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# Master Thesis

# Causation and Effectuation in the Context of Product Development Process in a Large-sized Established Company

**Master Program:** Corporate Entrepreneurship and Innovation

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**Abstract:** Effectuation represents entrepreneurial way of thinking and it is commonly applied to new ventures. Causation, as the inverse logic to effectuation, represents traditional way of thinking, and it is commonly used among large existing organizations. Recent research on effectuation shows that causation and effectuation are two relative logics, and effectuation can be extended to the existing organizations. The purpose of this research is to study relationship between causation and effectuation and to reveal how causation and effectuation influence each other during the product development process of Stage-Gate in the context of a large existing organization.

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# 1. Introduction

## 1.1. Background

In today's global world of rapidly changing technologies and ever intensified competition, there is an increased need for organizations to create sustainable growth and competitive advantage by continuously offering new products and services. In order for organizations to innovate more effectively, Cooper (1990) suggested that they need to better manage their product development process.

Product development in an established organization[1] traditionally takes place in a linear fashion – beginning from the stage of ideation, then planning, development, testing and finally ending with the launch of the product. Organizations employ different product development models, such as sequential development model and partly parallel development model (Schilling, 2010). As one of the models, stage-gate model (Cooper, 1990) contains each of the above mentioned development stages followed by a decision gate where a go/no-go decision is made. This go/no-go decision is very critical for the product development due to it decides whether the product will go into the next stage or not. In the traditional approach of product and service development, a lot of emphasis is made on the planning stage (Ansoff, 1991; Wiltbank, et al., 2006) where activities such as feasibility analysis, competitor and market analysis are performed. The goal of these activities is to minimize the risk for product and services development by predicting the future. And the reason why these activities are important for an established organization is due to that technology development has been at a high pace in the past years, there is an urge for established organizations to obtain product's market responses faster than before, and at the same time they also need to reduce waste during the product development process and optimize resource usage in order to remain and sustain their competitive advantages.

Recently, an alternative decision-making approach named effectuation was suggested by Sarasvathy (2001a). Sarasvathy (2001a) named the aforementioned traditional planning based on prediction approach as causation, and elaborated that causation approach begins with a defined goal and the stakeholder aggregates resources in order to meet this goal. Therefore, the traditional product development process is namely based on causation logic. Effectuation, on the other hand, is an inverse of the causation approach; the logic behind effectuation is that "to the extent to which we can control the future, we do not have to predict it" (Sarasvathy, 2001a:251). Effectuation is the logic which can be integrated to the product development process. Using effectual reasoning, one does not begin with a specific goal but with a given set of means; the goals emerge over time from one's action (Sarasvathy, 2001a). An effectual stakeholder accesses the opportunity cost based on what he is willing to lose (Sarasvathy, 2001a). Sarasvathy (2001a) believes that the pre-existing knowledge is of limited help to predict the future and follows a flexible learning-based approach.

[1] An established organization: an existing organization with a matrix structure delivers its value to the market in a well organized and independent way.

## 1.2. Problem discussion

As Cooper (2000) describes, it is not so easy for established companies to succeed with new products, and there are two ways to achieve it: one is to do projects right; the other one is to do the right projects. The challenge that established companies are facing is to develop new products quickly, efficiently and effectively (Schilling, 2010).

According to the literature on the topic, product development approach (in a new venture as contrast to established enterprise) can be broadly classified into two categories: Causation and Effectuation (Sarasvathy,2001a; Sarasvathy, 2008 Read, et al., 2010). Causation has been a traditional logic commonly adapted by decision-makers at larger organizations (Sarasvathy, 2001a). The logic of causational decision-making is based on accurate prediction of the future and rational planning to overcome the contingencies (Wiltbank, et al., 2006). Causation uses in-depth analysis and rational planning to predict the changing situation and handle the uncertainty in which a firm operates (Wiltbank, et al., 2006).

The effectuation theory has gained considerable momentum since its introduction not too long ago. A number of empirical studies have been done from entrepreneurial context and the theory has been further advanced by different researchers (Sarasvathy & Dew, 2005; Dew, et al., 2009, Chandler, et al., 2011). Sarasvathy and Dew (2005) conducted an empirical study on a group of entrepreneurs with companies having sales of $200 million to $6.5 billion. Results showed that entrepreneurs used means-based approach for handling uncertain future: (1) the logic of identity; (2) the logic of action; and (3) the logic of commitment. Dew, et al. (2009) conducted a study among MBA students and expert entrepreneurs using “think aloud” protocol analysis. The group was asked to solve decision making problems in relation to new venture creation. It was found that expert entrepreneurs used effectual logic for making decisions. They outwitted MBA students, identifying more potential markets, a holistic view on venture development, and a less emphasis on prediction. In contrast, MBA students based their decisions on ‘predictive frame’ and followed the classical planning-based management approach.

When Sarasvathy (2001a) proposed the theory of effectuation, the effectuation theory was originally developed in the context of entrepreneurship and new venture. Thus, its intended area of application was the field of entrepreneurship, and the goal of the research was to uncover the psychology of successful entrepreneurs and to identify what principles they worked on. However, in the introductory work Sarasvathy (2001a) argued that the theory has a far wider applicability than the field of entrepreneurship and could also be applied to an established enterprise. The authors contend that although Sarasvathy (2001a) suggests that effectuation is a very broad concept and can be applied to established firms, but there is little research that has been done so far in this area. Therefore, the authors believe a high potential research area for effectuation would be to study product development process in an established enterprise. Also, the authors observe that there is a lack of study exploring the relationship between the causation and effectuation constructs (e.g. means vs. goals driven).
During the literature research, the authors find few studies related with the effectuation logic in a corporate context:

Brettel, et al. (2011) studied the effects of effectuation and causation in a corporate R&D context. In their research encompassing several expert interviews and a pilot study of 123 R&D projects, they concluded that a positive relationship existed between R&D output and efficiency in projects with high innovativeness and various effectual constructs in terms of "affordable loss", partnership, and "acknowledging the unexpected". Svensrud and Åsvoll (2012) conducted a theoretical study relating effectual strategy with innovation in large corporations. They proposed mathematical models to demonstrate the value of different effectual constructs in comparison with causal constructs in the context of opportunity growth in a firm. The study concluded that effectuation logic is almost as important for innovation in large corporations as for start-ups, and effectuation process and causation process are interweaving. Duening, et al. (2012) briefly discussed the application of effectual logic to enterprise innovation process: the product development process – Stage-Gate to be specific. And they argued how core principles of effectuation can be valuable to different stages of the product development process. However, the paper limits itself to pure theoretical discussion and does not build upon empirical findings.

The authors as well find out that some research has also been done on the nature of relationship between effectuation and causation logic:

Chandler, et al. (2011), in their research to build quantifiable measures to effectuation constructs, found one construct – alliance/pre-commitment – to be common for both causation and effectuation approaches. He concluded that forming alliance and obtaining pre-commitments is an activity pursued by practitioners of both entrepreneurial approaches. Rust (2010) in his research project studied the influence of causation versus effectuation on entrepreneurial firm survival. The study found that occurrence of "pure" causal or effectual approaches in dynamic industries is negligible and that the majority of entrepreneurs followed an approach composed of both causation and effectuation. Svensrud and Åsvoll (2012) described that effectuation logic is not a replacement for causation logic, but both exist in parallel within large corporations. Furthermore, both approaches are equally important for corporate decision-making and action-taking (Dew and Sarasvathy, 2002).

From the aforementioned arguments the authors can clearly identify a lack of research between the two areas: effectuation logic in a large corporate context and the relationships between the various effectual and causal constructs. With the thesis work, the authors try to address this gap by studying the relationship between effectuation and causation in a Stage-Gate product development process in a large established corporate context.

## 1.3. Research Question

After identifying the research gaps in the literature review, studying effectuation logic in an established company, and studying the relationship between effectual and causal constructs in an established company are determined to be the focus areas for the authors. Combined with the background of the case study company, the research question arrives as follows:

Q. How do causation logic and effectuation logic influence each other in the context of the product development process in a large-sized[2] established company?

During the research study, the authors will try to identify the various constructs of effectuation logic and causation logic deliberately at different product development stages and how they influence each other, namely how traditional causation influences effectuation.

## 1.4. Purpose

The purpose of this master thesis is to explore effectuation logic in a causal environment which can be seen as a large-sized established corporation which pursue pre-determined goals with rational planning. Due to a case study and qualitative research method are employed, the study aims to investigate and provide detailed empirical data on how causation logic and effectuation logic influence each other during product development process. Additionally, the authors aim to contribute to the discourse of effectuation research in two ways: First, it contributes to the effectuation theory by studying the co-existing relationship between the causal and effectual reasoning and how they have impacts on each other in a large existing corporation context with empirical data. Second, the study contributes to an overall propagation of effectuation theory and its generalizability outside of entrepreneurship context.

