Strategic planning of New Product development process in line to customer's strategy: the role of collaborative platforms.

Mariastella Messina
University of Messina, messinamariastella@virgilio.it

Antonio Leotta
University of Catania, leottant@unict.it

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Mariastella Messina[1][0000-0003-2810-9553] and Antonio Leotta[2][0000-0003-2964-3045]

[1] Department of Economics, University, Via dei Verdi, 98122 Messina ME, Italy.
marmessina@unime.it

[2] Department of Economics and Business, University of Catania, Corso Italia, 55, 95129 Catania, Italy.
antonio.leotta@unict.it

Abstract.

Purpose: This study aims to investigate how the use of collaborative platforms favors the alignment between the strategic planning of NPD projects and customers' strategic goals. The paper addresses the challenge risen in NPD literature, especially in the co-development setting.

Design/Methodology/approach: Rooted in the paradigm of pragmatic constructivism, this paper conceptualizes a learning method through which actors can use collaborative platforms to align the strategic planning of NPD project with customers' objectives. Empirical research on a multinational company operating in the semiconductor industry demonstrates the method in action.

Findings: The results show that the use of a collaborative platform enabled the sharing of information on NPD process and customer's requests during the different phases of NPD process. This influences the planning of the development, which varies depending on the customer goals in the different phases of NPD process. The interactions lead to revise the planning of NPD project in line with the changes experienced by the customer. Our study displays how the collaborative platforms favor the learning process and foster the communication across organizations.

Implications/Limitations: The paper answers various calls for research on creating more insights into the studies on co-development projects focused on the customer's strategic perspective, highlighting the role played by collaborative platforms in favoring the learning process.

Originality/Value: This paper tries to conceptualize a method to analyze the learning process in innovative projects, examining how a well-crafted NPD strategy requires a continuous alignment with the strategic goals of the customer.

Keywords: collaborative platforms, strategy, co-development process.

1   Introduction

In the last years there has been an increasing adoption of co-development projects. Customers have been regarded as an important source of innovation [1], becoming a co-creator of value within the network. However, customers' divergent goals and their effect on co-development have been neglected in the extant innovation literature. So, it remains unclear how customers' divergent goals shape the strategic planning of NPD. The latter is a complex activity that is dependent on knowledge and learning. Capturing knowledge and lessons learnt may be challenging, but it offers a key opportunity for organizations in making a successful new product, avoiding repeating the same mistakes. Hence, there is the need to understand in detail how lessons learned from past failure have been incorporated into current plans and examined in their prospects for success [2]. The learning opportunities play a pivotal role to share diverse knowledge, identifying which factors enable or disable the development process [3]. The new knowledge developed by past projects could be embedded in technological tools [4]. The latter can enable a learning process; capturing and storing the experience of past projects could be useful in helping to identify new patterns for future NPD projects. However, the research on the influence of digital technology on organizational learning and creativity is still in its infancy [4].

The question here addressed relates to how collaborative platforms play a role in aligning the strategic planning of NPD projects with customers' strategic goals. The paper focuses mainly on the co-development projects.

The work is based on pragmatic constructivism approach. The theoretical perspective is a useful guide to investigate and conceptualize a learning method that explores how actors can use collaborative platforms to align the strategic planning of NPD with customer's objectives. This study presents the findings of an interpretative study conducted at Semicom, which is the pseudonym of one of the major players in the semiconductor industry. The aim of the article is to bring light into the black box of the co-development process by describing how the collaborative platforms favor the alignment of the strategic planning of NPD projects with customers' strategic goals [1].

Our case study presents the NPD flow of a supplier that enables joint development with its customer. The interactions lead to revise the planning of NPD project in line with the changes experienced by the customer, understanding the role played by collaborative platforms in the interaction and support of the learning process. The paper responds to calls for more research about the influence of digital technology on organizational learning and creativity [4]. A learning theory is the lens applied to gather insights from the main dynamics that affect the co-development process. Our study adds insights to the pragmatic constructivism as a method theory for analyzing, conceptualizing, and understanding how the use of collaborative platforms can favor the learning process [5].

The presentation of this article starts with a review of the relevant literature on strategy, co-development process and digitalization. Next, the gaps in the extant knowledge are identified, the methodology chosen is described, and the analysis of the multiple sources of data presented. Finally, the implications, limitations and further research are covered.

2 Co-development processes: a Strategic approach in New Product Development project.

Research showed that the link between New Product Development (NPD) and strategy is important to gain a competitive advantage [6], [7]. There has been greater recognition that strategy might guide NPD processes. However, the development of process planning is a lively research area, especially in innovation settings [8]. On the one hand, the improvisation strategy could speed up the product development process in highly turbulent industries [9]. On the other hand, a well-defined NPD process enables strategic goals to be used to select and guide NPD projects that meet set goals.

