Internal Software Startups – A Multiple Case Study on Practices, Methods, and Success Factors

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***Abstract*— Startups are often seen as drivers of innovation. In an attempt to leverage this potential, larger business organizations have founded internal startups as a subset of internal corporate ventures (ICV). These smaller organizations are intended to be more agile than the parent organization, in order to produce new service and product innovations using their own methods and practices independently of the organizational culture and methods of the parent organization. However, our understanding of ICVs is still lacking in terms of processes and success factors, and especially the more recent internal startups have scarcely been studied thus far. To approach this novel area of research, we take on a qualitative approach by means of a multiple case study of internal startups in large companies. Based on the data, we argue that the origin of the idea of the internal startup heavily influences the processes utilized by the internal startup, as well as the connections between the internal startup and its parent organization. We also highlight various practical implications.**

Keywords*— *Internal Startup, Corporate Venturing, Software Startup

I. Introduction

Startups are typically associated with innovativeness. Especially during the height of the startup boom during the 2010s, they were considered in general to be drivers of innovation. On the other hand, larger organizations struggle to create radical innovation [2]. As innovativeness is considered important for any business organization, conventional business organizations have also turned their attention towards startups in search of innovative practices. If startups are innovative, surely, they work in ways that foster innovativeness as well?

The way startups operate has been studied by academia as well as practitioners. Numerous grey literature sources discuss various work practices and methods for software startups, including the Lean Startup Methodology [21]. In attempting to foster innovativeness, mature business organizations have attempted to utilize these methods and practices in various ways.

One approach in doing so has been the Internal Lean Startup. Internal startups utilize startup methods, typically working as a separate project or team whose purpose is simply to innovate. By separating the innovation activity from the bureaucracy and day-to-day operations of the rest of the organizations, larger organizations can also utilize these startup methodologies in an attempt to foster innovations [10].

Currently, the scientific knowledge about internal startups is still limited, particularly from a software engineering perspective. [28]. On the other hand, studies into internal corporate venturing do exist. However, even those studies have mostly focused on the social structure of internal venturing, and the phenomenon seems to be somewhat poorly understood [7]. Although various examples of successful internal ventures exist, failure stories are dominating [6].

In order to increase the likelihood of success of internal startups, the phenomenon should be further studied. As especially empirical studies into the utilization of these methods are lacking [8], we take on an empirical approach in this particular study. Due to the novelty of the subject area, we chose to utilize an exploratory, qualitative approach, by means of a multiple case study of three internal startups. The research question of this study is formulated as follows:

RQ: How can we characterize the internal startup process?

II. Theoretical Background

This section is split into three subsections. First, we discuss internal corporate venturing as internal startups are a subset of this area of research. We then discuss success factors in internal venturing. Finally, we discuss internal startups specifically.

A. Internal Corporate Venturing

While internal startups, much like startups in general, are still a new area of research, Internal Corporate Ventures (ICV) date back to the 1960s [27]. It is a part of the larger context of corporate entrepreneurship. Corporate entrepreneurship is further split into corporate venturing and strategic entrepreneurship by Morris et al. [18]. In these two categories, internal startups fall under the former.

ICVs exist inside established business organizations and consist of either an individual or a group of individuals whose responsibility is to develop a new service or product innovation and to manage all elements related to this task [1]. ICVs are fully owned by the parent organization [17]. However, they are still separate entities inside the organization with their own culture and organization [19]. They are typically borne out of the parent organization's desire to enter new markets or to produce new products and services. By

utilizing an ICV rather than e.g. investing into an external venture, it is possible for the parent organization to both leverage their existing resources to innovate and reap higher returns upon success [17].

ICVs are typically small organizations intended to be more flexible and open to exploring new options. They are often organized as a separate division inside the organization, referred to as a New Venture Division (NVD) [5]. The NVD approach is intended to result in less bureaucracy through new corporate structures within the venture organization.

Advantages of ICVs, based on existing studies, are considered to be: 1) fostering growth [19], 2) diversification [26], 3) improving financial performance [9], (4) building capabilities and competence [3], and 5) enhancing innovativeness [3]. However, most internal ventures fail [6] and there is no consensus as to how the desired goals and outcomes of ICVs would be best achieved [7].