## 1.5. Delimitation

The scope of the study was constrained by the geographical distribution of the case study company and the limited data access, and hence the authors were limited in the data gathering and analysis. As a consequence, the authors focus the study on discovery, scoping, build business case, and development activities of the product development process, and other activities such as testing and launch could not be focused.

## 1.6. Key Concepts

Cooper (1990) suggests an alternative way to manage the product development process efficiently and effectively in order to create sustainable growth and competitive advantage in the increased competition on the market. This alternative way of managing the product development process is named Stage-Gate (Cooper, 1990). Stage-Gate divides the whole product development process into different stages – Discovery, Scoping, Build Business Case, Development, Testing & Validation, and Launch (Cooper, 2008), and there are Go/No Go gates following each stage to determine if the product will go into the next stage and investment will continue or not.

Cooper (1990) suggested that for companies to create sustainable growth and competitive advantage through the means of the product development they need to better manage the innovation process. He purposed another model known as stage gate model the for the purpose of managing the product development process.

[2] Large-sized company: a company which has a turnover of more than £5.75m or employs more than 250 staff.

According to Sarasvathy (2001a:245) “Effectuation takes a set of means as given and focus on selecting between possible effects that can be created with that set of means.” An entrepreneur begins with only an aspiration to create a new venture, uses the resources within his reach, and on the way discovers the goal. The goal itself remains flexible and the venture changes course several times based on experimental learning. Whereas, according to Sarasvathy (2001a:245), causation is described as, “Causation processes take a particular effect as given and focus on selecting between means to create that effect.”

Effectuation provides a conceptual framework for entrepreneurship in an environment with high degree of uncertainty by seeking to control an unpredictable future.

Effectuation includes five sub-constructs (Sarasvathy, 2001a): (1) beginning with a set of given means; (2) focusing on affordable loss; (3) emphasizing strategic alliances and pre-commitments; (4) leveraging contingencies; (5) seeking to control an unpredictable future.
However, the fifth sub-contract ‘seeking to control an unpredictable future’ actually relates to the problem space itself, the very area which the effectuation logic tries to address.

# 2. Theoretical Frame of Reference

## 2.1. Product Development Process

As Schilling (2010:239) recognizes, "the ability to develop new products quickly effectively and efficiently is now the single most important factor driving firm success". And various researches on how to manage the product development process more effective and more efficient have emerged. In order to succeed with the product development, there are three key objectives to be achieved (Schilling, 2010): maximizing the product's fit with customer requirements; minimizing development cycle time; and controlling development costs.

There are two types of product development processes. One is sequential development process which consists of a set of sequential gates where managers would make decisions on whether the product would proceed to the next stage, send the project back to the previous stage for revision, or kill the project (Schilling, 2010). The other one is partly parallel development process where some of the development activities partially occur simultaneously (Schilling, 2010). Many firms adopt the second process to shorten the development cycle (Schilling, 2010), due to it requires parallel problem solving which results in less recycling and reworking (Kuratko, Morris and Covin, 2011).

Kuratko, Morris and Covin (2011) state that technology-push (the company sees technical possibility and strive to capitalize it) and market-pull (product innovation starts with the customer and is driven by marketing people, and market research has a critical role) are two dominant approaches that can be deployed throughout the stages of the product development process in order to drive innovation to success.

## 2.2. Product Development Process – Stage-Gate

For companies which try to create sustainable growth and competitive advantage through the means of product development, Cooper (1990) suggests that these companies need to better manage the innovation process. An alternative model known as Stage-Gate is proposed for the purpose of managing product development process. A Stage-Gate is defined as "conceptual and operational map for moving new product projects from idea to launch and beyond – a blueprint for managing the new product development (NPD) process to improve effectiveness and efficiency." (Cooper, 2008:214).

Stage-Gate model consists of a series of stages and gates (Cooper, 2000, 2008; Schilling, 2010; Kuratko, Morris and Covin, 2011). A stage is a step in the product development process where a specific task (e.g. design, development etc.) is being performed by the project team (Cooper, 2008). Each stage is followed by a gate where the project is evaluated to ensure that the project is executed in a efficient and effective way (Schilling, 2010), and a Go/Kill decision is taken to continue the investment in the project (Cooper, 2008).

The Figure 3 below describes the product development process which is divided into five stage-gate steps. Cooper (2008) argues that a stage in a stage-gate system consists of a set of activities with clear defined goals and purposes:

1) Gathering information in order to reduce the project uncertainties and risks and define the purpose of each stage in the process.
2) A stage that comes later in the process flow costs more than the preceding one.
3) Many of the activities within a stage take place in parallel rather in a sequential manner. For example, in the first stage of scoping, idea generation and concept testing may happen simultaneously.
4) Each stage is cross-functional.

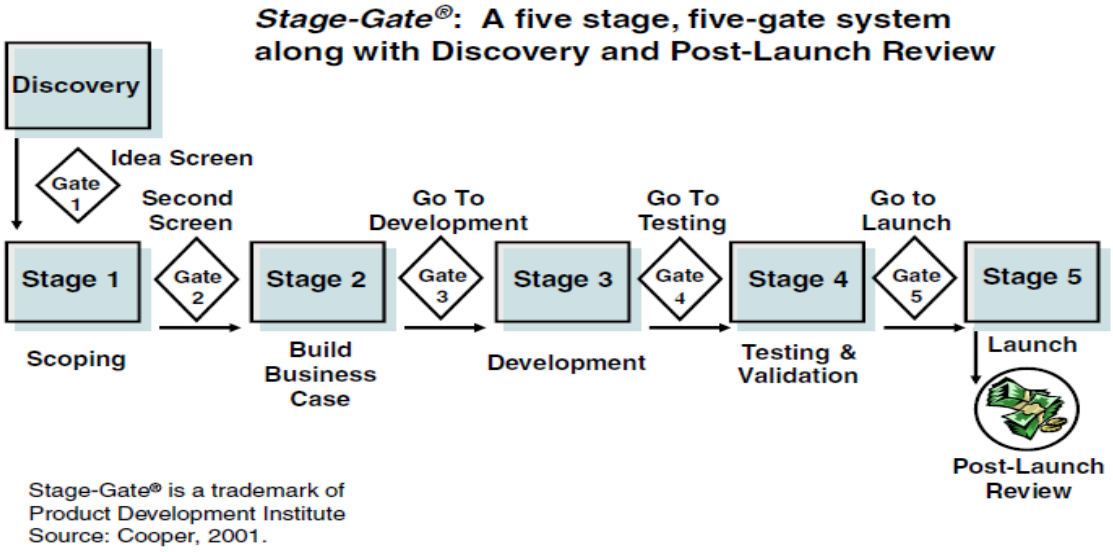


Figure 1: Typical Stage-Gate System for Major Product Developments
(Source: Cooper, 2008:215)

Cooper, et al. (2002a) state that function of gates is not merely to serve as review points or information updates, but to rather serve as check-point which helps in taking a go/kill decision. Tough go/kill decisions ensure that organization chooses the right projects and also the chosen projects are done right (Cooper, et al., 2002b). Cooper, et al. (2002b) suggests to develop clear decision criteria so that the decision makers can make Go/Kill decision objectively. Cooper, et al. (2002b) further suggest that these decision criteria must be operational (easy to use), realistic (uses available information) and discriminating (differentiate between good and poor project choices). Furthermore, Cooper, et al. (2002b) describe a functional role known as 'gatekeepers' - the people who tend the gates, make the Go/Kill decision and allocate the needed resources, such as people from senior management from different functions such as marketing, sales, and production.

According to Cooper (2008), the Stage-Gate model can be divided into following phases: discovery, scoping, build business case, development, testing validation, and launch.

**Discovery**

Cooper, et al. (2002a) recognize that the leading firms that have adopted the stage-gate process have incorporated an extra step to the product development process. A preliminary discovery stage is added to the beginning of the product development process in order to generate new ideas. Cooper, et al. (2002a) stress that good product ideas are essential for the success of a project, and thus new ideas require more care evaluation and selection. The goal of the stage is to filter high quality ideas from lower ones by utilizing certain tools, such as a scorecard consisting of visible criteria, voice of customer research, or ethnographic research (Cooper, et al., 2002a). Cooper, et al. (2002a) further suggest making use of certain techniques such as idea capturing and handling system to effectively manage ideas. Idea capturing and handling system involves ideas to be presented to the appropriate manager (e.g. product development manager) who brings the ideas to an initial screening. At the Gate of Idea Screen, the ideas are presented to and reviewed by a cross-functional group of managers (mid-level). In the case of a "kill" decision being made, the idea creator gets a detailed feedback; and in the case of a "go" decision being made, the idea is moved to scoping stage of the Stage-Gate system. The system also maintains a repository to store ideas which might again be considered in the future.