In the last years, there has been a growth in inter-organizational collaboration in NPD context. Because the complexity of the product is increasing, in-depth knowledge and specialization are required. Especially, technologically complex designs and product uncertainties stress the importance of close partnership with customers, involving them since the early stage of NPD process such as definition and planning phase of a new product.

For this reason, collaborative product development has been promoted as a means by which some of the awkward aspects of the product development process can be lessened [1], [3], [9]–[11]. Several reasons drive an organization to make strategic alliances (for instance, the lack of all the necessary expertise in-house).[1]

In co-development context, customers are an important source of innovation. The employ of customer's additional resources, skills, and capabilities helps the company develop and maintain its competitive advantage [1], [12]. The cooperation allows supplier's company to offer a customized product. In these processes the involved contributions to the development are drawn from multiple organizations. They come together and interact to undertake the tasks needed to develop a new product, and they work together as a team with the goal of creating a feasible product in an economical way [13]. The co-development process is iterative, involving a continuous evaluation, control and redirecting of the innovation development. By stimulating and facilitating

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[1] The strategic alliances can occur intra-industry or inter-industry [13]. In either case, a co-developer, who is a specialist company with relevant expertise becomes an integral part of NPD process, having a wide range of expertise and different forms of knowledge required.

learning, co-creative projects form an essential means for continually debating and re-directing the action plans in the development of new ideas.

However, the customer requirements and its strategic goals should be integrated into NPD from its point of view. Some studies shed light on challenges coming from customer involvement in development process, due to several barriers to successful collaboration, such as the different goals that the two parties aim for. Davis and Eisenhardt (2011) suggest that each partner shifts the co-development process to the direction that supports its own goals. Involving the customer requires a cooperative environment where joint problem solving and decision-making activities are occurring. In this way, the strategic objectives of customer and supplier should be aligned.

Besides barriers of customer involvement in the NPD process, benefits may occur. For this reason, there is a need to open the black box in the co-development process to better understand how customer-supplier interactions happen along these processes [1].

Despite the increasing trend of the co-development process, the research into the implementation of co-development remains somewhat limited. In the previous studies, the focus has been on integrating customer requirements into new product development from the supplier's point of view with a general approach to customer integration. Customers' divergent goals and their effect on co-development have been neglected in the extant literature [1].

The co-development process constitutes an interesting setting for our study, because of the specificities of the context. The co-development focuses on creating trust among involved parties, open dialogue and enhance the learning process to get a successful product. Moreover, in this type of collaboration, customers become the co-creators of value within the network [14].

Given the spread of digitalization in the last years, there is a need to better understand the role played by collaborative platforms in a co-development context.

3   Digitalization and NPD

Digitalization has resulted in novel organizational phenomena that cut across multiple levels of analysis, including strategy and creativity. Some studies have argued that digital tools support collaboration, coordination and communication among NPD team members or inter-firm partnerships since they enhance the knowledge available to an NPD team [15]. Especially platforms could be employed to coordinate exchanges within the co-development process, because digital technologies enable close collaboration and coordination among participants. Platforms have always been seen as an interesting model for managing NPD and innovation successfully [16], allowing the different individual actor's viewpoints to be more easily understood and communicated. Co-development context requires a co-ordination and the sharing of knowledge among actors, whose interests are not fully aligned [17]. Especially in such context

organizations need a platform for collaboration on projects, as well as to share detailed documents and idea generation to meet customer needs. The digitalization has enabled many customers to work with a wider range of supplier. This is because digitalization could open up new opportunities for value creation, value delivery and value capture. The new knowledge developed by organizational members could be embedded in technological tools, helping to identify new patterns in the development process [4].

However, research on the influence of digital technology on organizational learning and creativity is still in its infancy [4]. A theoretical perspective is needed as a useful guide for analyzing and conceptualizing a learning method that investigates how firms can use collaborative platforms to align the strategic planning of NPD project with customers' objective. In the next section, we analyze the theoretical framework taken into consideration for the analysis. This framework draws on the pragmatic constructivism approach.

4   Theoretical framework

The pragmatic constructivism (PC) provides a framework for investigating, understanding, and theorizing organizational practice as constructed through the activities of the actor involved in a dynamic environment.

For illustration of the relevance of actors, we can consider the Lego's case study. In this case, the top manager was engaged in formulating the company strategy. However, he didn't give much attention to the capabilities and skills available in the different businesses. The result of this managerial approach was poor financial performance. Then, a successful financial outcome is created through an interactive process of innovation involving suppliers, manufacturing, sales and marketing, and the controllers' production of relevant accounting information for planning and decision-making [18].

