Analysis of Success Factors of the Innovation Transformation of Siemens

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ABSTRACT
Siemens is a global leading enterprise established in 1847 and its business mainly lies in electrification, automation as well as the digital era. In the past two decades, Siemens has entered the power industry 4.0, which focuses on digital business. This study is committed to using the relevant enterprise innovation theory to comprehensively analyze the three factors of Siemens's innovation transformation. It identifies the comprehensive strategies of Siemens in the aspects of enterprise personnel, enterprise strategy as well as ecosystem. Hence, this study has a certain enlightening effect on enterprises in the same industry or similar industries

Keywords: *Siemens, enterprise personnel, enterprise strategy, ecosystem, innovation*

1. INTRODUCTION

Siemens is the global leading enterprise which was founded in 1847. Its business covers more than 200 countries in the world. Its business focuses on electrification, automation as well as the digital era [1]. The development history of Siemens can be divided into three periods. The first period is 1847-1860, during which Siemens had the risinge in industry 2.0, which is mainly electrical business. The second period is 1960-2000, in which Siemens developed in industry 3.0, which is mainly in the automation business. The third period is 2000-2022, in which Siemens enters the power industry 4.0, which is mainly the digital business. This study mainly researches the enterprise personnel, enterprise strategy, as well as ecosystem of Siemens to identify the strategies of Siemens in innovation.

The former research on the success factors of Siemens innovation transformation mainly focuses on one part, such as the technology innovation, but those researches lacks a theoretical and comprehensive analysis on the integration of several parts. The author presents here a research on enterprise personnel, enterprise strategy, and ecosystem

This research can identify the successful strategies in the innovation transformation of Siemens. It can give inspiration for the enterprises of the same or similar industries. Moreover, this research provides successful sources for the start-up companies or small and media enterprises, so that they can find their road to expand their business and be more competitive and sustainable in the market.

2. THEORETICAL BASIS

2.1. Amabile: Componential Theory of Creativity

The componential theory of creativity is a comprehensive model which describes the necessary social and psychological issues needed for an individual's creative work. The fundamental of this theory is the definition of creativity, which generates the ideas or results that are both innovative as well as appropriate to certain goals. In this theory, every creative response includes four components, namely, three components within the individual, the relevant skills in an area, the relevant process of creativity, and the internal task motivation, as well as one component outside the individual, namely, the social environment of the individual's work. The current version of this theory includes the impact of organizational creativity as well as innovation on the work environment created by managers. (Figure 1)

This theory poses the possibility to identify why and how the employees of Siemens can exert their pontential for innovation and obtain success, because the environment of Siemens provides the necessary components for realizing the appearance of innovation.

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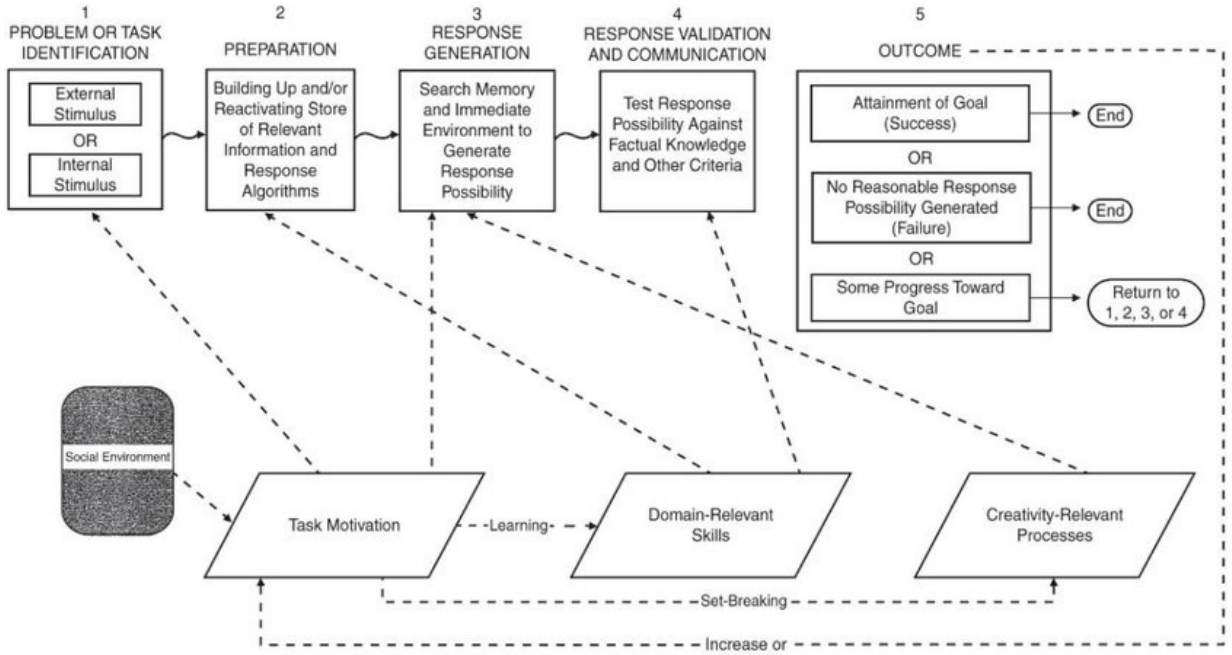