B. Success Factors in Internal Venturing

The following success factors for ICVs have been frequently discussed in the literature:

- Strategic relatedness (e.g. [9], [26]). (i.e. how related the venture is to the core business), as well as the parent organization's familiarity with target market (e.g. [7])
- Autonomy of the ICV (e.g. [13][25]).

However, there is no consensus as to what extent these really are success factors for ICVs. Strategic relatedness is usually considered a success factor, but Covin et al. [7] remark that focusing on familiar areas can reduce willingness to learn and increase resistance against explorative and disruptive innovations.

In studying autonomy in ICVs, Gemünden et al. [13] discussed four types of autonomy: (1) goal-defining autonomy (goals of the ICV), (2) structural autonomy (organizational structure), (3) resource autonomy (sufficiency of resources to accomplish tasks), and (4) social autonomy (self-organization). Gemünden et al. [13] considered autonomy a success factor, while Kuratko et al. [15] found no such correlation.

C. Internal Startups

Internal Startups (ISU) are akin to conventional ICVs, although they lack a widely accepted definition, given that the construct startup itself also lacks one [20]. Building on the literature on both ICVs and startups, we consider internal startups in the context of this study to be entrepreneurial initiatives formed as an organization within a corporate structure, which search for a repeatable and scalable business model intended as a new business for the corporation. ISUs can be argued to mostly differ from ICVs in terms of the methods they use (e.g., Lean startup [21]).

Much of the current ICV literature is from before the 2010s, preceding the rise of software startup research. Moreover, there are various definitions used that make comparing findings of different studies difficult [19], and there is no established consensus in success factors of ICVs [7]. ISUs remains as a scarcely studied topic [28].

III. The Cynefin Framework

The Cynefin framework (Figure 1) is a decision-making tool from the field of knowledge management and complexity science [16]. It is intended to help its users make sense of the current situation in order to act accordingly. To this end, it splits decision-making circumstances into five domains, discussed below. In the context of ISUs, it can help us better understand why practices and methods applied in ISUs either support or do not support their service and business development. We utilized the Cynefin framework, as it was adopted successfully in research about software startup before [31] (section IV).

Fig. 1. The Cynefin Framework

A. The Five Domains of Cynefin

Cynefin is based on three assumptions: 1) the assumption of order (relationships between causes and effects exist), 2) the assumption of rational choice (human actors will make rational choices based on their perception of the effects), and 3) the assumption of intentional capability (external actions are a result of internal behaviour).

In the *simple* domain, causalities are readily apparent and widely known. It is characterized by best practices. The simple domain is an ordered domain. E.g., a dislodged bike chain is within the simple domain.

The *complicated* domain is the expert domain characterized by good practices. Causalities are discoverable, but only upon expert analysis. The complicated domain is an ordered domain. E.g., a malfunctioning car is within the complicated domain.

The *complex* domain is characterized by experimentation. Due to heightened uncertainty, and due to causalities only being apparent in retrospect, experimentation is required in this domain. Through experimentation, a reasonable course of action can be decided on. The complex domain is an un-ordered domain.

Chaos is characterized by time pressure and a lack of cause and effect relationships. Due to the time pressure, there is no time to experiment in a planned fashion, which necessitates ad hoc actions. Once an action is taken, its effects should be quickly analyzed before acting again. The chaotic domain is an un-ordered domain. Typical examples of chaotic situations are crisis management ones.

Finally, in addition to the four main domains, *disorder* refers to a situation where the current domain is not readily apparent and needs to be discovered.

As an organization operates, it moves from domain to domain, depending on the current situation at hand. Sometimes this can be intentional, utilizing the framework to position oneself. For example, exploration is the act of moving from the complicated domain to the complex one by removing some degree of control in order to explore possibilities. [16]

B. Connections Between the Cynefin Domains

The Cynefin framework also features some characterizations of connections within each domain. In the context of organizations, this refers to e.g. organizational hierarchy. For example, connections in the simple domain have strong central density but weak spreading distribution. In practice, this means that there would be a strong connection between management and employees but weak connections between individual employees. On the other hand, in the complicated domain, the central connections are also strong, but as more cooperation between individual employees (experts) is required, the distributed connections are also strong.