Other studies have developed and applied the methodology of PC for analyzing, conceptualizing, and understanding several business cases [19]. In the study mentioned below, the concept of PC has helped to assess the outcomes of the budget meetings. Liboriussen et al. (2021) outline that the current estimation of the exhibition budget is reached applying a learning circle. Through this approach the budget is continuously constructing and reconstructing in accordance with the expectations and real outcome of the project's process. This study shows how the PC helped the management accountant to direct the process paying attention to potential conflicts between the financial and artistic objectives, leading them to find action possibilities in line with the interest of all the actors [20]. These findings were confirmed by other two case studies on complex planning and decision-making situation involving a high-degree of information uncertainty and multiple decision-participants [5]. In both cases there is a continuous dialogical interaction between several specialized actors to produce an alignment of expectations (will it work?) with real outcomes (did it work?) of accounting information.

Also, they reveal that actors are accountable for realizing a good planning and decision-making process [5], [18].

The action plan must help the setting of strategic goals, identifying the actions to achieve them. We draw on pragmatic constructivism to conceptualize a learning method through which actors can use collaborative platforms to align the strategic planning of NPD project with customers' objectives. The difference between what is expected (goals) and what happens (results) unfolds the possibility that actors can engage in a learning process [5], [21]. There is a continuous interchange between goals and results that proves valuable and reinforces the learning process. When one has realized a strategic plan of a new product the gap between what one expected to do and what one has really done includes two dimensions, "strategy setting" and "strategy execution". The strategic setting gap refers to the deviation between what one expected to do and what one should have done. While the strategic execution gap refers to the deviation between what one should have done and what one has really done [18]. The reasons for both gaps must be searched for in the continuous and unpredictable changes of the action environment. In the co-development context, the strategic setting gap and the strategic execution gap may also be due to a potential misalignment between the supplier's and customer's expectations.

Assuming the perspective of the actor, only ex-post can the strategic setting gap and the strategic execution gap be observed. Indeed, the actor first realizes that what he/she has really done is different from what it should have been done, then he/she comes back to why what it should have been done differed from what he/she expected to do. The order of the actor's reasoning is represented in Table 1.
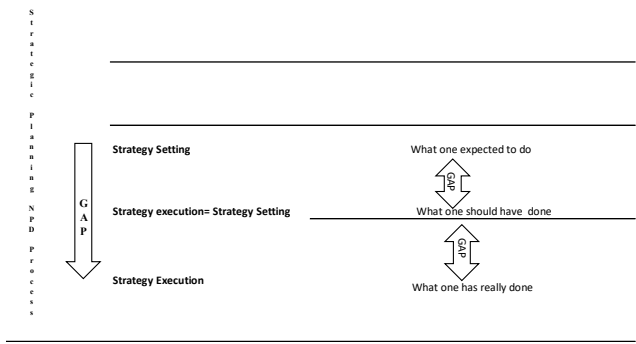

Table 1. Strategic Planning of NPD projects.

The monitoring of the gap between what one has really done and what one expected to do becomes a basis for continuous learning and improvement during the development process. The learning process plays a pivotal role for the creation of a strategic planning

and the development of a successful idea that can work effectively, satisfying the customers' needs. Using this conceptual framework to read the case study we attempt to answer the research question on how collaborative platforms play a role in aligning the strategic planning of NPD projects with customers' strategic goals.

5 Research Methodology

The analysis is based upon a field study conducted in a single organization, operating in the semiconductor industry. The case study design is useful for answering "how" questions [22] as in the research question of this study related to how collaborative platforms play a role in aligning the strategic planning of NPD projects with customers' strategic goals. The company considered in this study is Semicom.[2] The company was selected because it represents an extreme case for two reasons: first the NPD projects are well-formalized trough a rich description documentation related to the different aspects of NPD process (such as management control system, accountability, proposal of new products and so on). [3] Second, the organization assigned the highest weight to one customer as innovator following a co-development strategy.

The field study was conducted during an internship over a period of 8 months; from May to November 2021 (See Table 2).

Table 2. A summary of the empirical material

- Context: Innovation process.
- Duration: 8 months.
- Hours of data drawn on for this paper: 500h

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[2] An invented name was used to respect the privacy of the company.
[3] All this information is stored in the digital tools.