Figure 1 Componential Theory of Creativity[1]

2.2. Employee Creativity: Personal and Contextual Factors at Work.

This study examines the independence of employees' creativity as well as the contributions of relevant individual features and the three features of the organizational environment, including the work complexity, supportive supervision as well as controlling supervision. It also discussed three indexes of the performance of employees' creativity, the disclosures of written patent, the contribution to organization suggestion programs, as well as the supervisory rating of creativity. This study found that when partners have certain creative characteristics and complete complex and challenging work under the supervision of supportive and non controlling methods, they can produce the best creative work.

Componential theory can be used to explain why and how the individuals in Siemens can exert their innovative potentials, For instance, based on this theory, it can be perceived that the potential talented employees, the creative peers, and the the supportive and unconstrained environment provided by Siemens are the key factors which promote the innovation in Siemens. This theory will be futher discussed in detail for Siemens in Part 3 of this paper.

This research identified that the partners can generate the best creative work when they have certain features of creativity and take the complex and challenging work as well as supervised under a supportive and non-controlling method.

2.3. Ford's theory

This theory shows that creative, as well as habitual action, represents the simultaneous behavioral options that may be impacted by multiple domains in the area of social behaviors. It integrates the description of psychology and sociology on creativity as well as conformity for presenting a theory of individual's creativity behavior in an organizational environment intertwined by organizations, groups, institutional and market domains. This theory contributes to creativity research and describes how the intentional behaviors and evolutionary processes which legitimize action interact with each other for facilitating creativity as well as innovation.

This theory gives the inspiration of the importance of psychology, sociology, organization, group and market factors in cultivating the innovation in Siemens. This theory will be further discussed in detail for Siemens in Part 3 of this paper.

3. ANALYSIS

3.1. Enterprise personnel

As shown in figure 2, the employees of Siemens are around 303,000 employees on the payroll of Siemens in 2021. The segment with the biggest volume of employees of Siemens was the digital industry, which had around 73,000 employees. The second-largest segment of Siemens is the smart infrastructure, which had around 70,000 employees. From such kind of data, it can be perceived that Siemens pays a lot of attention to the area

of the digital area, which is one of the leading areas that have the potential for innovation transformation. Hence, the rich human resource is one of the successful strategies of Siemens. This factor proves Amabile's componential theory of creativity that the individual is one of the essential factors in innovation transformation. Based on the thinking of crowd sourcing, the increased number of human resources can enhance the realization of high individual creativity. Siemens' rich human resources of innovation in both numbers and qualities prepare the soil for a prosperous innovation result.