Once we enter the un-ordered domains, the central connections become weak. In the complex domain, distributed connections are strong but central connections are weak. The team works together closely but due to the uncertainty in the domain, management has no clear control or grasp of the causalities in play, making their role weaker. In the chaotic domain, all connections are weak amidst chaos. [16]

IV. Research Framework

Based on the literature, a research framework (Fig. 2) was devised to direct the data collection and analysis. First, basing on Tukiainen [26], we identified four dimensions that are in play in the context of an ISU: 1) the external environment, e.g., the market, 2) internal environment, i.e. parent organization, 3) the internal startup environment inside the organization, and 4) the development process inside the ISU. According to the literature, they all influence ISUs, and thus they are portrayed multidimensionally.

To then make sense of the ISU processes, we implemented the Cynefin framework (section III) inside this layered view of the ISU. This was done to better understand the development process and the causalities in play. We utilized the Cynefin framework as a framework for process theories that further help us understand the context.

As the unit of analysis here is a single ISU, the applicable process theories based on Van de Ven et al. [29] are the life cycle theory and teleology. In the context of Cynefin, the life cycle theory is located within the ordered domains, as the theory describes sequences and presents clear relations between the events. However, some analysis is also required, pointing towards the complicated domain as well.

The teleology process theory is centered around the metaphor of purposeful cooperation. The goal of a teleology process is not pre-determined, and the causalities are not apparent beforehand. This refers to the complex domain in the context of Cynefin. Moreover, the process is iterative, focusing on finding patterns and setting goals during the process, further supporting this idea. However, there is also some overlap with the complicated domain, if the causalities are known in a particular case.

Higher-level startup methods are scarce [28]. We chose to incorporate the most prominent one, the Lean startup, into the model. Lean startup is an iterative process focused on learning and improvement through data, featuring the build-measure-learn loop. Practices such as the Minimum Viable Product (MVP) support this process. In Cynefin, the iterative nature of the process points towards the complex domain. However, as startups are often associated with time and financial pressure, existing studies have suggested that they are likely to operate primarily in the chaotic domain [20]. Finally, in the context of ISUs, establishing an ISU in and of itself is a good example of exploration, a practice related to the complicated domain.

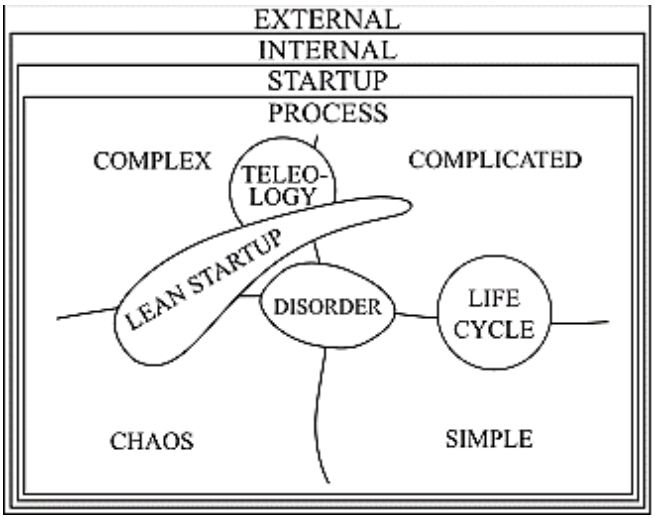

Fig. 2. Research Framework Devised Based on Existing Literature.

V. Study Design

In addition to the main research question, two supporting research questions were utilized to direct the data collection and analysis. These were:

- How does the connection between the parent organization and the internal startup influence the development process of internal startups?
- How do the development processes of internal startups change over time?

The first one is related to the existing literature on ICV success discussed in section II. Past studies have discussed the connection between the parent organization and the ISU (ICV) and its effects on success, both in terms of autonomy of the ISU and its strategic relatedness to the parent organization [9]. The second one is related to the Cynefin framework as well as existing ICV literature. Our understanding of the way ISUs implement startup methodologies is currently lacking [8]. This question is intended to address this specific gap.