	Formal conversation and activities:**321h**	Informal conversations and activities:**176h**	Interventional conversations:**3h**
Non particpant observations:**297h**	Normal workday-Spending time in the organization-:**297h**		
Documentary Analysis:**60h**		NPD process manual, strategic plans, budgets, NPD stage-gate models, NPD profitability models, NPD project report: **60h**	
Interviews:**34h**	13X2h=24h meetings with all fuctional managers: the financial controller of ABC group , the division manager; the application manager, the design manager, the marketing manager, the product engineer, the program manager, the business unit manager, the business unit financial controller, the design program manager.	Coffee and Lunch breaks: **10h**	
Workshop:**4h**		Coffee break:**1h**	Validation meeting with all manager interviewed after 3 months: Prensentings findings, literature and theoretical framework and discussing those with all of them :**3h**
Participation in meeting:**5h**		Attended three meeting :**5h**	
Direct observation:**100h**		Coffee and luch break: **30h** / Lunch with different "colleagues" (financial controller, etc..): **70h**	

Table 2. Summary of the empirical material.

Formally, the research is based on a combination of four types of data: semi-structured interviews; archival data; participant observations and participation in meetings. Triangulation through several sources of evidence provides stronger substantiation than single source [23].

The overall analysis was verified and accepted as accurate by the actors interviewed during a meeting, in which the researchers displayed the results achieved.

5.1 Company overview

Semicom is one of the major players in the semiconductor field. Semicom operates a complex matrix organization, which is organized into product group, geographical sales regions, operations, and corporate functions. Sitting on top of the matrix are three business areas, each responsible for distinct sets of products. Each business area is divided into separate profit and loss units (listed in descending order: group, sub-group, division, and business unit).

Semicom has a turnover of 12.8$ and 48.000 employees worldwide, of whom 8.400 employ in R&D. Innovation is crucial for the company to develop a competitive position in its different four end-markets that addresses: automotive, industrial, personal electronics and communication equipment, computers & peripherals.[4] Semicom runs

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[4] For the automotive and industrial markets Semicom address a wide customer base, particularly in industrial, with a broad and deep product portfolio. In personal electronics and

many NPD processes in parallel and makes large investment in R&D and manufacturing processes to keep the pace with technology.

Semicom conducts cooperative and collaborative actions with the most major customers such as Apple, Bosch, Continental, Delta, HP, Huawey, Intel-Mobileye, Samsung, Seagate and Tesla.

According to the mission and vision of Semicom, the CEO stated: "*We work closely with our customers to fulfil their requirements. We want to make the customers as a strategic partner.*" This means that customers must be part of the development process [24]. This is in line with the trend developed in the semiconductor business in the last years [23] .

Semicom has been able to incorporate the customer as an innovator along the NPD process, establishing in one of its businesses a co-development strategy to gain a competitive advantage [1]. Semicom takes some benefits from the early involvement and integration of the customer into the development process [25], such as the reduction of development costs, higher quality with fewer defects, reduced time to market, and customer-originated innovations. Semicom achieves significant improvements in NPD through an extensive partnership with a specific customer, hereafter called: Alpha. [5] In this context, the road mapping is used to chart technologies. This means that Semicom must adapt its NPD business strategy to its customer's strategy.

Despite the customer-centrality, the NPD process is formalized in the stage-gate process. The latter offers a blueprint for monitoring, analyzing, and correcting the path of NPD. This means a continuous learning and improving process that leads to constant revisions of the strategic profile which aims at decreasing the variance between established goals and accomplished results [5].

5.2   NPD process

Our case study presents the NPD flow of Semicom that enables joint activities, in which Alpha is involved. Semicom product maturity life cycle spreads from Maturity 00 to Maturity 90. It was typical (see Figure 1), with eight stages and six gates (see for example [26], [27]). While the NPD process spreads from Maturity 00 to Maturity 30, it is particularly on this latter process that we focus our attention. When the Maturity 30 is reached, we can observe if the expectation has become real outcome[5] and the strategic alignment between customer objectives and the Semicom ones is accomplished.

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communication equipment, computers, and peripherals Semicom has a selective approach both in terms of customers it serves, as well as in the technologies and product it offers.

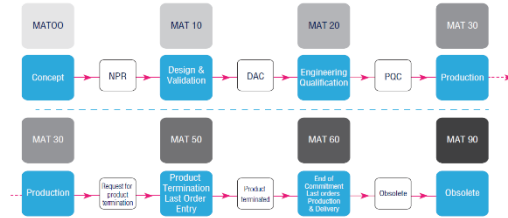[5] An invented name was used to respect the privacy of the customer.

Figure 1. Product Maturity life cycle

The co-development process identifies the following Stage-Gate: 1-Initial Stage-Gate; 2-Concept Stage-Gate; 3-Design Stage-Gate; 4-Engineering Stage-Gate [1], [28]. Each of them will be analyzed deeply in the next section.