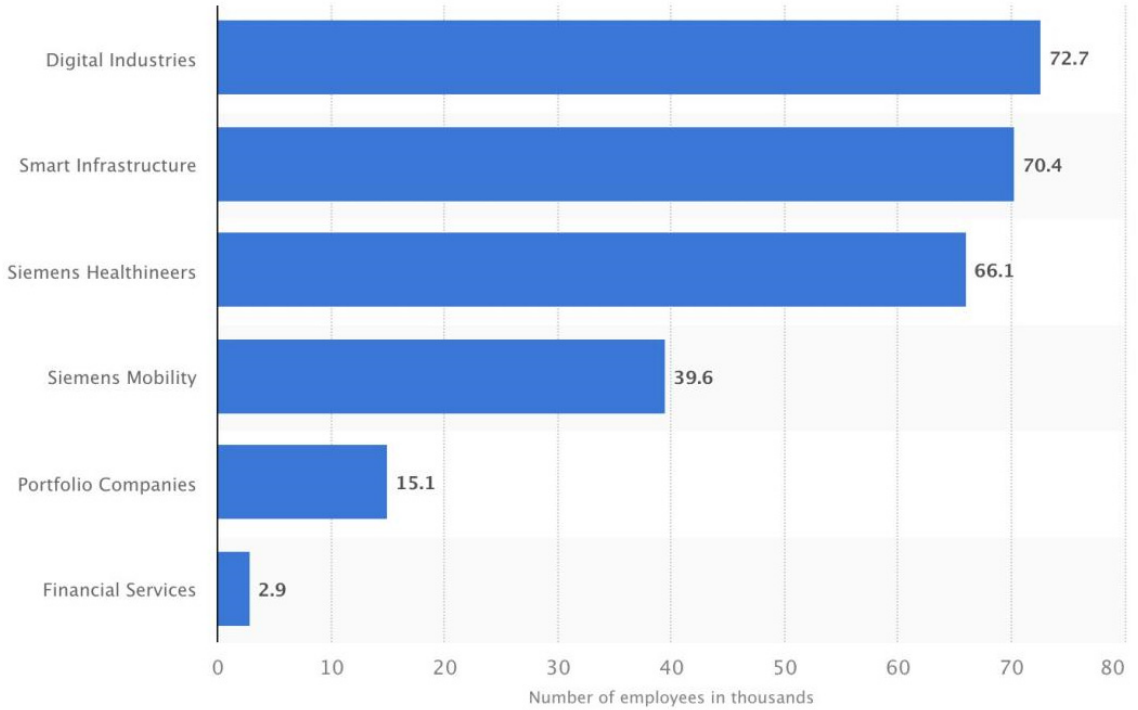

Figure. 2 Number of Siemens AG employees in 2021, by key segment(in 1,000s)

3.2. 3I program

3I program refers to ideas, impulse and initiatives. The 3I program is a "Siemens-wide" program that promotes, implements as well as rewards employees' ideas as well as initiatives. A good 3i idea should identify "what" needs to be improved, conclude "how" the things can be improved, and explain "why" the implementation of the idea can generate the real improvement on Siemens' customers, employees, or Siemens itself. For instance, in 2018 Siemens has gained the "best idea management" reward given by the Zentrum Ideen management (Idea Management Center). In the 2017 financial year, the internal idea management of Siemens, that is, "3i-LDEA, innovation and proposition", made a solid contribution to the success of Siemens again. In the financial year of 2017, Siemens has received more than 16,000 suggestions from its employees, about 400 suggestions per day, and around 12,500 suggestions was implemented, which brought more than 3 billion euros profit and savings for the whole Siemens company [4]. This success evidence of Siemens proves the theory of Oldham and Cummings (1996) about the creativity of employees relating to the individual in work and the issues of the environment. It provides that when there is creativity supervision and rating system, supportive and uncontrolled environment, and creative organizational environment, then employees can exert the best (Figure 3).