A. Case Descriptions

We used the purposive sampling strategy and selected three unusual, revelatory cases of the relationship between ISUs and their parent organizations as our research setting [4][12][30]. According to Robson's [22] categories of research purpose, we conducted an exploratory study to understand insights of the internal startup processes in the connection to contextual factors within the parent organizations. A selective sample is used in this study, as we

looked at ISUs that develop innovative services or products. We also looked for the cases where the temporal dimension can be captured, i.e., cases where the respondents could reflect the whole process from ideation to launching and market acquisition. Our selected cases are presented in Table I. Though they were in different stages at the time of the data collection, all case ISUs had paying customers. Moreover, in all cases, the software being developed was, for the parent organizations, an innovation.

TABLE I. CASES OF THE MULTIPLE CASE STUDY

Case Int. Startup	Parent Org.	Case Description
Vipps	DNB	Mobile payment application
Intelligent Building	Tieto	Data-driven IoT solutions with data analytics
Delta	Tieto	Data collection service AND data analysis tool using AI and machine learning.

We would argue that all three startups are particularly interesting units of study. The Vipps case is a well-known Nordic success story from Norway, an internal startup of the largest Norwegian financing services group, DNB. DNB has more than 2 million retail customers and 200 000 corporate clients. They have an IT department for internal development, operation and maintenance of their IT-based products and services. Vipps is one of their many internal startup efforts. It is a mobile application for smartphones that makes it possible for the user to make payments to the receiver's telephone number instead of a bank account. Following the resounding success of the applications, Norwegians no longer "send" money: they now "Vipps" it. Vipps is today partially owned by other Norwegian banks as well.

On the other hand, Tieto (today known as TietoEVRY) is one of the largest Nordic IT and service organizations with 3 billion euros in revenue and 24000 employees. Tieto's Intelligent Building case became later known as Emphatic Building and is today a registered trademark with global sales. In this light, we would argue that these are high-profile internal startups, with the focus of this study being on the more in-depth study of a few such startups than on high case quantity.

B. Data Collection

Data from the three cases were collected through interviews and by utilizing secondary data sources (i.e. various project documents). The analysis is based on the interviews, while the secondary data sources were simply used to ascertain some of the claims of the respondents for the sake of validity. Possibilities to utilize observation-based data were highly limited due to the limited access to the case companies.

The interviews (Table II) were conducted as semi-structured interviews, F2F on-site when possible, or online if not. Some questions and topics were prepared beforehand to direct the interviews, but the respondents were asked various case-specific questions based on their answers. Each case had two respondents who were interviewed in three sessions. However, in addition to the case-specific interviews, two interviews with upper management in Tieto's cases were also conducted, featuring two subjects with insights into both Case Delta and Case Intelligent Building.

C. Data Analysis

The interview data were analyzed by utilizing multiple data analysis approaches. First, thematic analysis was utilized to analyze the data. The approach consisted of five steps: extracting the data, coding it, translating the codes into themes, creating a model of higher-order themes, and assessing the trustworthiness of the synthesis.

TABLE II. INTERVIEWS CONDUCTED

Case	Type	Respondent	Duration
Vipps	Online	A1	30 min
Vipps	F2F	A1	48 min
Vipps	F2F	A2	1 h
Int. Building.	Online	B1	88 min
Int. Building	Online	B2	20 min
Int. Building	F2F	B1	30 min
Delta	Online	C1	58 min
Delta	Online	C2	62 min
Delta	Online	C2	30 min
Int. Building and Delta	Online	BC3	29
Int. Building and Delta	F2F	BC4	58

Initially, 24 codes were identified, based on reading through all the interview transcripts once. The process was then repeated, placing emphasis on systematic coding across cases, resulting in 32 codes categorized into six higher-order and three lower-order themes.

As process data from qualitative cases can be challenging to analyze due to the difficulty of drawing boundaries between entities and the high number of potential factors in play, the data were also analyzed using another approach, the narrative strategy. The narrative is typically utilized in-process research. In doing so, the progress in each of the cases was narrated to aid the analysis. Finally, a cross-case analysis was conducted to compare similarities and differences among the cases (Seaman 1999).

VI. RESULTS

This section is split into four sub-sections. The first three discuss each case separately, while the last one summarizes the analysis.