**Scoping**

Scoping is the first stage of the product development process (Cooper, 2000). This stage involves a preliminary investigation and conceptualization of the opportunity or the project (Cooper, 2000; Schilling, 2010). Project is assessed on the technical aspects, the market aspects, and financial & business aspects, then an action plan is designed for the next stage (Cooper, 2000).

**Build business case**

A more detailed investigation on the project is being carried out at this stage to develop a business case and plan (Cooper, 2000). This is a very crucial stage for the product development as this is last point before the project goes into the development stage and a large part of resources are allocated for the project (Cooper, 1990). A feasibility analysis is being conducted from the technical, marketing and operational aspects (Cooper, 2000). As well, a competitor analysis is done in order to evaluate similar projects which might exist in the market and to understand and to compare the project with the competitor's project (Cooper, 2000). Process of competitor analysis also involves identifying gaps in the existing offering from competitors and to see how these gaps can be fulfilled by company's own project (Cooper, 2000). And the business case developed at this stage includes three main components: product and project definition (Cooper, 2000); project justification (e.g. financial cost benefit analysis) (Schilling, 2010); and a detailed project plan for the development stage (Schilling, 2010).

**Development**

Development stage begins with the actual design of the product and then technical development follows (Cooper, 2000). The manufacturing or operations process is being mapped out, rapid prototypes are developed, limited in-house product testing is done, initial customer feedback is obtained, and the market launch and operating plans are developed (Cooper, 1990, 2000). And the test plans are also defined for the next stage by the project team (Schilling, 2010).

**Testing and validation**

At this stage, the entire project's viability is being tested through the product's validation, the product process's viability, customer acceptance and market verification (Cooper, 1990; Schilling, 2010). A number of activities are undertaken as well, including extensive in-house product tests, customer field trials of the product, trial or pilot production, test market or trial sell, and revised financial analysis (Cooper, 1990). By the end, the launch and operational plans are finalized and post launch and life cycle plans are defined (Schilling, 2010).

**Product launch**

Product launch is the final stage of the product development process where the full commercialization of the product takes place (Cooper, 2000). The full production begins, the product is being introduced to the market and the sale of the product begins (Schilling, 2010).

## 2.3. Causation and Effectuation

### 2.3.1. Causation definition

Causation is a traditional business thinking and reasoning (Duening, et al., 2012) which is based on rational planning (Wiltbank, et al., 2006). It is a goals-driven approach where one begins with sensing a 'gap' in the market or with an unexploited opportunity, a thorough market analysis is conducted and a business plan is developed, then required resources are aggregated and stakeholders are approached in order to implement the plan, and finally the project is executed (Sarasvathy, 2001a; Duening et al., 2012). The purpose of causation is to predict the future in order to overcome the contingencies while pursuing the maximum opportunity (Read and Sarasvathy, 2005; Wiltbank et al., 2006; Sarasvathy, 2008).

Moreover, Sarasvathy and Dew (2005:542) describe causation approach as a paradigm which "begins with exploration resulting in the identification, recognition or discovery of an opportunity, followed by a series of tasks to exploit the opportunity" including: developing a business plan from extensive market research and detailed competitive analysis, acquiring the resources and stakeholders to implement the plan, and adapting to the changing environment over the time to create a sustainable competitive advantage (Sarasvathy and Dew, 2005).

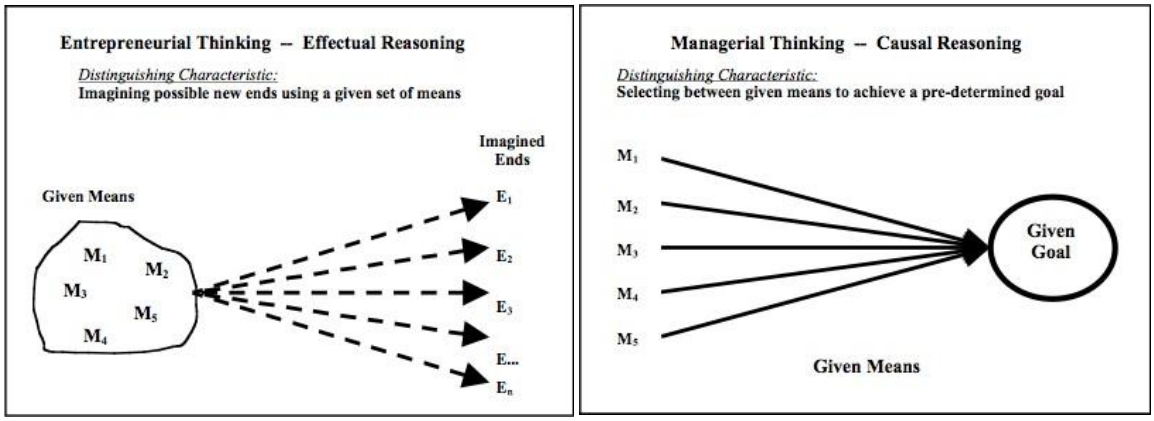


Figure 2: Effectual vs. Causal reasoning (Source: Duening, et al., 2012)

### 2.3.2. Effectuation definition

Sarasvathy (2001a) states that using effectuation a stakeholder accesses the uncertainty and takes the decision. An effectual stakeholder works in a non-predictive environment and accesses the opportunity cost based on what he is willing to lose. He believes that the pre-existing knowledge is of limited help to predict the future and follows a flexible learning-based approach. Effectuation can be summarized into four key principles that distinguish effectuation from causation (Sarasvathy, 2001a):

a. Means-driven action
   The entrepreneurs consider the means as: who they are, what they know, and whom they know. They begin with the resources in hand and reshape their goals as they act and learn.

b. Affordable loss
   This principle prescribes committing in advance to what one is willing to lose rather than investing in calculations about expected returns of the project. Since they control what they may lose, they do not have to predict what the expected returns could be.

c. Forming partnerships
   The goal is to find stakeholders, form strategic alliances and make early commitments. Entrepreneur actively seeks partners, people who can help him, rather than worrying about his competition.

d. Leveraging contingencies
   Entrepreneur acknowledges and embraces the risks associated with entrepreneurship, he leverages surprises to his benefit rather than trying to avoid them. He believes contingencies are unexpected opportunities that he can capitalize on by remaining flexible.

Furthermore, Read and Sarasvathy (2005) describe effectuation approach as a continuous process, a set of repeated steps which a firm can utilize to form partnerships and attract early customers, which then further allows it to expand and grow. The effectual process leads to two cycles:

1. Expanding cycle: the resources available to the venture are increased by increasing stakeholders in the effectual network (Sarasvathy and Dew, 2005; Read and Sarasvathy, 2005).
2. Converging cycle: constraints on the venture are accumulated to converge into specific goals over time (Sarasvathy and Dew, 2005; Read and Sarasvathy, 2005).

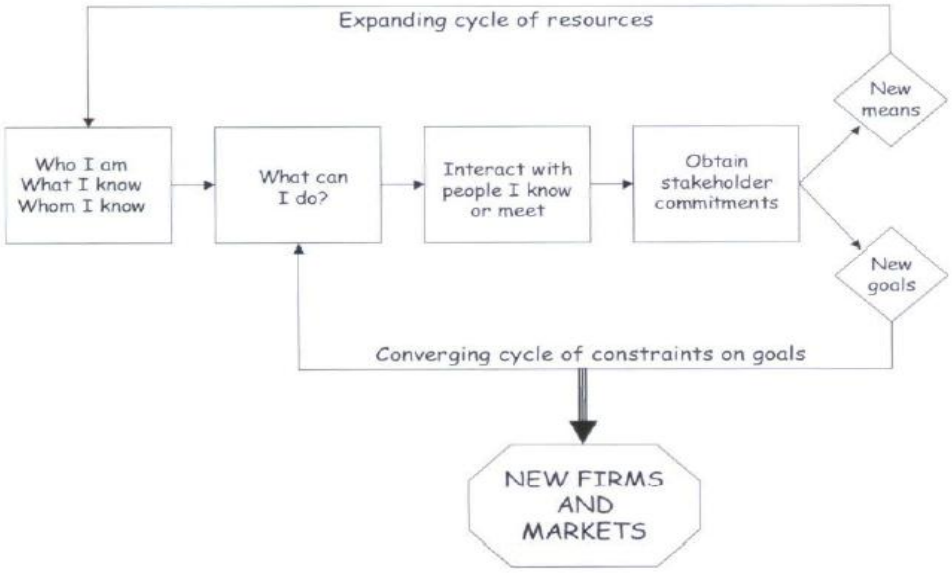


Figure 3: Effectual Process (Source: Read and Sarasvathy, 2005)

Dew and Sarasvathy (2002) argue that effectual logic can also be applied to large firms. Since effectuation addresses the decision making problem under specific circumstances which can also be pertinent in projects in large corporations. Projects targeted at new markets or projects for which market does not exist yet may qualify as Knightian uncertain situations (Sarasvathy, 2001b) where effectual logic stands valid.

