Competing with Intel and Nvidia: The Revival of Advanced Micro Devices (AMD)

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Abstract - **Nowadays, organizations need to have innovation mechanisms, and this is due to the market constantly evolving. This ever-changing climate may cause instability within organizations, in some cases even lead them to a scenario of bankruptcy. In this case study, we analysed the unlikely success story of Advanced Micro Devices (AMD). AMD is a company that operates in the semiconductor industry. A company responsible for computer processors since 1969, and more recently it went through a major change in its strategic management to survive a bankruptcy situation. Even though AMD showed a lack of adaptation throughout the years, especially when smartphones and tablets first appeared, AMD has, since then, turned their focus towards what they are fundamentally good at, and they bet on those segments, which were high performance computer components. These segments were mostly dominated by very few players, such as Intel and Nvidia. This restructuration was led by Dr. Lisa Su, as she rethought the various strategies used by the company, propelling AMD once again to the top and making it one of the market leaders in the technology industry. In this study we focused on the successful case of AMD, by understanding the type of strategy chosen by the company and how it influenced its ongoing success. To achieve this, we collected information in various ways. Regarding the gathering of information about the company, an analysis of Dr Lisa Su's interviews and the organization's website was made. After carrying out these tasks, academic articles were read to identify the approaches selected by the company. Dr. Lisa Su's management proved to be fundamental to the company's success, as her futuristic vision and her ability to bet on promising products allowed AMD not only to face its biggest competition, but also to go head-to-head against it. This study suffered some limitations in terms of data collecting since there was no opportunity to talk with the company and consequently ended up being based on the formed opinion of the authors.**

Keywords - Strategic Management; AMD; Innovation; Technology; Dr Lisa Su; Marketing.

I. INTRODUCTION

The necessity of innovation is not necessarily new, as it can be considered a trait of the human forum [14]. The first innovation we can observe is the introduction of agriculture, about 12 000 years ago, whereby human beings felt the need to innovate their mode of feeding, going from just being hunters to completely adopting a whole new system, and by doing this they opened the doors for the development of society [16].

Innovation turns out to be an inevitable phenomenon, given that it originates from a natural human tendency to think about how we can improve or how to do something differently. To be able to identify an innovation, it is necessary to define its concept. It refers to the idealization and implementation of an idea, and currently it happens mostly in an organizational context [14]. If the concept is applied successfully by an organization, then it will flourish in its intended market and allow the organization to create long-lasting relationships with its customers [35]. With the very significant advancement of technology, companies have been forced to innovate to succeed, while facing competitors and achieving customer satisfaction [6]. However, for the innovative process to be successful, the manager needs to have a vision, meaning that, he/she needs to know which product to bet on.

In this case study, we will analyse a successful story that managed not only to survive a bankruptcy scenario, but also to become one of the biggest technology leaders, due to the application of good strategic management allied with a solid offer of quality products.

II. METHODOLOGY

This study aims to tell more than just the story of Advanced Micro Devices (AMD). Its purpose is to understand in more detail the type of strategic management chosen by the company and how it managed to recover from a possible bankruptcy. We

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also discuss how the company has managed to adapt to market pressures, the growing development of technology and how it has stood out with its product offering in such a competitive sector.

To accomplish our goals, we initially resorted to secondary data collection (collecting information on AMD's revenues), using the company's website as well as the interviews given by the CEO. After assessing the company's success, information was collected on the type of strategies implemented by the company.

Then, a more qualitative research was conducted, which was based on the collection of authors who supported or refuted the approaches embraced by AMD. This research allowed to define relevant strategic management concepts. In addition, we use classic authors such as Porter and Hitt, as they provide solid intellectual grounds of the analysed concepts [34, 17].

For this search for publications, several data base search engines were used, such as Scopus and Google Scholar. These search engines allowed us to filter the results according to the keywords used and the desired time interval.

III. THEORETICAL CONTEXT

With globalization, the increasing competitiveness in different markets and the rapid evolution of technology, there is an urgent need to implement new business models and new management strategies aimed at not only differentiating themselves from others but also in surpassing them [6].

The common goal for all companies is to increase their productivity by simplifying the organizational system, as they need to adapt quickly to the needs of customers. This concept of seeking constant improvement is called Kaizen Philosophy [38].

It is essential to have knowledge of how to act, depending on the internal and external environment in the company, it being a key to good performance, since it allows for a conscious use of resources and to thus be able to achieve the defined goals. This management involves everything and everyone who is a part of the organization, which means that new forms of learning are valued and adopted, and that teamwork and individual skills are valued [8].