A. Case 1: Vipps (DNB)

Vipps had a clear goal set for it by its parent organization: to enter, at the time, the emerging market of mobile payments. This was to be an extension of the current market of its parent organization, utilizing a new service offering. However, as the user base of the new service extended past the initial user base of the parent organization, bank customers, it was partially a new market as well.

Nonetheless, the strategic relatedness between Vipps and its parent organization was relatively high. This made it possible for Vipps to utilize expert competence found internally within the parent organization. This, they remarked, helped them greatly in gaining the leading market position in the area, at the time.

The service they were developing was technically isolated from other services provided by the parent organization. This contributed to the Vipps team operating with a high degree of autonomy.

"At the same time as Vipps started, DNB had an ongoing project collocate their data centers in Norway. Therefore, the technical solution had to be implemented on the side of the other IT-projects. Vipps were therefore an isolated solution. This has definitely been an advantage, as we could work as a

small startup, not being so dependent on the other solution and processes within DNB." (A2)

The management of the ISU team and those with the power to make the calls in practice were placed close to the team, resulting in strong connections between the parent organization and the ISU. This made it possible for the Vipps team to make (and carry out) decisions quickly, which in turn made it possible to operate in an agile manner.

"Vipps was technically more independent, since it was not reliant on the heavy processes other IT-projects have to attend. In addition, there was time pressure to be early in the market, so we got authorization from the top management to go outside normal routines and control processes." (A2)

The time pressure in terms of entering the market quickly resulted in the team utilizing new development practices not otherwise commonly utilized in the parent organization. They also applied one of the elements of the Lean startup method, consequently, wishing to operate in a leaner manner: the MVP. The team developed a single feature MVP as a bootstrapping tool, which reduced development costs, and iteratively worked on it towards launch.

However, the team ultimately made meager use of the Lean startup method. Outside the use of an MVP, the team discussed no other Lean startup practices. There were no major pivots to the general idea or any major system features.

"There were no drastic changes. It was clear from the start what we were going to make. This was quite different from past projects… the possibility of creating a success of a product with so few features." (A1)

Due to having a clear goal from the start and a clear idea of how the events should proceed, the case had more elements of the life-cycle process theory present in it than the Lean startup. Vipps went through the stages described in theory (startup, grow, harvest, and terminate), with the exception that the team was not terminated. The team kept working on the service past its launch, adding new features, working to reach new customer segments, and discovering new use scenarios.

Most of the uncertainty associated with the Vipps case stemmed from the team having no idea how the service would ultimately be received. The team was not involved in idea or service validation activities typical of a startup to the point where they would have felt assured of their success. The time pressure experienced by the team forced them to develop the system more rapidly, adding further uncertainty to the process. They set up a continuous improvement team to implement new features while conducting quality control to negate any adverse impacts on quality. Based on the success of the project, they managed uncertainty well.

"We have never communicated to our users or potential users that they should download an app, only about 'vippse'ing money. So, when a new [potential] user gets an SM saying 'this person has vippsed this amount of money', they have a higher desire to download the app." (A1)

Vipps was an "idea-fist" ISU, with a clear idea and goal set for it by the parent organization. It was a narrow-shouldered innovation [23], as the development was influenced by a few people. The team initially utilized more traditional development and business methodologies. As the time pressure mounted, they began to utilize more agile and collaborative methods and tools than those of their parent organization. However, they utilized few startup methods in terms of business development.

The frequent utilization of expert competence and the strong connections in the team and between the team and management point towards the Vipps case being largely in the complicated domain of the Cynefin framework.

B. Case 2: Intelligent Building (Tieto)

The intelligent building ISU was rather strategically unrelated to its parent organization. They aim to develop a new service for entering an industry unfamiliar to the parent organization. Unable to rely on the current customers of the parent organization, they are creating a new market for themselves in the target country. Due to the strategic unrelatedness, the intelligent building team is loosely integrated into the parent organization, only leveraging some of its sales networks and asking for support for legal and financial matters.