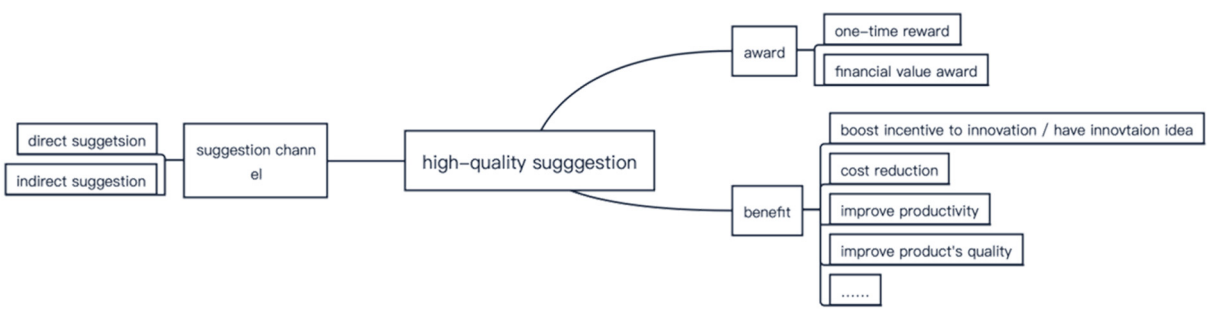

Figure 3 The 3I program

3.3. Creative work performance

3.3.1. Apprenticeships:

Siemens provides different types of apprenticeships, such as communication messages of design engineers. The plan of apprenticeships is very effective for Siemens since it is an off-the-job college training as well as experiences of on-the-job work. The benefits of this approach include the following four factors. The first is most workers start to work in their hometown, therefore, they can work in the known workplace comfortably. The second is apprenticeship can enable the workers obtain the HND qualification in the relevant areas. The third is that the apprenticeship requires the communication skill and teamwork capability, so that Siemens can ensure a better team. The fourth is employees can obtain experience and attachment to their companies, establishing trust and responsibility. Therefore, Siemens assumes that the apprenticeship provides a specific channel for the future development of the company.

3.3.2. Siemens Commercial Academy:

This system is initiated in 2005 for ensuring the entry of the financial and commercial talents to enter Siemens. The study period of the Siemens Commercial Academy is four years, which is another choice beside directly going to university. After graduating, these students can experience the real-life of Siemens. Moreover, the Siemens Commercial

Academy includes various financial and business courses, including accounting, human resources, purchasing, and enterprise[5]. Therefore, students can serve Siemens via various areas of focus at a later stage. In addition, this program supports the degree of European business management and provides the development training of communication and speech skills. It also provides professional courses such as information technology and language learning, such as German language training. This program also helps employees realize multitasking during their work and study. Hence, for employees who participate in this academy, it is a very effective plan since they can obtain valuable experiences as well as formal or work-related study. In this way, they are becoming an asset of Siemens since they have the opportunity to create.

3.3.3. Siemens Graduation Programme:

The Siemens graduation program is a training plan targeting for the different but related regions of graduates. There are three core business areas in which Siemens recruits graduates, including engineering, information technology, and business. Every graduate of this program is viewed as an individual and can discuss with the direct line managers at the beginning of their study to determine their training and development plans. According to Herzberg's incentive theory, when employees are paid attention to by their employers, they have a better performance, a good feeling towards their work, and a good work satisfaction and development opportunity. Siemens has realized the most important part of this theory. The Siemens Graduation Programs have provided opportunities for employee development, career development, job satisfaction as well as self-motivation, which will bring a long-term commitment and profit for Siemens.

3.4. Enterprise strategy

Siemens proposes that Our top priority is to support our customers achieve their goals to become digital – no matter if they are active in a discrete or process industry.

3.4.1. Establishing an innovative corporate culture

3.4.1.1. 1996 Creative campaign

As shown in the above figure 4, during the 1996 creative campaign, 246 ideas, 6 seed findings were transferred to other divisions. Only having creative ideas is not sufficient to obtain long-term success. What is essential is that new products, solving programs, or service standards must be formulated based on creative ideas. Siemens adopts a forward-looking business model and turns ideas into new products and services. Hence, the creative ideas, plus pioneering business model as well as the actions which turn the ideas into new products are the components of the innovative strength of Siemens.

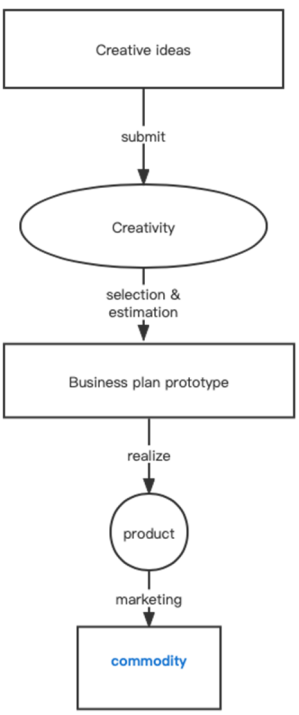

Figure 4. 1996 creative campaign

3.4.1.2. TOP 10 innovation project

Siemens has adopted the Top 10 innovation projects, such as cost-saving, sales incentive, asset management, quality innovation, leadership and collaboration, balanced scorecard model, best practice sharing, electronic platform as well as comprehensive improvement, Siemens relies on the power of cooperation. It cooperates with partners from the academic field, customers, and suppliers, turning the inspiring ideas into innovation, and then pushing them to the market. Siemens realizes this target with the help of an increasing partner network. In addition, this cooperation method is also a component of the DNA and core of Siemens. Interdisciplinary cooperation and various forms of open innovation are the common ways for innovation, such as the cooperation with customers, suppliers, universities, and experts in the beginning of the R&D and the whole life period of the business. This allows the company to best meet the unique demands of customers, including custom products, services, or solving projects. Moreover, the feedback of customers will flow to the development which is operated.