Studies show that companies will only be successful if they can adjust to the needs of their employees, which is why it is a differentiator for a functional organization or not. For a company to grow and innovate, they must not forget its qualified and integrated professional body, that is, employees must be considered a responsible part of the organization's success, just as they must feel that their work contributes significantly to achieve all of the firm's goals. In this perspective, it is crucial that the quality of training, motivation and integration of the people are considered [28].

For a company to be successful, it needs to fit into the market and survive the competition imposed by other companies. Thus, to guarantee its survival, productivity, and sustainability, it will have to focus on continuous improvement, and on transforming and developing new skills that can respond to the difficulties that arise [22].

Currently, companies are faced with recurring situations in the market that force them to reconsider their products, since they end up becoming obsolete and unable to generate profit [21], creating the need to stand out in the market. These situations cause instability and difficulties in organizations, and the only way for companies to overcome them, is for them to change their competitive strategy. However, for the strategy to be efficient, the company must bet on innovation, trying to create greater value in its offering [3]. The competitive strategies adopted by organizations can be classified into three types: the competitive cost strategy (based on minimizing expenses and increasing the production volume); the competitive differentiation strategy (investment in technology, distribution, research, development, and others) and the competitive focus strategy (invests only in a specific niche or region, perhaps with a specific product) [26].

In addition to the competitive strategy chosen by the organization, it is necessary to consider the competitive environment of the market to which it belongs, whether it is blue ocean or red ocean [23]. The red ocean represents situations in the market where several companies have the same offer, making the competition constant. On the other hand, blue ocean is the opposite market situation, given that it allows companies to offer their products with reduced competitive presence [31]. However, blue ocean situations are generated from red oceans of other industries, that is, the organization from a large market area chooses a more specialized branch and invests in the creation of new products, thus managing to unlock new spaces in the market [23].

No less important, the type of marketing used by the organization is a decisive factor for its success, given that it shapes the customers' perspective of the product and the company [29]. There is an additional difficulty when the company tries to launch its brand and differentiate itself from existing products, given that the market is already in maturation and it ends up demanding a greater capacity to develop its value as a brand [35]. From this standpoint, marketing emerges as an extremely valuable tool, by using new information and communication technologies (ICT) as a resource. In addition to enabling an increase in value, as well as product distribution, it also facilitates the relationship

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between company-client, since the client now has more means to give their feedback and thus gives the company the possibility of following up on customer preferences and needs [1].

In an increasingly international world, it is essential to have solid strategic alliances. These partnerships allow organizations to share risks and the resources necessary to enter demanding international markets. Furthermore, strategic alliances can facilitate the development of new skills that will contribute to the future competitiveness and viability of the organization [19]. Each partner in an alliance contributes knowledge or resources to the partnership. Most of the time, partners enter an alliance with the purpose of acquiring new capabilities, specifically technological capabilities. However, for technological knowledge to be transferred in an alliance, trust between both partners is key. This trust is affected by at least four fundamental questions: the initial conditions of the relationship; the negotiation process to reach an agreement; interactions between partners; and external events. Moreover, trust is also influenced by the culture of origin of the organizations involved in the alliance [19].

When it comes to large markets the role of women is not recognized in the same way as for men. Despite the increase in gender equality in the world of work, few women are actually able to obtain important management positions. Statistics indicate that only 29% of CEOs are women, with no significant improvement over time [7]. In the past two decades, the reasons given for not promoting women were: for lack of guidance; lack of management experience and other male stereotypes [43]. However, studies have already been carried out showing that the presence of a woman in a top management position made the company more profitable. A study carried out by Dezsö & Ross in 2012, led to the conclusion that female representation in important management positions provided benefits of social diversity, that is, it enriched the behaviours shown by managers and motivated other women at lower organizational levels. On top of it, the company's performance was improved, particularly if the company's strategy is based on innovation [9].

IV. Company History

AMD is a North American company specializing in the production of semiconductor devices that are used in computer components, such as processors and graphics cards. It was founded on May 1, 1969, by Jerry Sanders, as a start-up in Silicon Valley [41]. In 1982, and until 1986, it supplied chips to Intel, being recognized for the quality and performance of its products [41]. In 1991, AMD launched the Am386 line of microprocessors, a reverse-built chip that was compatible with Intel's offering. This led to a legal dispute, which ended only in 1994 in favour of AMD. That same year, Compaq hired AMD to produce Intel-compatible chips for its computers. In 1996, AMD bought a microprocessor company known as NexGen and from that moment on, it started to distance itself from the market based on Intel architecture. In 2000, AMD introduced the Athlon processor, which was designed based on Microsoft's Windows operating system. With this launch, AMD became the first company to produce a 1 GHz (giga hertz) microprocessor, which emphasized AMD as a serious competitor in the chip market. In 2003, the company launched the Opteron and Athlon 64 processor lines, based on the AMD64 architecture. These releases defined a pivotal moment in the history of the organization, as this was the first x86-64 processor architecture and bringing this technology to the market was revolutionary. So revolutionary, in fact, that the current market leader Intel was forced to license this technology, thus entering into a cross-licensing agreement with AMD [5]. A year later, the company launched the world's first dual core x86 processor, and AMD's innovative offer redefined the industry standard once again [5].

