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Identifying Critical Success Factors in EDAS Industry Using DEMATEL Methodology

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Abstract:

EDA stands for printed circuit boards and Electronics including integrated circuits Used to design systems a group of software tools. However, over the past few years, the EDA industry has stuck in stagnant growth. The EDA industry currently faces significant challenges, including time-to-market demands and design complexity. The EDA industry has evolved over the past few years it has seen flat growth. Average sales due to increasing price pressure Prices fall and consumer EDA Instead of strategic acquisitions Think tactically. Without Significant change, the EDA sector is in steady decline and tends toward irrelevance. Problems EDA evolved or EDA tools and Services are no longer useful. Problem That is, the value of the electronics industry Software from Proposal Silicon Switched to applications, this is EDA considerably the demands of the customers changes. This study is trying to list and evaluate within a certain criteria the EDA Critical Success Factors (CSFs). DEMATEL is useful for managing internal dependencies will be instrumental. The results indicate that Competition in the EDA industry Local demand situation for the benefit and Government are important variables and can have a major impact on the sector's response.

Introduction

To create electronic systems such as printed circuit boards and integrated circuits, there is a group of software tools known as electronic design automation (EDA). To build and evaluate entire semiconductor devices, chip designers use a set of interconnected tools called a design flow. In EDA, service providers must not only help clients reduce design and validation costs and solve technical problems, but also help them stand out from competitors and collaborate with partners around the world. [1]. One of the hottest subjects in recent years for electronic design automation(ETA) in Machine Learning (ML) .Studies have been published in EDA techniques Uses ML to optimize and Design space reduction and exploration, Logic synthesis, placement, routing, testing, Chip design including verification, manufacturing etc. Many cover all phases of the flow . These ML Based techniques are more conventional andsignificantly outperformed techniques. [2,3]. Running EDA tools in the cloud and Encouraging, completed designs And many other designs and users From both the design process A framework for collecting data provides Tools, especially, design To improve the ability to provide clues or Deep heuristics into design tools Incremental Design by Motion Designers Learn from levels [4]. As a result of recent advances in EDA tools for power electronics modules, package properties can now be simultaneously analyzed and optimized from an electro-thermal and thermo-mechanical point of view. Despite the fact that EDA tools provide basic factors such as trace spacing, very few or no EDA tools include voltage and material dependent rules[5]. Electromagnetic compatibility (EMC) issues with the product during the development cycle and from the component level to the system Up to the level can arise at any level, because modern Electronic systems are ever increasing Act in proportion. of the design cycle During the design phase to reduce cost and length Consider higher-order electromagnetic (EM) effects should take Sellers are better now Trying to provide tools, and then some Encouraging results are new to the digital world have started showing up in the tools. However, RF and more so for mixed-signal domains In developing practical EDA tools More work needs to be done. [6].

Electronic Design Automation

In the beginning of the Electronic Design Automation (EDA), discipline. A program for evaluating electrical circuits called SPICE was developed as a class project at the University of California, Berkeley in the early 1970s. Over time, it evolved into the de facto protocol in all design contexts. EDA had a turbulent expansion, resulting in the establishment of profitable businesses such as Mentor, Cadence and Synapsis in the 1980s. These companies entered university and research laboratory research to provide complete design tool solutions. These EDA providers eventually experienced a dynamic phase of consolidation and became billion-dollar businesses. [7]. EDA was developed to help engineers develop semiconductor-based devices. We used EDA concepts to implement improved circuit complexity and therefore accelerating the design of genetic circuits. [8]. EDA is influenced by technology in many ways. Many technical limitations allow for compilation, placement, and routing: A logic library separates the technology from the logic, simplifying compilation. It often takes the form of fixed cells of uniform height and dimension. Additionally, until recently, digital circuits were represented with "bundled" components, and the coupling was assumed to have low latency, making it impossible to study field effects such as crosstalk. Problems with electricity use were limited to the power grid. Everything has changed. Without EDA, no semiconductor is made. Nevertheless, EDA technology is driven by semiconductors. [9].