"Intelligent Building is less integrated to Tieto compared to other internal startups. Yet, they are still working with branding people and some IT employees, but not as much as other internal startups. […] It does not make sense to have a high degree of integration if you don't have the synergies..." (BC3)

As a result of its loose connection to the parent organization, the central connection, in the context of Cynefin, is weak. This is correlated with the complex domain, as a looser central connection implies the exploration strategy. For intelligent building, its parent organization was mostly its customer and main investor, although the team also collected resources from other partnerships. On the other hand, the connections within the team were strong, facilitating communication in the distributed team and supporting faster decision-making. The Intelligent Building team comprises both internal and external employees and both full-time and part-time ones.

"When we now go into new areas, we need to test and develop in light speed, and be extremely agile in our approach. The startup model is a way to detach the startup from a lot of other requirements which need to be in the large organization, because of security demands, financial, and etc." (BC3)

The team utilized new tools (e.g. Slack) and methods (e.g. Lean startup) not utilized by the parent organization to facilitate communication in ISU, as the team considered a high degree of agility crucial to its success. Due to the newness of the service, the team was also unable to utilize various existing materials of Tieto.

Due to the high degree of uncertainty associated with the venture, the team utilized experimental approaches to gain knowledge of their situation, including multiple elements of the Lean startup methodology. In general, they cited a high degree of customer focus in the project, particularly focusing on testing assumptions through customer development, as well as validated learning. E.g., they built numerous MVPs, utilizing the BML loop to improve the service based on the MVPs and other data. They utilized a functional MVP to collect data from real use, iterating rapidly. The only prominent startup pattern not utilized by the team was the pivot, with the project only featuring minor technological pivots.

"Lots of assumption have been tested. I calculated that I had about 250 customer presentations. […] …we don't code anything that is only our idea and not a customer need." (B1)

Intelligent Building was a "team-first" ISU, with the origin of the idea being from multiple sources. It was a broad-shouldered innovation [23], reaching out wide to multiple customer segments before implementing a specific idea.

Intelligent Building started in the complex domain, lacking a clear idea for the service while exploring disruptive technologies. As they gained more knowledge of the domain over time, discovering causalities, they moved towards the complicated domain. Nonetheless, they continued to utilize startup patterns focused on experimentation, remaining in the complex domain.

Being in the complex domain, the team applied fit-to-context methods and tools. Their process also related to the teleology process theory, as the goals of the ISU have been adjusted throughout the process and were still being adjusted when the data was collected. However, due to the involvement of the parent organization, there have been some mixed processes with some life-cycle stage elements being added. The parent organization divided the process of the ISU into phases, with decision points leading to no or go outcomes, depending on the situation at the time. Similarly, as in any project, the parent organization also introduced time pressure into the process.

C. Case 3: Delta (Tieto)

Delta was another ISU of Tieto founded to develop two services: a data collection service (D1), as well as a data analytics tool utilizing AI and machine learning (D2). As opposed to the Intelligent Building, Delta was strategically far more related to its parent organization. This made it possible for Delta to utilize existing customer channels and contracts to build their customer base. However, while D1 applied familiar technologies, D2 required new competence.

In terms of D1, Delta was positioned in the ordered domains of Cynefin. The requirements of D1 were much specified from the beginning, and it was being co-created with the customer. D2, on the other hand, required more exploratory approaches. This resulted in two separate processes, and, consequently, two different teams within the ISU.

"D1 team is a more traditional product development team. There is a product manager, leading operation, and chief architect responsible for the technical structure of a product, more traditional in D1. For D2, the capabilities needed are more related to machine learning and advanced analytics, which are difficult to find inside our parent organization." (C1)

The two teams initially worked separately with some collaboration. D2 hired external competence, unable to leverage existing ones from the parent organization. As the ISU progressed, collaboration with the teams increased as they began to develop an MVP with a customer, implementing both services.

Though D1 began as a standard customer project, it moved towards the un-ordered domains as the product was being extended during the project. D2 was exploratory to begin with, with the objectives becoming clearer as the development progressed, moving it towards the ordered domains from its starting point within the complex domain. D2 was developed in collaboration with multiple customers, resulting in different requirements from different customers.

"Whereas for the D2 service, where we are building machine learning capability on top of the D1, there has been more uncertainty. We have used MVP development methodology all the time" (C1)

The different approaches were also a result of the type of data being used. As D1 handled sensitive data, there were regulations in play affecting its development and creating clear requirements. As these regulations were already tackled by D1, which D2 utilizes, the development of D2 could be more exploratory.