### 2.3.3. Comparison between Effectuation and Causation Constructs

Sarasvathy and Dew (2005) highlight the primary differences between causal reasoning and effectual reasoning as depicted in the table below.

| | **Causal Principles** | **Effectual Principles** |
|---|---|---|
| **Initials** | Goals-driven | Means-driven |
| **Risks** | Expected returns | Affordable loss |
| **Market** | Competitive analysis | Partnership |
| **Uncertainties/ Opportunities** | Predictive | Creative |

| **Contingencies** | Avoid | Leverage |
|---|---|---|

Figure 4: Causation vs. Effectuation (Source: Sarasvathy and Dew, 2005)

And Chandler et al. (2011) list four key constructs that differentiate causation and effectuation approaches:

i. A focus on short-term experiments to identify business opportunities in an unpredictable future (effectuation) versus prediction of an uncertain future by defining the final objective up front (causation).
ii. A focus on projects where the loss in a worst-case scenario is affordable (effectuation) versus maximization of expected returns (causation).
iii. An emphasis on pre-commitments and strategic alliances to control an unpredictable future (effectuation) versus business planning and competitive analyses to predict an uncertain future (causation).
iv. Exploitation of environmental contingencies by remaining flexible (effectuation) versus exploitation of pre-existing capabilities and resources (causation).

#### *2.3.3.1. Means-driven vs. Goals-Driven*

The effectuation approach emphasizes on "creating something new with existing means" (Sarasvathy, 2008:21). An effectual stakeholder begins with the logic of identity. He explores the means he has by questioning who he is, what he knows, and whom he knows. Stakeholder engages in entrepreneurial activities but no specific goals are set instead different possibilities emerge as the stakeholder takes action.

Duening et al. (2012:208) present a list of possible resources that a stakeholder may have access to:

• Capital (cash and access to cash)
• Talent (personal and those of other stakeholders)
• Physical equipment
• Access to lucrative markets
• Specialized knowledge or knowledge of particular industries
• Patents or other intellectual property
• Key insights into a specific industry
• Personal connection and relationship

Using the means disposed to him, the stakeholder begins to imagine what he can possibly achieve with them. He takes action to move forward in a particular direction, but reconfigures his course as the outcome becomes clearer (Sarasvathy, 2001a).

However, in contrast to an individual entrepreneur, an organization is a collective entity, a pool of resources, therefore for a firm the basic questions of identity have to be seen in a

different context. “Who I am” may refer to existing competencies, and market position; “What I know” may refer to technical or domain expertise of the employees, tacit knowledge, and dominant design; and “Whom I know” may refer to partner networks, and customer segments (Sarasvathy, 2001a).

The causation approach emphasizes on goals-driven logic which can be clarified by the planning school (Brettel, et al., 2012), which advocates the systematic analysis (including market research, financial assessment, competitor analysis, etc.) and rational planning (Wiltbank, et al., 2006). As market is seen as a dynamic environment which involves uncertainty, predicting the future accurately is considered to be important for organizations to outperform others (Wiltbank, et al., 2006). Based on the systematic analysis which are used to predict the uncertain future, pre-defined goals are set and then rational planning are designed to serve as a guideline in pursuit of the goals (Brettel, et al., 2012). After the goals are defined, resources are allocated to achieve the goals.

Product development in a larger organization takes place in a traditional sequential way (Takeuchi and Nonaka, 1986; Schilling, 2010) from one stage to another - begins with the planning process during which project roadmaps are drawn and specific milestone goals are set, resources are identified, and estimation is made, then a go/no-go decision is taken, resources are allocated and the development begins. This is a clear goals-driven causation approach (Brettel, et al. 2011). On the contrary, in an entrepreneurial venture based on effectual reasoning, product development involves starting with a vague idea and making use of the resources at hand (Saraswathy, 2001a, 2008; Brettel, et al., 2011). The goals are fuzzy in the beginning but become clearer as the development continues.

The argument against means-driven principle from organization perspective is that the benefits achieved by entrepreneurial ventures by taking means-based action may not be the same sought by the organizations. Read, et al. (2010) list the potential benefits of means-driven approach as – reduced dependence on investors, working with limited resources, and a possibility to create opportunities which might be a better fit with existing capabilities. An established organization is more concerned about exploiting opportunities and meeting its goals, and is usually willing to invest the required resources to achieve the desired end.

#### *2.3.3.2. Affordable loss vs. expected returns*

Sarasvathy (2001a:252) states, “Effectuation predetermines how much loss is affordable and focuses on experimenting with as many strategies as possible with the given limited means. The effectuator prefers options that create more options in the future over those than maximize returns in the present.”

An effectual stakeholder does not begin with a definitive business model and hence does not give consideration to expected returns; rather he evaluates what he is willing to lose (Sarasvathy, 2001a). The effectual stakeholder rationally argues a boundary investment within which he is comfortable to invest further resources (Sarasvathy, 2001a). Affordable

loss serves as an important criterion for decision making for effectual stakeholder (Chandler, et al., 2011). He makes a go/no-go decision based on the expected cost of executing the idea, if the cost is within his limit of affordable loss he continues with the idea, but if the cost is above the limit he rejects the idea (Chandler, et al., 2011). The investment boundary is subjective and depends on the risk taking ability of the stakeholder. The risk taking ability will vary from stakeholder to stakeholder depending on his personal circumstances or his belief (Read, et al., 2010). The belief comes from the strength of the idea (goal orientation) or in his own self (who am I), and it determines his commitment toward the venture (Read, et al., 2010).

Experimentation is an inherent aspect of affordable loss principle, where entrepreneurs run rapid low cost experiments to test and validate their ideas (Sarasvathy, 2001a). Effectual entrepreneurs experiment with alternatives with affordable loss as the worst case scenarios. Koberg, et al. (2003) positively associated experimentation as an effective way of creating innovation within an organization. Koberg, et al. (2003) further stressed that by means of experimentation a manager is able to recognize new opportunities and as well as react quickly toward changes in market or technologies. Goel and Karri (2006) argue that managers and entrepreneurs differ significantly on how they view innovation. Goel and Karri (2006) state managers are more favorable toward the elements of quality and efficiency, and they aim to minimize the lead time driving inefficiency out of the system. Also, they prefer incremental innovation, step by step improving the existing products and services. Goel and Karri (2006) view is in contrast with Koberg, et al. (2003) which states that managers seek radical innovation with the help of experimentation. An interesting observation about incrementally building the product is from startup literature.

In the contrast, the causation approach emphasizes the calculation of expected returns which leads to the selection of resources to achieve the given goals (Sarasvathy, 2001a). Expected returns weights upside and downside information equally, and maximizing it results in rational decision making (Brettel, et al., 2012; Dew, et al., 2009).

#### *2.3.3.3. Partnerships vs. competitive market analysis*

Partnerships refer to how an entrepreneur or an organization looks at the outside world. With effectuation approach the stakeholder seeks to build strategic partnerships (Sarasvathy, 2001a; Brettel, et al., 2011). Instead of focusing on competitors and engaging himself into competitive analysis, he brings stakeholders to the venture (Sarasvathy, 2001a; Read and Sarasvathy, 2005). His goal is to get early commitments from the partners and thereby he controls the future rather than predict it (Sarasvathy, 2001a). Also, focusing on co-operation enables an individual or firm to expand its resources (means) and to make use of the core competencies of other external entities – organizations or individuals.

On the other hand, causation is considered in competitive market analysis which relates to the analysis of market trends (Brettel, et al., 2012) and is in line with the planning school approach (Wiltbank, et al., 2006). Competitor analysis is a strategic management technique

(Mostert, 2006) used to access to the strength and weakness of competitors. Competitor analysis is helpful to do a comparative study, to determine where the organization stands vis-à-vis its competitor. The assessment is then further used to alleviate improvement effort within the company.

Also, there are numerous tools such as competitor array analysis (Katyal, 2009) and competitor profiling (Vella and McGonagle, 2000) that a company can make use of. Also, there are certain management models such as Porter's Five Forces (Porter, 1979) to analyze attractiveness of a market.

