to influence the markets, as illustrated below (figure4).

As such, by getting closer to key customers, remaining flexible and agile, AMD once more changed the rules in action in the industry, and came to be known for its alternative (to Intel) value propositions. Its direct benefits were obvious for the foreseeable future, that is gaining competitive advantages (and higher shares) on the markets, and getting early access to future market trends, yet it does not necessarily appear certain that Intel's reinvention, around its continuing strategy of platforms, will not be enough of a catch-up to overtake AMD in the medium to long term. Intel's leveraging skills and weight may endanger the more holistic approach of AMD, while bringing enough revenues to sustain any temporary downturn on the markets.

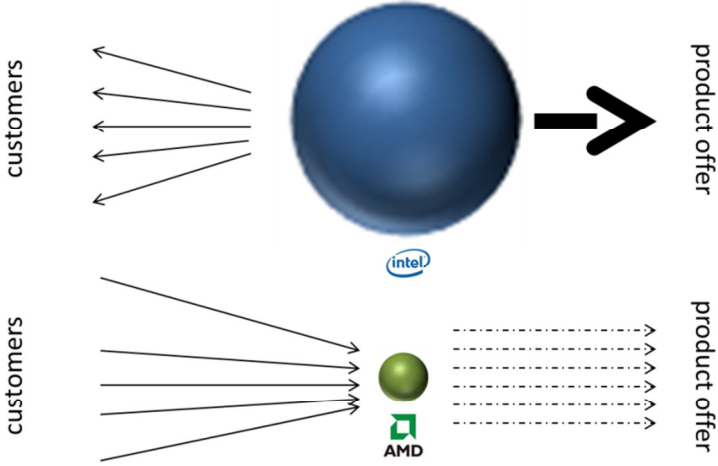Figure 4: AMD & Intel Customers' positioning (R&D wise)



Fig 4. AMD & Intel Customers' positioning (R&D wise)   ---> « inputs»   -·-> « outputs»

**Conclusion**

Back in 2003, AMD's challenger position to Intel, and financial woes, left it with no other choice than reinventing itself and the way it did business to "subsist" and sustain its presence on the markets. The initial situation with an ultra-dominance, an overall "industry standard" and pace setting from Intel, was commonly accepted by all major actors, which hesitantly opened their doors to alternative suppliers, such as AMD, only when (temporarily) let down by Intel.

To confront that, AMD's management was "forced" to foresee the emergence and needs for a set of new paradigms on the markets, where OEM partners, third parties vendors, end-users and consumers were eagerly encouraging alternative value propositions, if and when, such substitutions were not endangering their current relationship with Intel.

The Opteron chip, launched in 2005, then the following "customer-centric" and Torrenza moves, became all part of a broader agile methodology where AMD's center of gravity was to be redefined within the organization, as opposed to being found in the shadow of Intel, under the transforming leadership of Hector Ruiz, who envisioned that transformation already when joining the company.

Four years down the line, the market was offered a "crossroad of choices", with the two major actors having just reinvented themselves. It was just a new situation of some kind, for the market to learn to face.
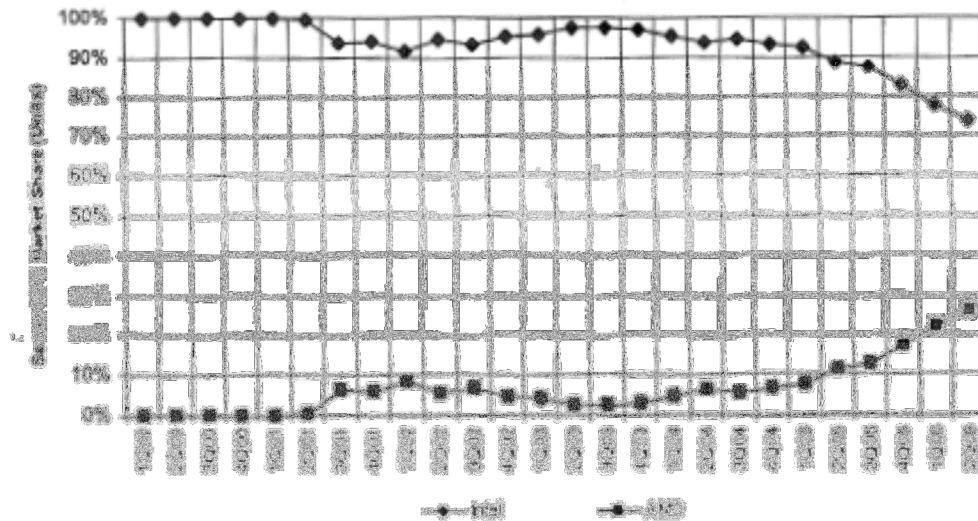
**Exhibit 1**