"...For D1 [...] we need to have quality management systems to certify the products [...] Because the D1 service is handling the strict regulations and other official sources, we can more freely develop the D2 product. We are using more lean, design thinking and agile methods. Every time when we are building a new iteration, MVP or design sprint, we interview customers and potential customers." (C1)

Overall, Delta has utilized all major Lean startup patterns. Based on customer feedback, Delta went through several major pivots. They frequently used different types of MVPs to visualize, clarify, facilitate, and reflect, utilizing them as a bridge between stakeholders as well as a bootstrapping tool for data-driven development.

D1, as a process, could be likened to the life cycle process theory. There were strict regulations in play, and the goal was known at the start. The steps towards reaching that goal were also outlined. However, even in terms of D1, Delta moved towards the un-ordered domains over time. D1 was an idea-first, narrow-shouldered innovation [23].

D2 was an exploratory service. It followed the teleology process and Lean startup patterns. The teleology process was present in adjusting the goal, and the team knowingly utilized Lean startup patterns as it operated. Users were involved throughout the development process to test assumptions. D2 was a team-first ISU, although it ultimately pivoted towards the core business of the parent organization.

D. Cross-case Analysis

Analyzing the three cases together, there are several Primary Empirical Conclusions (PEC) that can be drawn. We acknowledge the limitations of generalizing findings based on three cases, and thus would highlight that these are not universally conclusive remarks. Rather, they are the findings of this study, based on the data.

First, in terms of strategic relatedness, Delta and Intelligent Building shared the same parent organization but had different strategic relatedness to it, and yet were both in the complex domain. The origin of the idea seems to have more influence on the domain of the startups than the strategic relatedness. Team-first startups seem to position themselves in the complex domain, while idea-first ones would seem to be within the complicated domain.

PEC1: The origin of the idea influences the process of the internal startup. Idea-first startups tend to start in the complicated domain, while team-first startups tend to start in the complex domain

Strategic relatedness also seems to influence the connections between the ISU and the parent organization. Weaker strategic relatedness seems to result in weaker connections between the parent organization, resulting in a more exploratory approach.

PEC2: The more strategically unrelated the internal startup is to the parent organization, the weaker connections there are between the two entities.

This, in turn, results in the utilization of methods not typically utilized by the parent organization. Exploratory projects need to focus more on validating assumptions, resulting in the utilization of more agile methods and startup patterns. This creates tension between the internal startup and parent organization.

PEC3: Strategically unrelated and team-first startups mix methods, creating more tension between them and their parent, than startups which are more strategically related and idea-first.

Though time pressure originating from the parent organization was present in all three cases, the two ISUs of Tieto were less affected by it due to being separated into their own units. This separation made it possible for them to distance themselves from the normal routines for new projects in the firm.

PEC4: Startups being within an NVD are less affected by time pressure from their parent organization.

Vipps, which was more affected by time pressure than Delta and Intelligent Building, forced them to implement agile methods and some Lean startup patterns. The development of the MVP and its rapid iterations led to technical debt, which was tackled by a dedicated continuous improvement team.

PEC5: Applying Lean startup patterns under time pressure leads to technical debt.

Finally, it was clear that the ISUs within the complex domain were utilizing Lean startup patterns more than the ones within the complicated domain. The more exploratory the approach, and the more unfamiliar the domain, the more Lean startup patterns were implemented.

PEC6: The development processes for internal startups in complex domains are heavily influenced by Lean startup patterns.

VII. Discussion

We have summarized the primary findings of the study in Table III, below. They are referred to as PECs in the discussion.

Existing research [23] has divided internal startups into idea-first and team-first startups. Our study provides a better understanding of how these two types of ISUs differ (PEC1 and 3). Idea-first ones seem to spend less time utilizing exploratory practices than team-first ones, resulting in team-first startups utilizing more Lean startup patterns. This extends our understanding of strategic relatedness of ICVs (e.g. [9], [26]) in the context of ISUs and in software engineering.