According to Sarasvathy (2001a), establishing pre-commitments helps to reduce the uncertainty of the venture. By forming alliances the potential risk associated with the venture gets distributed among the partners. For an organization these partners can be suppliers, customers, distributor or anyone who has a stake in the firm's product or service.

There are varieties of ways a firm can gain by forming strategic partnerships with external organizations, e.g. a larger organization can enter into alliance with smaller firms. The smaller firms are usually characterized by an unpredictable operating environment and a high propensity toward risk (Aghion and Tiróle, 1994). Also, they are associated with higher innovation and new product offerings (Plehn-Dujowich, 2013); thus by working closely with smaller entrepreneurial firms, a larger organization can exploit opportunities they themselves cannot undertake.

Chandler, et al. (2011) argue that entering into strategic alliances is not a new phenomenon for organization. Firms create alliances to jointly work on a set of goals or to share each other's resources – distribution channel, knowledge, and expertise. He concludes that the dimension of forming partnership is not unique to effectuation but is common to both effectuation and causation model.

Kraaijenbrink (2012) suggests that co-operation with partners has its disadvantages as well. A company network may grow considerably complex over time and may require explicit resources to manage it effectively. The management of such network might be expensive both in terms of capital and time. Also, if a firm is working together with other firms, sharing risk and costs, then they will have to share profits and market share as well.

Chesbrough and Teece (2002) state that in industries with rapidly changing technology companies trying to produce internally will lose out to smaller highly competent firms. Chesbrough and Teece (2002) further say that potential downside to the co-creation is that the companies would focus more on their own interests, and there is a chance that partnership will fall out in the end. Chesbrough and Teece (2002) describe systematic innovation as innovations whose benefits can be realized only in conjunction with complementary products.

#### *2.3.3.4. Leveraging contingencies vs. Exploitation of pre-existing knowledge*

The predictive logic – the causation approach, centers on the exploitation of firms existing knowledge - its customers, markets, core competencies, experiences (Saraswathy, 2001a). The knowledge is used to define pre-determined goals and to pursue them. On the other hand, the non-predictive logic – the effectuation approach, does not rely on the pre-existing knowledge to confront unexpected situations but rather it embraces the change and look for opportunities (Saraswathy, 2001a). It is similar to lemonade analogy (Sarasvathy, 2008) where surprises even negative can be leveraged in positive ways.

The causation approach seeks to avoid unexpected situations (Wiltbank, et al., 2006); it hedges against potential risks by carefully planning the future. On the other hand, an effectual stakeholder accepts the changed reality and capitalizes on the unexpected opportunities that contingencies present (Sarasvathy, 2008). Contingencies serve as a course correction measurement to the effectual stakeholder necessary to re-evaluate the decisions and goals (Wiltbank, et al., 2006; Brettel, et al., 2012). And Brettel, et al. (2012) state that "This general notion is in line with the learning school approach, which proposes an adaptive and incremental approach to making decisions".

The following diagram summarizes how one can leverage the contingencies into new possibilities:

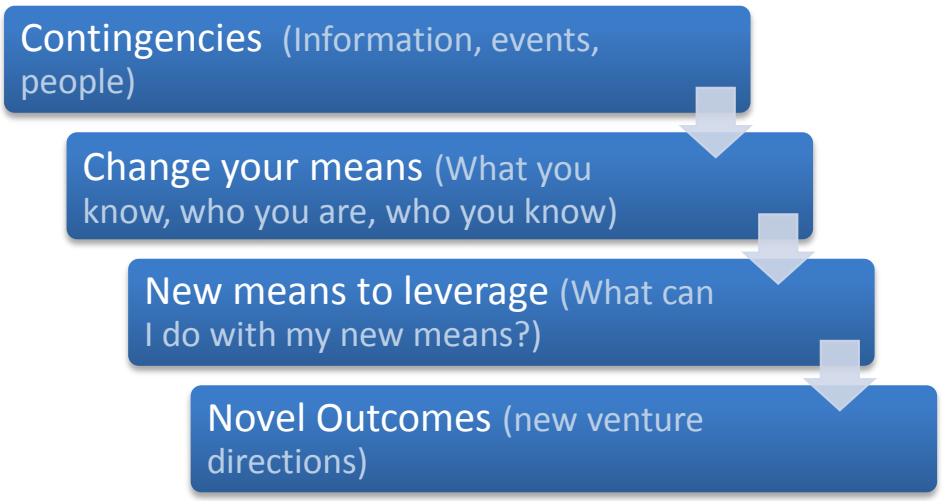


Figure 5: The contingencies path to novel outcome (Source: Read, et al., 2010)

At the same time pre-existing knowledge serves as an important tool for organizations. Pre-existing knowledge (Curado, 2006) facilitates the development of organizational learning to help capture and share knowledge in the organization. Levitt and March (1988) state that during the course of time an organization goes through different phases - favorable and unfavorable and much of uncertainty and risk that the organization faces, can be handled with what it has learned during the history of its existence. This knowledge consists of both tacit knowledge and explicit knowledge (Nonaka and Takeuchi, 1995) and a learning organization actively makes use of the collective learning of the individuals to adapt to the change. Schneier (1994) argues that organizational learning is a phenomenon spanning across the

participants of the firm who come together to share insights, knowledge, and mental models. Further Schneier (1994) states that learning is an accumulation of knowledge and experience gained over time. The learning must be retained to develop a knowledge reservoir in the form of organizational memory. The memory is further reflected in the form of various institutional mechanisms - policies, strategies, and models. Schneier (1994) argues that rate at which organizational learning may become the true source of sustainable competitive advantage in knowledge driven industries.

### 2.3.4. Relationship between causation and effectuation

***Inverse relationship***

Effectuation and causation have an inverse relationship (Sarasvathy, 2001b; Read and Sarasvathy, 2005). Sarasvathy (2001b:D1) argues that "effectual reasoning is not merely a deviation from causal reasoning. It is a distinct mode of reasoning based on an entirely separate logic than the logic behind causal reasoning." As well, Read and Sarasvathy (2005:50) advocate that "Effectuation inverts every aspect of casual rationality, including its problem space, solution process, fundamental principles, and overall logic." Causation is based on the logic of prediction in order to control the future, and effectuation is based on the logic of control in order not to predict the future (Sarasvathy, 2001b). Causation considers the environment is largely outside of the decision-makers control area, therefore it seeks to predict it and tries to adapt to it; effectuation considers the environment as the internal cause of the effectual actions, therefore it seeks to facilitate the stakeholders' pre-commitments in order to control it (Read and Sarasvathy, 2005).

***Relative relationship***

Sarasvathy (2008) argues that the effectuation and causation are mutually exclusive and they lie on opposite quadrants of a control vs. prediction matrix. Causation is primarily a planning based approach with high emphasis on prediction and lower on control. Whereas, effectuation lies in the bottom right corner of the quadrant with a higher emphasis on control and a lower emphasis on prediction.

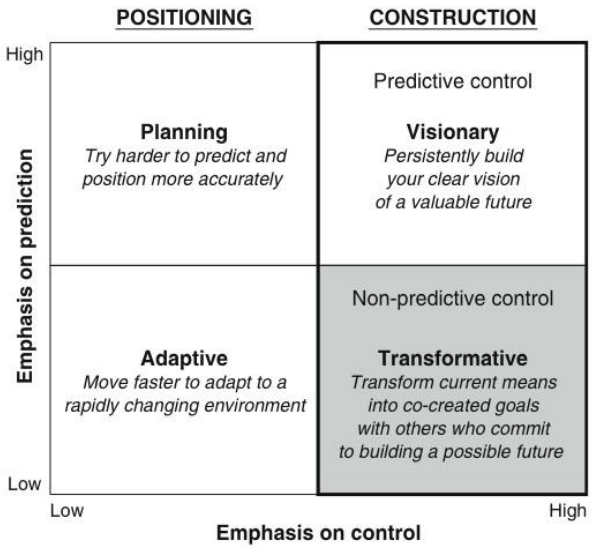


Figure 6: Prediction vs. control (Source: Sarasvathy, 2008)

However, it is also argued from the literature that both causation and effectuation do not exist independent of each other but exist in parallel to each other (Dew and Sarasvathy, 2002). As Sarasvathy (2001a:245) states that "Both causation and effectuation are integral parts of human reasoning that can occur simultaneously, overlapping and intertwining over different contexts of decisions and actions". Often entrepreneurs instead of choosing one approach, take a middle path, a balance of causation and effectuation.