1. Initial Stage-Gate

NPD process starts with a new proposal coming from Alpha, the latter provides Semicom the detailed product documentation about the design of the new product. The specification or restrictions for the development is narrow, the customer wants to get exactly the required results.

Alpha sends the Request for Information (RFI) to six suppliers to select the best one. The selection of the right suppliers has become one of the most important activities for ensuring stability to the customer network and all the invited suppliers are supposed to invest in the pre-selection development work, even if only one of them will win. This means that Semicom is not the only supplier involved in the process and in two weeks must send a response. Alpha communicates with Semicom through a collaborative platform, called RD. When Alpha receives all the suppliers' proposals, it selects three of them and send another document called Request for Product (RFP). This document includes in-depth information, the selected suppliers have one or three months to replay, specifying the information required related to the performance; the technology evaluation, the dimension, and the price of the new product. After this stage, if Semicom is selected as a supplier, the award of the project will be assigned to it for developing the new project and a document called Engineer Requirements Specifications (ERS) will be sent to Semicom. ERS will be the starting point of the NPD project and a kick-off meeting will take place. The financial controller stated: *"[Alpha] team participate in the decisions to be made, how to direct the project itself and therefore in some way we are very controlled. But we are on board of the [Alpha]'s project who has every interest in making the whole process go through"* (See Table 3).
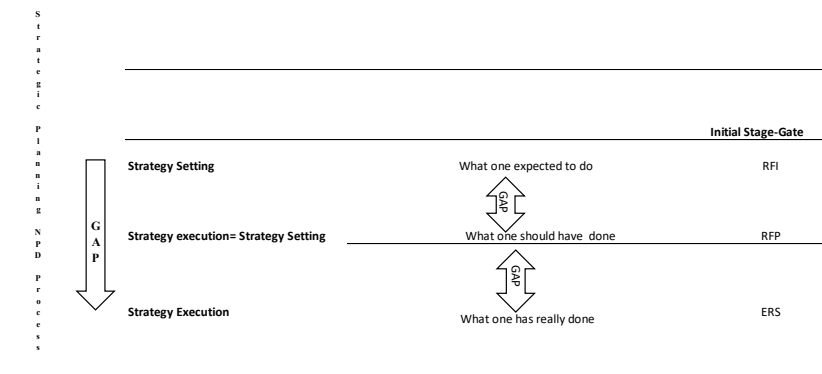
		Initial Stage-Gate
Strategy Setting	What one expected to do	RFI
GAP		
Strategy execution= Strategy Setting	What one should have done	RFP
GAP		
Strategy Execution	What one has really done	ERS

Table 3. Strategic Planning of NPD at Initial Stage.

2. Concept Stage-Gate

The concept stage usually starts with a kick-off meeting, which involved around 100 members coming from the customer and Semicom side to coordinate technological capabilities and develop the new device. This way of proceeding has a positive impact to diminish the variance between expectations and real outcomes [5]. This could also be useful as a basis for an informal exchange of experience. The product engineer stated: "*The [Alpha] team members is called mirror team and cover all the skills involved in the Semicom's project team.*"

Two weeks later of the meeting, Alpha sends an updated documentation, and the Concept Stage-Gate officially starts.

The involvement of the customer at the concept stage contributes to the identification of critical problems and major technical uncertainties [5]. The design manager stated: "*The advantage of the co-development with [Alpha] is related to its technical knowledge and expertise. This means that [Alpha] can give us suggestions or helps us to make decisions among a range of possible solutions.*" This means that the involvement of Alpha supports the identification of the different possibilities.

Alpha must be informed during weekly meetings. In this way, the alignment between NPD strategic planning and Alpha strategy is monitored. The interaction between week-to-week actions and deliberated strategy leads to knowledge creation and to a better understanding of how to redefine the current strategy. Regular coordination meeting is preferred as they allow to check the alignment of objectives with outcomes to monitor the gap. For Semicom there are no opportunities to introduce modifications and improvements in the NPD process. When a problem occurs, it can be quickly communicated to the other side and the solution can be found easily.

It is crucial that Semicom integrates all relevant information about the solution in the form of a proposal. The report, called NPR, shows key information about the

12

projects (financial indicators, general information, milestones summary; market forecast summary; main competitors' analysis and marketing summary; IP summary; development resources planning summary; development cost planning summary; manufacturing cost; manufacturing information and requirements; etc.). The development of NPR is an important part of the project. The customer must check whether the proposal corresponds to its expectations [5]. Both parties have access to the upgraded version of the proposal, which will be uploaded in RD collaborative platform. The use of the collaborative platform is crucial to enhance the exchange of report, data, and information. It enables the different members of the team that are geographically located in different places to communicate in a faster way [29]. Usually, the documents stored in the platform are discussed during the meeting. However, in some cases the communication happens only through RD as stated by the product engineer: "*Sometimes when Semicom send the report through the platform, [Alpha] can respond us by email or platform. If it needs more information, [Alpha] asks us to clarify some points. For example, in the case of very long reports, even hundreds of pages, [Alpha]'s project team need to check the results carefully and then let us know their observations.*" Therefore, the digital interactions provide the opportunity for thoughts, potential ideas, and views to be shared and exchanged.