While smaller, more agile businesses and start-ups, especially in the design and management fields, are creating sophisticated products and services, established electronic design automation companies are struggling to figure out how to incorporate the Internet into their product lines. [10].A paradigm shift in the EDA application environment is occurring due to growing design complexity and the need for multidisciplinary/multinational design collaboration. This change is required to meet time-gain objectives in increasingly saturated market windows [11].With pixel, sensor or photovoltaic arrays Digital and analog/mixed-signal circuits Complex flexible systems that integrate-On-panel will be realized in future, and EDA is the Key to success. [12].Software systems, operating systems, Storage systems and programming languages Due to developments in areas like EDA Often significantly affected. A few past wide, area network infrastructure it has grown rapidly over the years represents an opportunity for business and studying computer science in general is a new one Advances in generational skills. We especially consider tools, Libraries, design and validation services Flexible, scalable and adaptable A "virtual" design that can be connected to the system Allows users to create settings A distributed, integrated environment Building the entire EDA community as an organization [13]. EDA uses redesign flows, It contains the necessary specifications of the design Important design steps until completion are repeated repeatedly. EDA A brief overview of electrical design in software High-level to organize delegations Explanation, logical explanation and physical structure A hierarchy consisting of can be used. Synthetic biology past 50 Since EDA's tremendous success over the years can be inspired. The bio- of synthetic biology. Design Automation Subfield Sometimes Referred to as EDA. Genetic design automation (GTA), a different acronym for synthetic biology, may better express the idea that DNA molecules, rather than other biological materials, are the focus of the field's engineering efforts. [14]. Due to developments of Microelectronics Technology (of organs miniaturization, better manufacturing techniques etc.) Advanced, but specialized computer-aided design also due to the development of (CAD) tools, Electronic Design Automation (EDA). Of complex microelectronic systems in design, EDAs are indispensable. Artificial Genetics created in the field of biology Design Automation (GDA) tool By creating software like this Facilitating the development of new engineering disciplines Important[15].The success of the semiconductor industry is electronic Design Automation (EDA) greatly depends on Parity check, logic set, Physical design and testing methodology well-defined and such as creation Well-structured design problems Designers increasingly deal with EDA Rely on tools. New problems to cope with their competitors Improvements that differentiate products emphasizing their design time it frees them to spend. [16]. Electronic Design Automation (EDA) for Use of Computer Aided Engineering (CAE) tools University engineering in general as a high priority in curricula considered. Asynchronous approach when using dynamic logic two is to provide EDA support for designs challenging for key reasons. First, EDA From the perspective of the instrument, each coherent a dynamic gate is like a flip-flop Works because it has a clock input requires and both of the clock signal uses levels. Secondly, Steady-state timing of dynamic circuits Complexity of Analysis (SDA), charge distribution and worst-case delay related greatly increased by ambiguity.[17].

DEMATAL Method

The management of safety and risk is one of the key areas where MCDM techniques have been widely applied. Numerous MCDM techniques have been used in this discipline, including the DEMATEL Method. [18].The DEMATEL approach, which was first created by Fontela,Gabus in 1976, Gabus, and Fontela in 1972, is a useful technique. Based on graph theory, DEMATEL creates a map between system parts by efficiently evaluating all relationships. A deeper comprehension of the interrelationship may be acquired by studying the total-relation matrix of the components. [19].A thorough approach for developing and analysing structural models incorporating causal interactions between intricate elements is DEMATEL. The DEMATEL approach is a powerful tool for assembling group knowledge for creating structural models and for illustrating the causal relationships between subsystems using causal diagrams. However, decision-making judgements are frequently made using sharp values, which do not accurately reflect how [20].Even though there have been numerous improvements made to DEMATEL, they are still best suited for basic systems and cannot address the decision-making issues that arise in complex systems. It is not difficult to locate examples of the DEMATEL being effectively used to address a variety of real-world issues in many disciplines, and numerous high-level methodologies have been proposed to further develop and enhance the DEMATEL. [21].The DEMATEL model construction process is described below:

- To create a direct-correlation matrix, a relative scale should be created using the following four levels, which measure the relationship between the criteria: influence levels none (zero), low (one), medium (two), high (three), and very high (four).
- Normalized direct-relation matrix
- Total-relation matrix
- Creating a causal diagram
- Determining the inner dependency matrix and a threshold value

In this analysis, alternate and evaluation considered are factors for production, Consumer demand, Related Industries, rivalry with domestic firms, Government Support, Chance.