Kraaijenbrink (2012) argues, "researchers are puzzled how the two models relate to each other and if they can exist together in a particular business context." He contradicts that the two models are only extreme ends within the spectrum of entrepreneurial theory, and Sarasvathy's model of effectuation and causation is an oversimplification. He suggests that the effectuation constructs are independent of one another, and these constructs do not have a clear 'part-of' relationship with theory of effectuation, and therefore the focus of the further studies should be the constructs itself. Kraaijenbrink (2012) contradicts as well Sarasvathy's argument on that effectuation is best suitable for the creation of new markets, and suggests that effectuation can be as beneficial to the firms working within existing markets, and that the effectuation principles can be applied to the existing business to improve their current offering.

Svensrud & Åsvoll (2012) describes the dynamics between effectuation and causation with respect to the opportunity growth (from coming into being to full exploitation) in a firm. They build a mathematical model for each of the four principles of effectuation and then combined the four to create one overall model. The diagram depicts the value created by pursuing effectuation approach for opportunity exploitation.

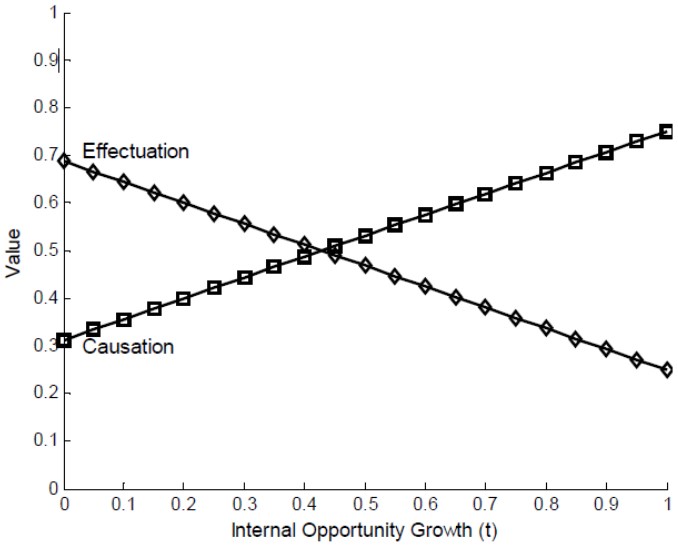


Figure 7: Effectuation and Causation in Large Corporations
(Source: Svensrud & Åsvoll, 2012)

The figure shows that effectuation has its greatest value at the initiation of the opportunity, and this value decreases during the growth of the opportunity. Consequently, causation has its lowest value respectively at the initiation of the opportunity and its value increases during the growth of the opportunity. Effectuation and causation meet almost halfway, which represents that there is a shift of the strategy for opportunity management from explorative effectuation to predictive causation (Svensrud and Åsvoll, 2012). And this is also in line with Jaruzelski et al., (2011) who suggest another product development process model with agile at the front end to optimize, balance, prioritize requirements and identify risks earlier, and lean approaches at the back end to minimize the wasted effort and resources expended on product launches. However, Svensrud and Åsvoll (2012) argue that both effectuation process and causation process are interweaving and have a relative relationship in between in terms of the opportunity growth.

Dew and Sarasvathy (2002) state that effectuation is not an alternative or replacement to causation logic, but both can exist in parallel within their own problem space. Each approach has its own usefulness and the choice should be dictated by the circumstances such as phase of the product lifecycle or the growth stage of the organization. It is further argued that the application of effectuation logic can probably be discovered in areas other than the field of entrepreneurship, but effectuation will be adapted according to the boundaries and requirements of a particular domain (Dew and Sarasvathy, 2002).

## 2.4. Lean Startup

Lean startup methodology is based on the belief that entrepreneurship is a science and to reduce uncertainty startups should be managed using scientific approach. It combines together the key tenants from several different best practices including lean, customer development (Blank, 2005), incremental design and continuous learning. The goal is to build

and test hypothesis based around customer needs, one begins with a product with minimal feature set, called Minimum Viable Product (MVP), takes it out to the customer, and validates the hypothesis. Based on the new learning the product developer makes a decision whether to continue development or to take a change in direction, called pivot. The development goes through several rapid iterations and the product is built incrementally complying closely with the need of the users.

The key principles (Ries, 2011) of the lean startup methodology are listed as below:

1. Entrepreneurs are everywhere

Ries (2011) suggests that entrepreneurship is not a rare art and entrepreneurs are not only the ones building their businesses in a dorm room or in a garage but entrepreneurship has much more broader applicability including larger corporations, government organizations or any organization which faces the challenges of creating value for its customers. In a larger organization it may imply a need for innovativeness and a culture to foster creativity.

2. Entrepreneurship is management

Startup is not only about a product, the inherent uncertainty has to be managed, just like in an established organization.

3. Validated Learning

A startup begins with an idea and a set of assumptions, in order to transform them into a successful venture, an entrepreneur must validate his assumptions and learn from the findings. The learning has to be built on scientific grounds, based on experiments which allow entrepreneur to test his hypothesis.

4. Innovation Accounting

To successfully manage a startup, entrepreneur needs to measure progress by setting up milestones, and by prioritizing work. The accounting has to be actionable, and should employ metrics that help the business to measure the problem that they consider most important (Croll and Yoskovitz, 2013).

5. Build-Measure-Learn

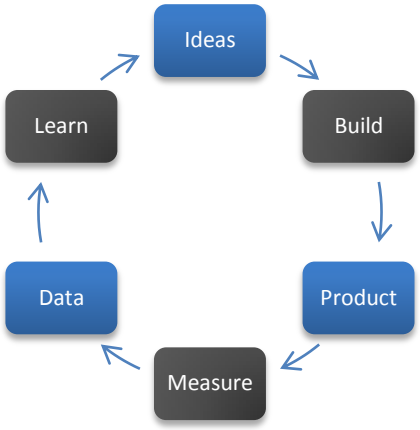


Figure 8: Build-Measure-Learn Cycle (Ries, 2011)

Ries (2011) argues that the goal for a startup is not only to develop an idea into a product, but to build a product that a customer wants and a product that can be delivered with minimum amount of waste. Lean startup brings a product with minimum viable features on the market to test the business hypotheses and to receive valuable customer feedback without initially investing heavily on the product development; therefore it minimizes the financial risk down to an affordable-loss (Sarasvathy, 2001a) level.

Both lean startup and effectuation address product development process as an iterative cycle (Ries, 2011; Read & Sarasvathy, 2005) where they have many similarities as follows:

1. Entrepreneurship: Both lean startup and effectuation address to entrepreneurship and new ventures.
2. MVP – Affordable loss: Lean startup addresses to build minimum viable product in order to keep the potential loss as low as possible, whereby it is very similar to the affordable loss suggested by effectuation which means to keep the potential loss at the acceptable level.
3. Validated learning – Leveraging contingencies: Validated learning is another important concept in lean startup, which addresses to learn from the product's market performance and customer feedback in order to be flexible. And this is similar to leveraging contingencies in effectuation which suggests acknowledging and learning from the unexpected in order to remain flexibility.
4. Pivoting – Leveraging contingencies: Lean startup suggests pivoting after validated learning in order to adjust the product according to the market requirement, and effectuation also suggests embracing the risks and contingencies to make changes on the product required by the market in order to bring the product to the success.

## 2.5. Scrum

Agile Manifesto is one of the major innovations in software development methodology in last few years (Vlaanderen, et al., 2011), and it has adopted some effectuation constructs into software development process. As one of agile software development methodologies, scrum

encourages taking small steps, inspecting the current product and market situation, adapting the product goal and process practice through an iterative and incremental way (Paul and John Singh, 2012).

There are three different roles involved in scrum framework, and they are product owner, scrum master and the team (Paul and John Singh, 2012). Product owner is the person who is responsible for maximizing the return on investment of the product, identifying new features or new products, setting up a prioritized task list and selecting the next list of tasks for the scrum team to do in the next iteration cycle. Scrum master is the person who helps the scrum team to follow the scrum framework to achieve the goal. The team is cross-functional and self-organized team consisting of people with different expertise, such as developers, testers, designers and etc.

Scrum framework consists of several scrum artifacts and scrum events (Paul and John Singh, 2012). First, product backlog is a refined and prioritized list of tasks where the product is defined by the product owner, and these tasks are written in a story format. Second, the heart of scrum framework is the sprint which is a time-boxed iteration where the team follows the product backlog to develop the product. The length of each sprint is fixed from one week to one month. In each sprint, there are sprint planning meeting where the sprint is planned before it starts, daily scrum which is a daily meeting between the team and scrum master, sprint review which takes place at the end of each sprint to reflect on the whole sprint, and sprint retrospective which is a self-organized time-framed meeting for the team and scrum master to self-evaluate the work and inspect areas where improvement is needed.