3.4.1.3. Consulting – Implementation – Optimization

Siemens has cooperated with all of its partners to create an innovative ecosystem based on the end-to-end digital solution program and other top technologies such as AI and 5G via the process of consulting, implementation and optimization. Moreover, it adopts a systematic and holistic end-to-end approach to digital transformation. For instance, Siemens Healthineers adopt a customer-centric approach and it focuses on the most important things to its customers, from providing the patient healthcare and satisfaction degree of the highest quality to lowering risk and enhancing the bottom line[6]. Through the customed creative service and adopting the method of customer-first approach, the products of Siemens can enable its clients have a competitive advantage via a lower cost. (Figure 5)

Figure. 5 Customer-centric

3.4.2. Ecosystem

3.4.2.1. Familiarity with the market environment

Siemens has established an internal website, which is a huge and efficient communication platform. Moreover, it has a completed employee email system, which means ensuring work efficiency and security at the same time. For instance, "Siemens-Betriebskrankenkasse(SBK)" is one of the biggest health insurance companies in Germany [7]. It adopts the Linchpin platform, in which cooperation is reached via the social intranet project. This internet system enhances usability to reduce the energy of employees in communication. Moreover, this system is standardized, which makes the management easier and the speed of updating is faster. This system benefits both the employees and customers of Siemens. Through the application center, every user can directly visit the useful tools based on the web, and the internal network of this system also provides the expert research function within the whole company. In this way, Siemens employees can better learn from each other, establish networks, and easily find suitable professional contacts.

3.4.2.2. Adjusting market position in time

Siemens always follows the steps of the time and adjusts its market position in time. For instance, in 2014, Siemens sold 50% Stake in Appliance Joint Venture to Bosch for $3.85 Billion, and "Bosch will pay €3 billion ($3.85 billion) for Siemens's stake, making BSH a wholly owned subsidiary of Bosch." [8]. Moreover, in 2013, Siemens sold for $1.7 billion its stake in a telecommunications equipment joint venture with Nokia corp. The joint venture of Nokia Siemens Networks sells telecommunication equipment to carriers of mobile phones via a deal of "€1.7bn (£1.45bn) [9].

3.4.2.3. Established Siemens Research and innovation ecosystems

Siemens has formed its research and innovation ecosystems. It has cooperated with participators of the academic field and other external innovations to face the challenge of technology and entrepreneurship. Siemens has maintained consistency with its technology portfolio. Siemens has developed its work within the 16 "Siemens Research and Innovation Ecosystems (RIEs)" which are globally connected as well as locally anchored [10]. This strategy of Siemens matches Ford's theory. This is because the individual's creative behaviors in a twisted environment of the organization, group, institution, and market area can exert its maximized potentials. Siemens' research and innovation ecosystem forms a fantastic soil for its employees to conduct innovation.

3.4.2.4. Using technology and digital power to create an environment that cares

The innovation of Siemens also pays attention to the environment. It uses the power of digital to create an environment that cares. Moreover, it provides the technology and services which can trace the key index of building performance for monitoring the environmental impact of them and optimizing energy as well as water consumption.

4. CONCLUSION

In short, this research can be perceived that innovation transformation strategies, that is, the enterprise personnel, enterprise strategy, ecosystem of Siemens match the relevant theories of innovation, such as the componential theory of creativity, the employee creativity theory of Oldham and Cummings, and Ford's theory. Siemens' rich innovation is benefited from its rich innovation personnel in numbers and in quality, such as its "Siemens-wide" 3I program, its innovative talent training, and perfect innovation ecosystem.However, this research lacks the study. of the application of AI to the field in a digital era, which leaves further research space. The application of AI and big data in the technology and business world has formed a big trend nowadays, therefore, in the future, it is necessary to identify how Siemens has applied AI in the field of innovation. This paper is limited to space and only studies the problems studied, thus ignoring many other problems. And by simplifying the problem, on the one hand, it increases the focus of the paper; on the other hand, it ignores the useful information. The paper also receives the influence of my experience, knowledge background, research methods and data adequacy, resulting in the research results not necessarily in line with the actual situation. For future study, it is suggested that to consider a wider question to research.

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