Factor Condition: An abundance of natural resources, the inputs of production, may give an industry its initial impetus. A pioneer industry may have been attracted to the area because their presence laid the foundation for a successful industry. Sophisticated labor, capital and information infrastructure are the components of production. Specialized components are more difficult to duplicate and require significant, ongoing costs. Entrepreneurship and venture capital are two of these elements.

Consumer demands:Consumer demand is the most important factor in the formation and development of an industrial cluster. There is sufficient demand from many industrial customers for providers to purchase and operate expensive specialist gear. Because the local market is perceptive and demands high quality, businesses operating there are more likely to offer better products because they can better understand the wants and needs of their customers.

Related Industries:Industrial clusters are often motivated by the accessibility, density and connectivity of vertically and horizontally linked firms. Suppliers and related industries are included below. Businesses that provide complementary goods or services to each other are said to be operating in related industries. While competing for market share in their industry's product or service based on their value chain management, they may collaborate or share certain functions such as distribution, technology development, production, or marketing. Competitively linked sectors can provide opportunities for technological interactions and, in turn, accelerate the development of competitive local supplier businesses that serve both. Closer collaboration between upstream businesses and regional input providers can accelerate the process of innovation and improvement.

Rivalry: Competition is the primary force driving start up growth and innovation. The emergence of highly specialized suppliers and related businesses is encouraged by the concentration of domestic competition. Competition between rival firms, their suppliers, or neighboring businesses is facilitated by the proximity of the cluster. This increases the depth, breadth and expertise of the cluster, encouraging greater investment in sophisticated infrastructure and factor production.

The role of government: By restricting direct cooperation and enforcing antitrust laws, the government should push businesses to improve efficiency, increase initial demand for new products, focus on creating special factors, and foster local competition. Additionally, it is the responsibility of the government to provide the growing infrastructure demands of the industrial cluster. Government involvement in a region's economy must inevitably change over the course of an industrial group so that it can identify and monitor the range of natural industries in the region and their stages of development.

Chances: Opportunities are events that a business cannot control. They are important because they lead to discontinuities where some lose competitive positions while others gain them.

Analysis and Discussion

TABLE 1. Direct relation matrix

	Factor Condition	Local Conditions	Related Industries	Rivalry	Government Support	Chance	sum
Factor Condition	0	3	1	2	1	1	8
Local Conditions	3	0	1	1	2	1	8
Related Industries	2	1	0	2	1	1	7
Rivalry	1	1	2	0	1	1	6
Government Support	2	3	2	1	0	1	9
Chance	3	1	1	2	1	0	8

TABLE 1. Direct relation matrix shows the relationship between criteria requires that the comparison scale be constructed according to the following four levels: No influence (0), Low influence (1), Medium influence (2), High influence (3), and Very high influence (4).

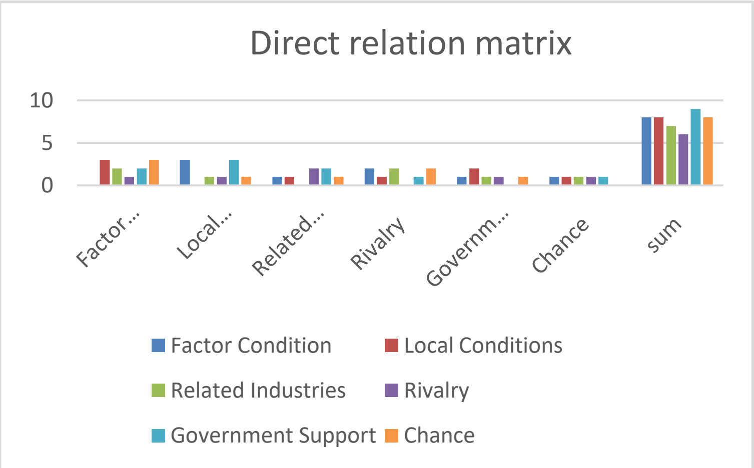

Figure 1. Direct Relationship Matrix

Alternative: factors for production, Consumer demand, Related Industries, rivalry with domestic firms, Government Support, Chance. Preference: factors for production, Consumer demand, Related Industries, rivalry with domestic firms, Government Support, Chance.