At the end of Concept Stage-Gate the customer decides if the concept could be released to Design Stage-Gate (see Table 4).
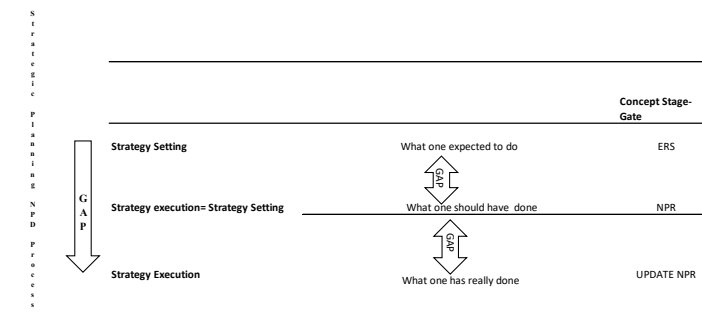

Table 4. Strategic Planning of NPD at Concept Stage-Gate.

3. Design Stage-Gate

During the Design stage, several changes and additional requirements could affect the concept of the project or the development costs [5]. In both situations the customer must be informed, and the situation must be evaluated during a meeting.

Because of complexity and risks related to the new product design and development activities, designers and engineers of Alpha often decide to adjust or change technical parameters, faced with new experimental or testing data or with environmental events. Analytical methods, tests and evaluation of prototypes indicate failures, potential problems, and deviations from specifications. If failures and deviations are indicated, a rework of the development process is necessary. This leads to an iterative process until a satisfactory result is achieved. The output of these activities was DAC project report. It remains a need to keep the project within the planned development time.

The prototype is used by Alpha to evaluate whether the product is in accordance with the initial specifications and with its expectations. The design manager stated: "*The early prototype is intended as a device from which others will be obtained to study the behavior and verify if it is in line with the initial specifications.*" Information and documents are shared with Alpha through the RD collaborative platform.

In some cases, Alpha could make a no-go decision along the development process, this means that the development process will be over.

The product engineer manager stated: "*There could be different reasons to explain why the project stops even though it has already reached the testing phase. A no-go decision may be due to the customer's strategic changes.*"

This in an example of learning opportunity at the project level [5], [30]. The process of monitoring, analyzing, and correcting is the basis for continuous learning and improving processes that lead to continuous revisions of the NPD strategic profile, to reduce the variance between the established goals and achieved results [5].

The early availability of prototypes allows Semicom to become aware of the new product properties at an earlier stage and begin to put forward the product to engineering studies (see Table 5).

The final design of the product is the result of an extensive and expensive cycle of design, testing, and re-design. The information is gathered in the DAC report, which could be different from the initial versions, depending on the number of changes made. At the end of Design Stage-Gate the customer decides if the prototype could be released to Engineering Stage-Gate.
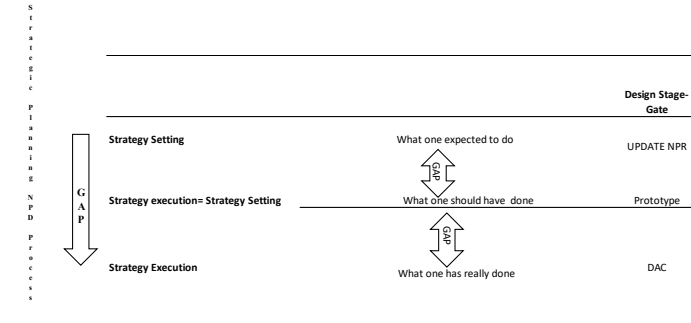
				Design Stage-Gate
		Strategy Setting	What one expected to do	UPDATE NPR
	GAP	Strategy execution= Strategy Setting	What one should have done	Prototype
		Strategy Execution	What one has really done	DAC

Table 5. Strategic Planning at Design Stage-Gate.

4. Engineering Stage-Gate

In the last stage some tests are carried out. The criteria established by Alpha should be respected to avoid a rejection of the product or a re-work until reaching the specifications established. The PQC project report describes the characteristics of the new product and represents a summary of all the reports previously written throughout the whole process. This report is shared through the RD collaborative platform.