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Exhibit 2a    x86 **Microprocessor** Market Shares 1993–Q2 2006 (unit share)
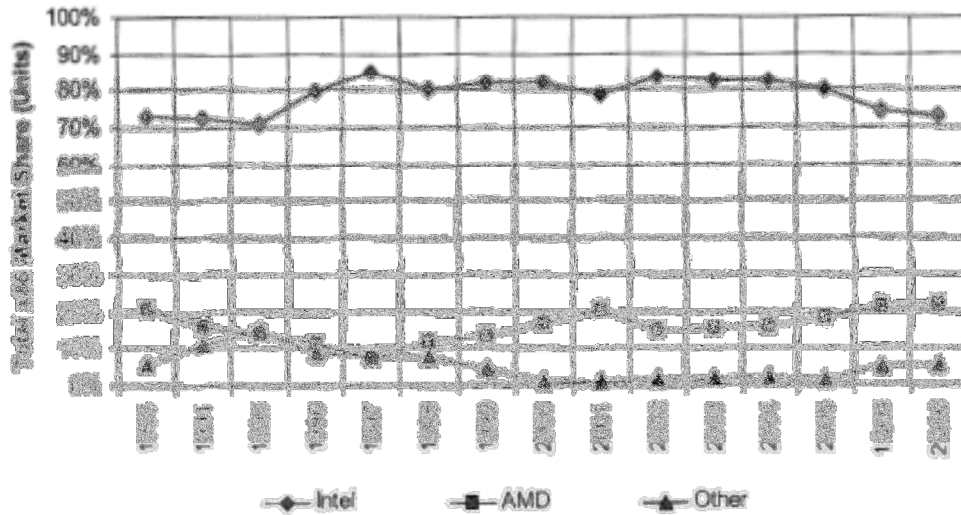


Source:   Dean McCarron, Mercury Research.

Exhibit 2b    x86 **Server** Microprocessor Market Shares Q1 2000–Q2 2006 (unit share)



Source:   Dean McCarron, Mercury Research.

Source: Dean McCarron, Mercury Research.

**Exhibit 2**

Exhibit 3  Selected Financial Statistics for AMD (in millions of dollars except for employees)

| Year | Revenue | Cost of Sales | R&D | Operating Income | Net Income | Additions to PP&E | Employees[a] |
|---|---|---|---|---|---|---|---|
| | | | 1,444 | | 165 | 1,618 | |
| | | | | | 91 | 1,441 | |
| | 3,500 | 2,587 | | | -404 | | 14,400 |
| 2002 | 2,697 | 2,106 | 816 | -1,225 | -1,303 | 705 | 12,800 |
| 2001 | 3,892 | 2,590 | 651 | -58 | -61 | 679 | 14,800 |
| 2000 | 4,644 | 2,515 | 642 | 889 | 983 | 805 | 14,400 |
| 1999 | 2,858 | 1,964 | 636 | -321 | -89 | 620 | 13,400 |
| 1998 | 2,542 | 1,718 | 567 | -164 | -104 | 996 | 13,600 |
| 1997 | 2,356 | 1,578 | 468 | -91 | -21 | 730 | 12,600 |
| | | 1,443 | 401 | | | 401 | |

Source:  Company 10-Ks.

[a] As a result of the Spansion, Inc. IPO in December 2005, the 2005 figure does not include the Spansion employees.

Exhibit 4  Selected Financial Statistics for Intel (in millions of dollars except for employees)

| Year | Revenue | Cost of Sales | R&D | Operating Income | Net Income | Additions to PP&E | Employees |
|---|---|---|---|---|---|---|---|
| | | 12,777 | 5,145 | | | 5,818 | |
| | 34,209 | 14,463 | 4,778 | 10,130 | 7,516 | 3,843 | 85,000 |
| | 32,144 | 13,047 | 4,300 | 7,530 | 5,641 | 3,656 | 78,700 |
| | | 11,648 | | | | | |
| | | | | | | | |
| | | | | | | | |
| 1999 | 29,389 | 11,836 | 3,111 | 9,767 | 7,314 | 3,403 | 70,200 |
| 1998 | 26,273 | 12,088 | 2,509 | 8,379 | 6,068 | 4,032 | 64,500 |
| 1997 | 25,070 | 9,945 | 2,347 | 9,887 | 6,945 | 4,501 | 63,700 |
| | | | | | | | |

Source:  Company 10-Ks.

Source:  Selected Financial Statistics for AMD & Intel.

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