TABLE 2. Normalisation of direct relation matrix

	Factor Condition	Local Conditions	Related Industries	Rivalry	Government Support	Chance
Factor Condition	0	0.33333333	0.11111111	0.222222	0.111111	0.111111
Local Conditions	0.33333333	0	0.11111111	0.111111	0.222222	0.111111
Related Industries	0.22222222	0.11111111	0	0.222222	0.111111	0.111111
Rivalry	0.11111111	0.11111111	0.22222222	0	0.111111	0.111111
Government Support	0.22222222	0.33333333	0.22222222	0.111111	0	0.111111
Chance	0.33333333	0.11111111	0.11111111	0.222222	0.111111	0

Table 2 shows that the Normalizing of direct relation matrix in critical parameters factors for production, Consumer demand, Related Industries, rivalry with domestic firms, Government Support, Chance.

TABLE 3. (I-Y)-1

2.143107887	1.27428037	0.86988065	1.05312427	0.81090569	0.68347765
1.434881816	2.06938919	0.89199626	1.00362743	0.90779312	0.7008542
1.170442312	0.98783056	1.67846946	0.95771121	0.71043763	0.61165458
0.975614322	0.87198689	0.78120758	1.68015446	0.63671893	0.54952024
1.476901474	1.41329277	1.0465949	1.08619237	1.79936813	0.75803885
1.384753101	1.1152586	0.86545752	1.06302364	0.7915282	1.58000234

Table 3 shows the (I-Y)-1 array value.

TABLE 4. Total Relation matrix (T)

1.143107887	1.27428037	0.86988065	1.05312427	0.81090569	0.68347765
1.434881816	1.06938919	0.89199626	1.00362743	0.90779312	0.7008542
1.170442312	0.98783056	0.67846946	0.95771121	0.71043763	0.61165458
0.975614322	0.87198689	0.78120758	0.68015446	0.63671893	0.54952024
1.476901474	1.41329277	1.0465949	1.08619237	0.79936813	0.75803885
1.384753101	1.1152586	0.86545752	1.06302364	0.7915282	0.58000234

Table 4 shows the total relation matrix value

TABLE 5. Ri & Ci

Ri	**Ci**
5.834777	7.58570091
6.008542	6.73203838
5.116546	5.13360637
4.495202	5.84383337
6.580388	4.6567517
5.800023	3.88354786

Table shows the sum of rows and columns of the total relation matrix with parameters factors for production, Consumer demand, Related Industries, rivalry with domestic firms, Government Support, Chance.

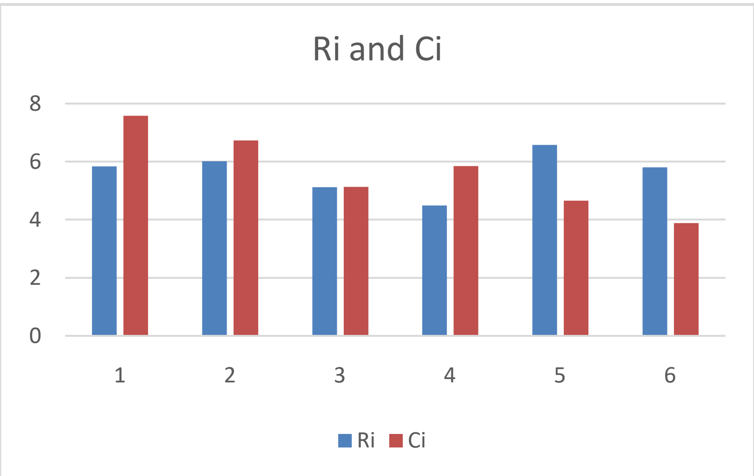

FIGURE 2. Ri and Ci

TABLE 6. Ri+Ci and Ri-Ci Rank

Ri+Ci	**Ri-Ci**	Rank	**Identity**
13.42047742	-1.7509244	1	effect
12.74058039	-0.7234964	2	effect
10.25015212	-0.0170606	5	effect
10.33903581	-1.3486309	4	effect
11.23714018	1.92363679	3	cause
9.683571261	1.91647554	6	cause