The first sampling will be examined by the quality management at Semicom with a standardized report and a second countercheck by the quality management department at Alpha. This procedure is useful to save development time and to be able to discuss the results and possible improvements in the product and process. This way of proceeding allows Semicom to reduce or eliminate the variation between objectives and outcomes [5]. In the performance evaluation step, the new product is qualified through characterization and reliability tests. If the results report (PQC) is approved by Alpha, the new product is ready to be manufactured. Alpha communicates the production volume to Semicom at the beginning of NPD. However, in this last stage, the customer updates the quantity to be produced, verifying if its initial expectations become real outcomes (see Table 6).
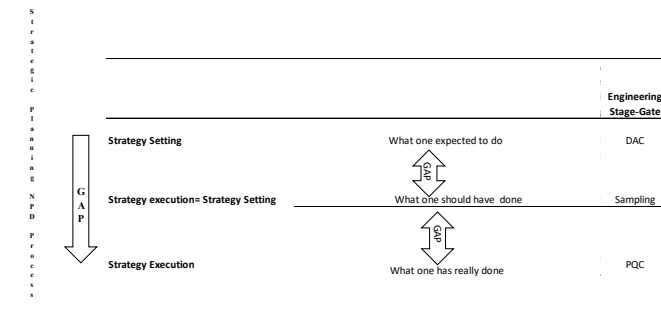
Table 6. Strategic Planning at Engineering Stage-Gate.

When the new product development process ends, a project review performed by Semicom is useful to summarize good and bad experiences of a co-development project. However, it is important to understand how the learning is captured, communicated, and employed to identify and develop new business opportunities in the future. This analysis is also useful for understanding how the learning is managed by developing team to decrease both strategy setting and strategy execution gaps, described for each phase of the development process. The Semicom learning management approach will be analyzed in the next paragraph.

6 Explaining strategy setting and strategy execution: Lesson learning cycle.

The goal is to create learning cycle stored in collaborative platforms that allows Semicom to reduce the gap between expectations and outcomes along the process. The learning cycle process changes the way in which the company solves problems and helps to avoid the repetition of the same mistakes. Figure 2 below shows the lesson learned cycle.
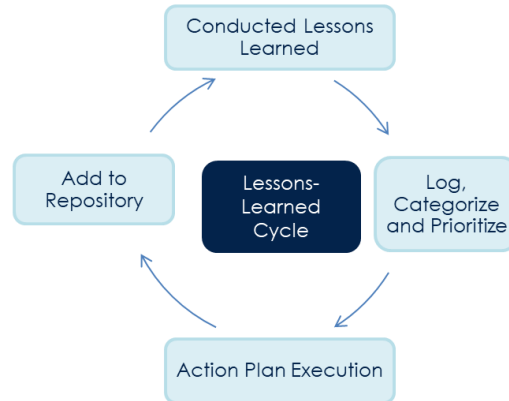
Figure 2. Lesson Learning Cycle.

Conducting lessons learned is the first step of the lesson learned cycle. First, past project review is carried out. This allows to identify a key project experience that has relevance to upcoming projects. The manager reviewed each finished project with the project team discussing what can be learnt for the future. Then, the product development manual will be updated to make it even more helpful the next time. Knowing the learning opportunities of a finished NPD project helps to improve the development process of the future projects [3]. A fully understanding of the product requirements and the development of risk analysis allows Semicom to anticipate risks from the early phases, implementing the right solutions. For example, the Failure Mode Knowledge Matrix provides a methodology for capitalizing the gained experience and sharing the knowledge of failure modes.

Secondly, the project team should *log, categorize, and prioritize lesson learned* in a plan template, called checklists. The latter are alive and constantly evolving to integrate the new learning. However, the way in which the lessons were documented was often somewhat cryptic. The Product engineer stated: "*We are trying to develop a platform that can be employed by everyone.*" The financial controller added: "*We have also to understand the difficulty to develop a collaborative platform to store the lesson learnt. The problem is how to formalize the information in an easy way, readable and retrievable by those who must use it. We need to create a structure, keywords, parameters that allow the actors involved to easily find the information they need. This means that it is so important to understand how lessons learned from past failures have been incorporated into current plans and to examine their prospects for success.*"

The project team reviews all the lessons learned to *ensure the action plan has been successfully executed*. Finally, the closed lessons learned are added to the lesson learned repository. The lessons identified in post-project review discussions or during NPD process should be stored into a collaborative platform, so that they can be accessed by

other NPD teams. This is viewed as an effective way to capture and transfer NPD knowledge.

Semicom wants to capture, store, and transfer in-depth knowledge and expertise so that it can reuse the best available knowledge and prevention solutions.