There are similarities between scrum methodology and effectuation approach as follows:

1. Iterative process – Both scrum methodology and effectuation emphasize that product development process is an iterative process (Paul and John Singh, 2012; Read and Sarasvathy, 2005).

2. Learning ability – Scrum methodology suggests self-evaluation and learning ability by the end of each sprint (Paul and John Singh, 2012), which is similar with organizational learning suggested by effectuation approach (Sarasvathy, 2001a).

3. Adaptation – Scrum methodology focuses on incremental development and adapting products to the market by inspecting the market situation frequently, and effectuation approach suggests leveraging contingencies which as well advocates adjusting products according to the market in order to make the product successfully.

In conclusion, product development in fast changing technology industry and industry's dynamic environment demand companies to adjust the traditional Stage-Gate product development process from a sequential process to a partly parallel development process (Schilling, 2011). Furthermore, companies are as well demanded to act more dynamically and in an entrepreneurial way in order to survive in an uncertain market environment. Due to uncertainty and ambiguity in this sphere, it is more and more difficult for companies to

accurately predict the future by conducting casual analyses and research; furthermore, it is more difficult to do rational planning to achieve pre-defined goals. Therefore, effectuation approach is yelled to take place in such a dynamic environment in order to manage the uncertainty and ambiguity. The old traditional management style needs to be replaced, and new development methods such as agile, scrum and lean startup are needed in order to bring effectuation logic into the product development process where traditional planning method is being undermining more than ever. In order to succeed with products and create sustainable competitive advantage in the high competitive market, established companies are willing to be more effectual than ever, and causation is going to be replaced or integrated with effectuation gradually.

# 3. Methodology

## 3.1. Overall research purpose and design

A longitudinal case study design was chosen as the research methodology, where theoretical knowledge aimed for has middle-range character (Bryman and Bell, 2011:9). The research was conducted mainly in the software development division and the planning division of a case study company where the authors had internship for over six months, with the purpose of studying the dynamics of causation and effectuation during the product development process in a large-sized existing corporate setting. The case study design facilitates an in-depth study of a single entity and provides the opportunity to understand the complexity of a business situation. Within the boundary of a single organization (Bryman and Bell, 2011:59), the case spanned multiple divisions, as it followed the product development process from initiation to completion. The framework of building theory out of case study suggested by Eisenhard (1989) was deployed in the research process, and qualitative method was used as the research tool to gather and analyze data. Qualitative method is often considered a method of choice for case study design (Bryman and Bell, 2011:60) and several qualitative methods can be combined to study the given phenomenon (Knights and McCabe, 1997). The authors collected data employing several methods such as semi-structured interviews, observations and company documents.

The relationship between the findings and the research is an inductive one, but the inductive and deductive approaches were both employed during the research process (Eisenhardt, 1989). Theoretical framework for the research was built upon existing academic literature with an inductive approach to identify the constructs characterized by effectuation compared to causation, and this theoretical framework was applied to systematize data gathered during the case study. Deductive approach was employed mainly in the data collection with the aim of testing the theory, and inductive approach was employed mainly in the final data analysis in order to build up the new theory.

The research process was divided into several steps. These steps were not linear in nature but cyclical, often input of an advanced step was used to better understand and develop the previous step. Especially, the process of data collection and data analysis was iteration (Bryman and Bell, 2011), where the authors switched between the data collection and data analysis in order to validate empirical data and better understand the interrelationships between constructs.

## 3.2. Selecting the research topic

A focus area was selected after careful consideration of several topics. The context of the study was considered, a scope was determined, and limitations were acknowledged, and after confirming to all the aforementioned dimensions it was agreed upon by the authors that the relationship between effectuation and causation remained the key theme and hence was chosen as the area of research.

## 3.3. General Research Question

The first step was to establish a theoretical framework by carefully selecting the related scientific literature. An analysis of the text was performed in order to establish what was known in the literature, and then the research question was identified in combination with the case study.

## 3.4. Data collection

Data collection is the process of obtaining relevant information needed to analyze the relationships between constructs of the research question. A data collection plan was developed to formalize the data gathering process. The plan was necessary to ensure the capture of relevant data within a reasonable amount of time. And data collection was aimed at developing a full understanding of the Stage-Gate process.

The authors followed a theoretical sampling approach to the research. Glaser and Strauss (1967:45) defines theoretical sampling as the "process of data collection for generating theory whereby the analyst jointly collects, codes and analyzes his data and decides which data to collect next and where to find them, in order to develop theory as it emerges". A cyclical research process was followed with continuously of theoretical reviews, data gathering, and data analysis.

**Primary Data Collection**

*Interviews*

In the primary data collection phase, one-hour semi-structured interviews with the employees and management team were conducted. The main purpose of the interviews was to create an understanding of the product development process and to identify and comprehend the role of various factors of effectuation and causation.

As Bryman and Bell (2011) suggested as being commonly used in qualitative case study, purposive sampling was selected by the authors as a non-probability sampling technique where the participants were not chosen on a random basis but were carefully selected. The research only involved people who were relevant to the product development process. Furthermore, the technique encourages sampling a variety of sources to generate wider range of data.

Therefore, there was a diverse range of employees with different organizational positions across two different organizations that were interviewed: senior managers, project managers, team leads, and release managers from the software development organization, and planners from the planning organization. Since the interviewees performed different roles in the organizations and belonged to different peer levels, they were posed with different set of questions according to the interview guide (see Appendix I) which the authors based on the

literature review in chapter two and the different positions that interviewees held in the organizations.

The first round of interviews was conducted with release managers of the software development organization with the aim of understanding the relationship and differences between software release and the hardware launch and discovering the influencing factors from effectuation and causation during the product release phase.

The second round of interviews was conducted with project managers and team leads of the software development organization. The purpose of these interviews was to understand the product development phase and the development methodologies and tools which were implemented by the software development organization, and how the development teams work daily and how a product was developed at a project level.

The third round of interviews conducted with the planners from the planning organization was aimed at understanding their work process, tools and measurement that they used in the product's planning phase, furthermore the influencing factors from effectuation and causation were discovered during the product planning phase.

The fourth round of interviews with the senior managers at the software development organization was conducted with the purpose of gaining the full understanding of the product development process from initiation to release and discovering the major factors of effectuation and causation which might have influencing impact on decision-making at the organizational level throughout the whole process.

Since the topic of the research was of scientific nature of which employees of the organization may not be aware of, indirect questions were formed and natural language was used. And during the one-hour interviews, the interviewees were asked questions based on the interview guides. But, at the same time participants were encouraged to have open discussions in order to arrive to any useful information that was not covered by the interview guides. Also, to increase the credibility of the data multiple persons from the same positions were interviewed.

A summary of people interviewed is presented in the following table.

| | **Number of people contacted** | **Number of interviews** |
|---|---|---|
| **Software development division** | | |
| **Senior Manager** | 4 | 4 |
| **Project Manager** | 6 | 3 |
| **Team Lead** | 5 | 4 |
| **Release Manager** | 7 | 7 |
| **Planning division** | | |
| **Planner** | 4 | 4 |

Figure 9: Summary of interviewees

*Other sources*

Also, informal meetings were conducted with other employees and managers to help the authors better understand the process and work culture at the organization.

**Secondary data collection**

Secondary data (Smith, 2008) can be defined as the data generated through systematic reviews, documentary analysis and as well as the results from large-scale datasets. For the purpose of the research, the authors used organizational documents as source of secondary data. Certain organizational information was obtained by accessing intranet pages of the case company and software development organization.

The authors also made use of news-letter from the software development organization as the other source of company document. The document helped to gain perspective on the job structure and roles performed. It also contained information on a holistic view of the product development process.

As well, the authors used Entrepreneurial Health Audit (Bisht and Sun, 2012) as the third secondary data source. Entrepreneurial Health Audit was conducted through an online survey by the authors at software development organization within the case study company in December 2012 to measure the entrepreneurship at organizational level.

## 3.5. Method for data analysis

The interviews were recorded and then transcribed; furthermore notes were also taken during the interviewing process. The authors carried open discussion sessions among themselves after each interview in order to identify key factors and outcomes.

As the method for data analysis, the authors followed a within-case analysis (Eisenhardt, 1989) with open coding technique. Open coding is defined as, 'the process of breaking down, examining, comparing, conceptualizing and categorizing data' (Strauss and Corbin, 1990:61). The result is the data organized into concepts which is then later grouped into categories (Bryman and Bell, 2011).