Table 10 shows the Calculation of Ri+Ci and Ri-Ci to Get the Cause and Effect. Theresult of this paper is factors for production 1st rank effect, Consumer demand 2nd rank effect, Related Industries 5th rank effect; rivalry with domestic firms 4th rank effect, Government Support 3rd rank cause, Chance is sixth rank cause.

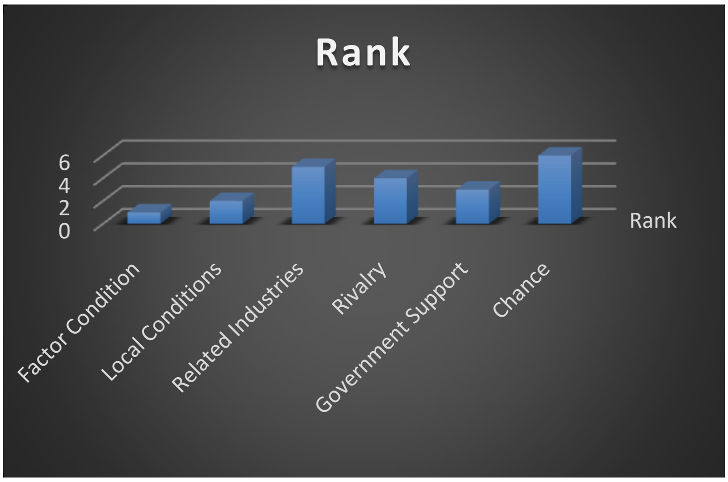

FIGURE 3. Rank of cause and effect

Figure 3 shows the cause and effect rank value. Here factors for production 1st rank effect, Consumer demand 2nd rank effect, Related Industries 5th rank effect, rivalry with domestic firms 4th rank effect, Government Support 3rd rank cause, Chance is 6th rank cause.

TABLE 11. T matrix

1.1431079	**1.27428**	0.86988065	**1.053124**	0.81090569	0.68347765
1.4348818	**1.069389**	0.89199626	**1.003627**	0.90779312	0.7008542
1.1704423	**0.987831**	0.67846946	**0.957711**	0.71043763	0.61165458
0.9756143	0.87198689	0.78120758	0.68015446	0.63671893	0.54952024
1.4769015	**1.413293**	**1.046595**	**1.086192**	0.79936813	0.75803885
1.3847531	**1.115259**	0.86545752	**1.063024**	0.7915282	0.58000234

Table 11 shows the T Matrix and value of alpha is 0.939874405.values higher than alpha are highlighted.

Conclusion

EDA has frequently been significantly impacted by developments in fields like software methodology, operating systems, storage systems, and programming languages. The rapid expansion of large-scale network infrastructure over the past few years marks a step forward for a new generation of industrial and computer science skills. In EDA, suppliers must work with partners all around the world to differentiate themselves from rivals while also assisting clients in lowering design and validation costs and resolving technical issues.The sector has to concentrate on integrated solutions to achieve this. Critical issues facing design teams today include time-to-market demands and design complexity. In this study, the model was analysed using the DEMATEL approach, and recommendations were taken into account as important success criteria for EDA. First, based on the crucial success elements for the EDA sector, this research assists in grouping all dimensions under cause categories and effect groups. Consumer demand circumstances and factor conditions are the primary driving elements for the expansion of the EDA business, according to the findings of our research.A key force in the growth of the EDA sector is local customer demand. A company's competitive edge can be increased by being close to the local market. Processing times for reacting to local demand pressures are often shorter, and businesses are typically more confident in their ability to comprehend and meet local demand demands. A country or area should create a science and technology platform, such as science parks or information centres, to encourage or improve scientific communication among participants. This is referred to as a science and information infrastructure.

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