New platform should enable learning, allowing to monitor the strategy setting and strategy execution to identify a new pattern of NPD project in transferring knowledge from one unit to another based on the new information.

7   **Discussions and Conclusions**

This study has investigated the role played by collaborative platforms in the co-development projects. Specifically, the study has addressed the question of how the collaborative platforms play a role in making explicit the strategic goals of customers during NPD process. The theory presented in the paper guided the interpretation of the data and the reading of the field evidence of a case study accomplished in 2021 in Semicom. Table 7 summarizes the results achieved.
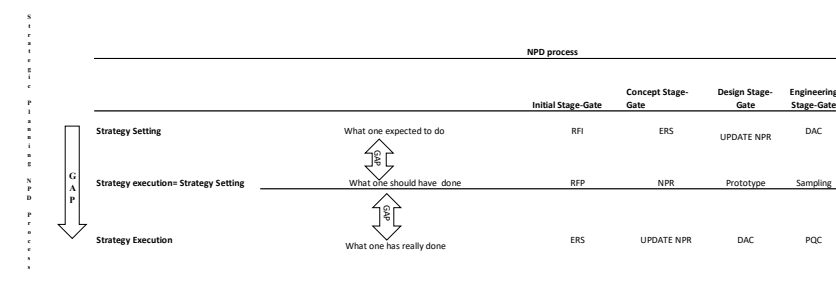
NPD process					
			Initial Stage-Gate	Concept Stage-Gate	Design Stage-Gate	Engineering Stage-Gate
Strategy Setting	What one expected to do		RFI	ERS	UPDATE NPR	DAC
Strategy execution= Strategy Setting	What one should have done		RFP	NPR	Prototype	Sampling
Strategy Execution	What one has really done		ERS	UPDATE NPR	DAC	PQC

Table 7. Summary of the findings.

The results exhibited in Table 7 confirm that the semiconductor industry requires a closer and more complex relationship structure with customers, showing how collaborative platforms are helpful in supporting such relationships [12].

The results of this study have important implications for NPD managers. Our findings offer several practical insights into managing the co-development projects. First, it is beneficial to obtain customer information throughout each phase of the NPD process. For this reason, company should build strong relationship with key customers early in the NPD process, because the acquisition of customer information as early as possible in the strategy phase of the NPD process is critical for improving project success rate. The emergent and iterative nature of co-development suggests that managers need to be aware of co-development opportunities in unexpected setting and be flexible in taking appropriate actions when required. Second, customers know their own needs

and participate in the co-development process. Suppliers need to acknowledge the divergent goals related to co-development process and view this process from the customer's side. Finally, the tools and practices that are used to manage co-development process may not be suitable for orchestrating co-development, and managers must be prepared to adopt other approaches. Based on the current research, some recommendations were derived for how managers could improve the process of learning from NPD:

- The project team could identify the most important points they learnt in each project. Databases of lessons learnt could also be structured around these points.
- NPD managers need to ensure that key lessons are not being omitted from past project review documentation.
- NPD managers need to recognize that, to encourage NPD learning, they must go beyond past project review, reports, and databases of lessons learnt. The methods that seem to be crucial include informal interaction between NPD teams (to maximize project-to-project learning), training and mentoring programs for NPD personnel, and focusing on the key categories of lessons learnt.

This study also contributes to research on collaborative learning. It is just an attempt in the advancement of knowledge about the conceptualization of a learning method through which actors can use collaborative platforms to align the strategic planning of NPD project with customers' objectives. Additional empirical evidence and theoretical concepts are required to fully understand the implications of this research.

The research was conducted in one industry, which limits the generalizability of the results. The research could be continued in different ways. Further research on the co-development processes in other semiconductor industries, in different sectors and from multiple perspectives is required. In doing so, future research should show whether our findings can be generalized across industries and countries. The current study has demonstrated the need for more research on learning in NPD. In addition, this study has used overall data of obtaining customer information for each individual phase. An alternative would be to focus more on what happens in one phase and use several data to capture customer information in detail [31]. Moreover, case study research always leads to qualitative results, which could not be quantified in numbers. Therefore, it would be useful to make a quantitative analysis based on the characteristics that have been recognized. Table 8 below summarizes all these aspects.

Implications		
Managers	Practicl insights to manage the co-development process	
Researcher	First step in the advancement of knowledge about the conceptualisation of a learning method trough which actors can use collaborative platforms to align the strategic planning of NPD project with customers' goals.	
Limitations		**Further Research**
One industry		Various industries and different sectors
Qualitative results		Quantitative analysis

Table 8. Summary of limitations, implications, and further research.

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