PECs 2 and 3 relate to autonomy, which has been studied as a success factor for NVDs in the past. Some past studies have argued that higher autonomy has a positive impact on NVD performance (e.g. [13][24]), although there is no consensus. Turning to the autonomy taxonomy of Gemünden et al. [13], we observed differing levels of differing types of autonomy in the cases. Low degrees of autonomy were found in terms of resource autonomy. Nonetheless, the overall autonomy of the case startups could be considered high, which would tie to the notions of past studies on the positive impact of autonomy [13][24]. PECs 2 and 3, however, mostly serve to provide novel insights into the effects of strategic relatedness.

TABLE III. Primary Empirical Conclusions of the Study

#	Description	Contribution
1	The origin of the idea influences the process of the internal startup. Idea-first startups tend to start in the complicated domain, while team-first startups tend to start in the complex domain.	Novel
2	The more strategically unrelated the internal startup is to the parent organization, the weaker connections there are between the two entities.	Novel
3	Strategically unrelated and team-first startups mix methods, creating more tension between them and their parent, than startups which are more strategically related and idea-first.	Novel
4	Startups being within an NVD are less exposed for time pressure by their parent organization.	Validation
5	Applying Lean startup patterns with time pressure, leads to technical debt for the new product innovation.	Validation
6	The development processes for internal startups in complex domains are heavily influenced by Lean startup patterns, iterating through the BML-loop creation, MVPs and pivoting their way through customer interaction to validated learning.	Novel

PEC4 confirms some of the effects of the NVD approach discussed in extant literature. That is, that the NVD approach gives the startups more autonomy [5] and to that end can reduce the time pressure exerted by the parent organization.

As for PEC5, technical debt has been studied in the context of external startups, and startups have been found to be particularly susceptible to accumulating it as they struggle with time pressure stemming from either resources or market factors (e.g. [14]). To this end, our findings serve to validate this notion in the context of internal startups as well (PEC5).

PEC6 provides some novel insights into the way internal startups utilize startup practices and methods. In the context of Cynefin [16], presence within the complex domain correlated with a higher degree of utilization of Lean startup patterns. Outside the context of Cynefin, this relates to PEC1: team-first startups were more exploratory and consequently utilized Lean startup patterns more frequently.

To summarize, the practical implications to be drawn from our findings are:

- Internal startups not closely related to the core business of the parent firm should be given more freedom in relation to the routines and control of the parent organization in order to support the exploration.
- Internal startups not closely related to the core business of the parent firm should rely more heavily on Lean startup patterns and have more customer focus in their process.
- Internal startups closely related to the core business of the parent firm, should be encouraged to leverage

existing resources and competences from the parent organization.

- Corporate support and facilitation of the internal startup should be customized depending on the type of internal startup. The New Venture Division approach is favorable when possible.

A. *Limitations of the Study*

As we chose a qualitative approach to studying the phenomenon, the generalizability of the findings can be questioned. However, as Eisenhardt [11] points out, qualitative studies offer a good starting point for studies into novel research areas, which internal startups are, especially from the point of view of software engineering. This multiple case study makes the findings slightly more generalizable, as Eisenhardt [11] also points out. Though two of the case startups being from the same parent organization can also be argued to decrease the generalizability of the findings, the diversity of these two cases could counteract this limitation to some extent.

Additionally, Cynefin can pose a limitation in that positioning the cases in the framework can be subjective to some extent. To tackle this limitation, the analysis was initially conducted by one author and then validated by two.

VIII. CONCLUSIONS

In this paper, we sought to better understand internal startups as a process. We conducted a multiple case study of three internal startups in two large organizations, utilizing a research framework heavily based on the Cynefin framework.

With these cases, we provide insights into how different types of internal startups (team-first vs. idea-first) differ in terms of processes. We also discuss the effects of how the connection between the parent organization and the internal startups effects the internal startup process. Our findings are summarized in detail Table III in section VII, and our practical key take-aways as bullet points at the end of section VII.

There is still a clear need for further studies on internal startups in the context of software engineering. This study provided an initial bridge between internal corporate venturing and software startup literature. Further studies should especially seek to study success factors for internal startups, as well as good or best practices in them. Also further research is needed in entrepreneurial self-efficacy (ESE), because high self-efficacy can influence entrepreneurial intentions. When internal startups are in the midst of innovation, the correlation between creativity and self-efficacy is essential [24].

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