In 2006, the company acquired ATI Technologies, a manufacturer of video cards for computers. Two years later, AMD announced plans to split the company in two – one part responsible for producing microprocessors and the other for manufacturing them. In 2009, the company filed a complaint against Intel due to anti-competitive practices, as it was financially compensating manufacturers who preferred their chips over AMD's and sought to bribe manufacturers to cancel or delay the launch of AMD chip products [41].

A few years later, the company was facing a bankruptcy scenario due to several factors, such as: slowdown in the purchase of computers, which at that time was its main source of revenue (due to the fast increase of smartphones and tablets); inconsistent leadership, from 2008 to 2012, namely the company had three different CEOs; problems in its supply chain, related to manufacturers; and little representation in the high-performance computer market [42].

In October 2014, Dr. Lisa Su assumed the positions of president and chief executive of AMD. This decision would drastically turn around the direction of the company [5]. More recently, in 2017, AMD managed to differentiate itself by presenting products with high performance and greater efficiency. However, these products of this nature take many years to develop, which was the case with their latest line of Ryzen processors, which started to be developed in 2012 by a team led by a former Intel engineer, Jim Keller [33]. This Zen architecture hit the market in 2017, and immediately impacted the market by providing a competitive price compared to Intel’s chips and, in some cases, surpassing Intel in performance. In 2019, the third generation of Ryzen chips released, still based

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on Keller's design, this turning out to be the big moment for AMD, as it dominated the competition in almost all metrics. Not coincidentally, during this time, AMD's stock price rapidly went up. Since then, AMD has been increasingly expanding its market share, it still being behind Intel, but in a much more favourable and competitive position than its rival. This growth will not slow down in the coming years [25].

V. Analysis of Organizational Management

A. Strategic management

AMD invested in a competitive focus strategy, that is, by focusing its attention on specific customer niches, it was able to improve and expand its product offering in these segments. By doing this, it allowed them to create more value for both the company and its customers [34].

When Dr. Lisa Su took the lead, the company's path would change substantially. Around that time, the mobile market was a promising segment in the technology industry. This led many technology companies to expand their offering to attempt to win significant shares in this new market. However, AMD, despite its history, would not necessarily be able to compete in a market of this type. It was then that the already CEO, Dr. Lisa Su made the decision not to compete in the mobile market at all. This market filled with opportunity would quickly become a gigantic red ocean, a space full of competitors [23]. On the other hand, the company redirected its efforts and time towards what they were fundamentally good at, the chip market. This business decision meant that AMD said no to an exciting segment like the mobile market, allowing instead for AMD to analyse and study its main market and consequently develop the technology necessary to innovate and expand its product range. Therefore, competing in a market that is not necessarily easier, but in a market that has fewer competitors, to which we can associate the concept of the blue ocean [31], is a good strategy. As well as being a market extremely hard to get into, despite all of AMD's unfortunate events throughout its history, they are one of the very few players in this industry.

This decision allowed the organization to create a line of high-quality products, while minimizing its cost [40]. The organization invested significantly in research and development, so that it was possible to create products that would answer future industry demand. Something which was only possible to do through correct predictions of where the market would be within a period of five years. These forecasts obviously vary depending on the product and the industry in which the company operates, and in the case of the semiconductor industry, despite the rapid evolution of technology, the product design cycle is not short at all. This market therefore requires a high capacity for anticipation and prediction [40]. Dr. Lisa Su highlights the need for extreme communication as well as transparency throughout the organization, for managers. So that all its employees are familiar with the objectives set by the organization. Only then may people and the organization itself improve [10].

B. Marketing

The commercialization of new high-tech products tends to be the most expensive phase of the entire product development process. Even when the whole process is well managed, risk is always present. New high-tech products usually have only one successful attempt to enter the market. If it fails, the consequences are inevitably fatal [12]. Which further raises the importance of marketing.

There is more and more supply in markets, and this at times turns out to be a problem for customers. When faced with what to buy, the first reaction is to postpone the purchase. Albeit, when it is no longer possible to postpone, they end up buying the safe choice, that is, opting for the leading brand in the market. There is security in numbers, and this position is even more relevant in technological markets [12].

AMD, despite not having the position of market leader, is increasingly solidifying its name in the market, thus seeking not only to cultivate a winning image, but also to emphasize the technological superiority of its products relative to the competition.

The company's focus is concentrated on three main segments: data processing centres; gaming; and computer components, such as processors and graphics cards. AMD seeks to position its offering according to its vision of where the market will be and what it will need from technology [11].

C. Strategic alliances

In many cases, how a new product is planned to enter a market is crucial. Some form of cooperation is increasingly seen not as an option, but as an absolute necessity [12]. Strategic alliances have the potential to create value for both companies involved. We can talk about four forms of strategic alliances that have technology as the driving factor: technological licenses; joint research and development; supply agreements; and joint ventures [44].

In AMD's latest partnership with Xilinx, the world's leading supplier of programmable logic devices, both companies had decided to team up to develop data centre solutions, which use AMD processors and field-programmable gate array (FPGA) from Xilinx [20]. This partnership demonstrates AMD's commitment to the continuous improvement of its products, in this case, its data processing centres. Hence, AMD has key partnerships with numerous companies that are leaders in their respective sectors and these same partnerships promote not only the offerings of both companies, but

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also promote the future technological development of these respective segments [19].

From a business perspective, AMD seeks to associate its product range with other leading brands. In this way, it strengthens its name in front of its consumers and creates valuable business relationships.

D. Female CEO: Dr. Lisa Su

Dr. Lisa T. Su is President and CEO of AMD, a position she has held since October 2014, and she serves on the AMD Board of Directors. Previously, she was the director of operations responsible for integrating AMD's business units, sales, global operations, and infrastructure training teams into a single market-oriented unit, responsible for all aspects of product strategy and execution. Dr. Su joined AMD in January 2012 as senior vice president and general manager of global business units and was responsible for driving end-to-end business execution. Prior to joining AMD, Dr. Su was senior vice president and general manager of networks and multimedia for Freescale Semiconductor, a semiconductor company. Dr. Su also spent 13 years at IBM, International Business Machines, where she held several leadership positions in engineering and business/research and development. Dr. Su holds bachelor's, master's, and doctoral degrees in electrical engineering from the Massachusetts Institute of Technology [5].

Dr. Lisa Su on the absence of women in leadership positions at the largest corporations in the United States of America, stated: "My hope for the next twenty years is not to be talking about how many female CEOs there are in the Fortune 500, because it will not matter. It will be natural for corporate leadership to reflect the most talented individuals" [4].

VI. Conclusion

If AMD had not undergone a restructuration in terms of its strategic management, that is, if they had not had the flexibility to adapt to the growing pressures in this era of new technologies, they would not have been able to survive a possible bankruptcy scenario and find the right direction.

In addition to the financial difficulties that the company faced, Dr. Lisa Su also had to overcome the stigma of being a woman in an important management position. Albeit that was not an impediment to success, and currently her compensation package is $58.5 million, surpassing the highest-paid CEO by 13 million [37]. Additionally, she has been at the forefront of top management leaders, regardless of gender.

Management by Dr. Lisa Su was essential for the company to be successful. Its ability to use new revenue mechanisms and new manufacturing techniques has allowed AMD to stand up to its biggest competitors, Intel and Nvidia. AMD achieved a higher production complemented by a minimization in costs. The company has learned to value its partners and recognize that they have allowed for greater growth. People have become an essential key when it comes to the company's value, as it continues to invest in their training and education, in order to empower people and give them the freedom to face all the challenges that may appear.

It is well known that success is not something that can be guaranteed, and it is increasingly an unstable state. Following this line of thought, a company cannot neglect the importance of innovation. That is, the company needs to innovate in the type of products it offers and these need to meet the needs of customers at the right time in the right place. Thus, they can maximize profit and maintain a strong position in the markets they operate in.

VII. Future Research

AMD has brought new and innovative technologies to the market and it does not plan to stop now. Consequently, its response to demand and the competition is getting increasingly better and more responsive. As Dr. Lisa Su previously stated, the organization's strategy for the next five years is betting on high-performance computers with an innovative combined offering, as well as expanding towards the telecommunications sector due to upcoming 5G technology. We cannot forget how strongly the company is focused on their data centres, as this is a very important growing segment for AMD, even more important as they are in the vanguard of this technology [25].

When it comes to future studies and seeing that AMD is constantly looking for new ways to reinvent itself, it will be interesting to study its ongoing progress and all the different strategies used, as they become one of the largest market leaders in the technology sector [40]. Additionally, the way the company has managed to stay afloat and successfully release new products in such an unprecedented time, because of the pandemic, is also a topic worth discussing and further analysing [2]. Furthermore, this study had some constraints regarding information gathering, since there was no opportunity to talk to the company and thus the article ended up being based only on the opinion and analysis of the authors, this being an important question for future studies to consider.

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