The authors coded the data in two steps. First the data was categorized into different stages according to Stage-Gate product development process model (Cooper, 2008), including Discovery, Scoping, Build Business Case, Development, Testing & Validation, and Launch. Second, in each stage, the authors used the theoretical framework of effectuation and causation approaches to deliberately identify different constructs of effectuation and causation in order to understand the rudimentary relationship between the two approaches. The within-case analysis was an iterative process where the authors went back and forth between the data collected from the case study company and the theoretical literatures to be sure of the research covers all different stages of the product development process and all

different constructs from causation and effectuation. And additional interviews were carried out in order to meet the required theoretical saturation level (Bryman and Bell, 2011).

## 3.6. Reflections of method choices

Due to the authors had internship at the case company over six months and the complexity and nature of the research (Bryman and Bell, 2011), the case study approach was seen as a better fit for the empirical study, as the focus of the research was the product development process followed by the firm. However the research was not confined to a single organization since the development process encompassed multiple organizations within the case company. The research covered two organizations – the planning and the development. Also, the authors restricted the study to a single geographical area. Primarily the authors did so because of the constraints of time, but also because the location of the case study was the center of the product development activities and widening of the geographical scope would not have any significant impact on the study.

Because of the shorter time frame the authors chose the grounded theory data analysis against inductive data analysis. Due to the restrictions of time the authors could only gather limited amount of data. Also, the analysis of the data was impacted by the shorter time frame.

It is acknowledged by the authors that tracing a complete product life cycle could have better illustrated the relationship between causation and effectuation in detail. Or, following products with causation approach and effectuation approach respectively could also have made a clearer understanding of the relationship of the two different approaches.

However, the generalizability of the final conclusions in this research might be restricted due to that only one company at one single location was investigated throughout the whole research process. This limitation has been taken into consideration due to the case study has an idiosyncratic characteristics (Eisenhardt, 1989), but in return, empirical evidences are being explored and related to the theory, and giving practical insights on the effectuation and causation literature.

# 4. Presentation of data

In this chapter, the empirical data collection from the case study company will be presented. First, a brief background introduction of the case study company will be presented in order to give an overall view about the company's business and activities. Then the data about the product development process will be given and organized according to the stage gate model for the product development process (Cooper, 1990): discovery, scoping, build business case, development, testing validation, and launch. However, due to these six stage gates are undertaken by two different organizations at the case study company, they are merged into three different stages accordingly: discovery/scoping/build-business-case stage, development/testing-validation stage, and launch stage.

## 4.1 Introduction of the case study company – SM[3]

The case study company SM is a large-sized established multinational mobile device manufacturing company headquartered in Tokyo, Japan. Originally, SM was a joint-venture founded in 2001 by a large Japanese home appliance and entertainment enterprise and a large Swedish telecom enterprise. In 2012, the Japanese partner acquired the 50% of the shares from the Swedish partner, and renamed the joint-venture to SM. Although the original joint-venture company was established over ten years, but SM is rather a relatively new subsidiary company within the Japanese enterprise.

As a mobile device manufacturer, SM's core business is to manufacture and sell android-based mobile phones and tablets and its strategy is built upon these mobile devices. One of the strategies at SM is to bring a unique user experience of the mobile devices to the customers by providing mobile applications and services with distinctive characteristics, moreover to promote the sales of mobile devices at SM.

In order to create this unique user experience and increase the sales of mobile devices by adding the value to the devices through applications and services, Apps & Services Development (ASD) was founded in April 2012 as an independent mobile application and services development division within SM to deliver differentiated applications and services to the mobile devices. ASD has four offices across the globes – Lund, Sweden; Tokyo, Japan; Beijing, China; and San Francisco, USA.

Compared to rather newly founded ASD, UXP is a well-established independent product planning division outside of ASD but within SM. UXP is the planning organization responsible for discovery – generating new ideas, scoping – investigating new ideas, and build business case – investigating new ideas in detail and planning for the project to start; and ASD is the application and services development organization responsible for development, testing and validating, and then launch – release the applications and services to the device projects at SM. UXP and ASD are two completely different and independent

[3] SM – is the abbreviation of the case study company.

organizations, but they work very closely to each other throughout the whole product development process as the following product development process of SM shows:

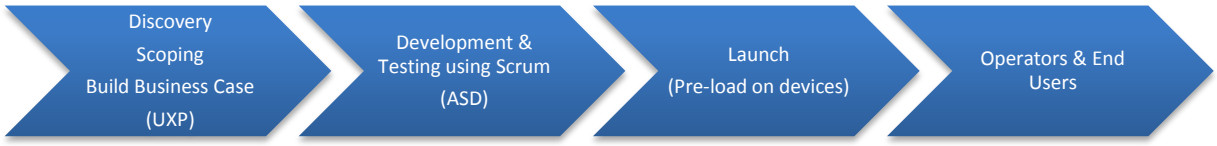


Figure 10: Software Product Development Process

## 4.2 Discovery/Scoping/Build business case

Discovery, also named as ideation, is being performed by both UXP and ASD because of the initiative of ASD which wants to generate ideas from developers' perspectives. And due to that both divisions use different approaches from each other at the ideation stage, UXP is responsible for scoping and build business case stages as well.

### 4.2.1 Ideation at UXP

UXP has a group of planners who are in charge of ideation and both short and long-term planning of the applications and services. The planners have two primary tasks, one is to generate new ideas for applications and services developed by ASD, and the other is to do the twenty week detailed planning. Further, they are also responsible for creating a long-term roadmap up to one or two years, depending on the products.

UXP creates a long-term roadmap for each product and it could be up to two years ahead. The long-term roadmap describes what the product should become in the coming year or two, the features that should be done, however, they do not design all of these into detail, and only a part of it is designed in detail up to six months and assigned to the development team. And as the development work begins the plan is adapted, inputs from development teams are also considered. In essence, the planning team works in a long cycle and then they work in a very short cycles together with the development team from ASD during the development stage.

At UXP, for a new software product, the planning usually begins with the SM top-level management team who usually has an overall directive focus area. This focus area can be driven by a theme, such as the theme for 2013 is entertainment which means UXP is going to focus on any ideas or products related to entertainment in 2013; or it can be driven by the products, such as camera or album, which give the planning team (planners) a guidance of that they should work more on camera application or album application in the coming period.

As the interviewee A from UXP said during the interview:

*"So often it (a completely new application) always starts with some kind of an overall directive focus area, then we sometimes have a number of workshops to try to narrow this directive down to something more concrete, such as does it mean a completely new application, or does it mean that we need to touch up on existing applications, try to be more concrete about what that directive means to us."*

In order to narrow down this directive focus area into something more concrete, planners at UXP organize workshops among themselves. They try to find out what this focus area means to them, such as whether they need to create a new product or they need to make changes on the existing products. For example, if the planners get a direction saying the focus area is connectivity, they will focus their work on the ideas or products for improving the connection between the mobile devices and other devices (TV, gaming console etc.).

Except the guidelines and focus areas from the top-level management team, there are several sources from where planners get their ideas at the discovery stage:

*Developers from ASD:* they are the ones from whom planners can receive some significant inputs about new ideas from the technical perspective and get some innovative or even radical ideas, and they are the ones whom planners work very closely during the whole development stage.

*Operators:* that SM works together with are one of few sources where the new ideas about the products come from. UXP utilizes their organizational network with the operators in order to improve the quality of the planning on the products. Sometimes operators can require certain applications or certain features or functionalities of an application to be delivered on the devices from SM. Since these requests are very important to the operators, planners have to take them into consideration and give them high priority in their product plans.

*Customer's feedback:* is another important source where the new ideas are generated from, because they are the end users who actually use those applications and services provided by SM, just as the interviewee B stated during the interview:

*"it is really just learn from the market, the consumers or the real users that actually use it are the ones could tell you what is good and what is bad, because internally we have some idea but we are not the actual users within the company, we are already a kind of colored we believe things"*

There are several different channels for UXP to obtain feedbacks from end–users or customers such as operators. One is the customer service team through which they can receive information from call centers. Another one is a company database which can provide information to UXP's preferences. Third one is the customer products management team which can provide feedbacks from end-users or from operators. The last one is the forums and the blogs where they can get direct information about the problems which end-users complain about or how the products are preceded on the market.

*Request from other units:* there are some other organizations at SM such as marketing, and business development teams from where come in the requirements for a certain application or a certain functionality of an application needed to be developed.

By utilizing activities aforementioned, ideation at UXP has three drawbacks. First, focus area limits ideation within a narrowed-down field, which eliminates potential ideation and more innovative ideas that are outside of the focus area. Second, specific goals are set, which indicates that goals-driven approach is being applied at UXP and flexibility is limited. Third, UXP follows the market requirement and trends closely at ideation stage. UXP is a market follower instead of market creator.

### 4.2.2 Ideation at ASD

In order to foster developers' creativity and fully utilize their expertise, skills and knowledge, ASD encourages developers to create and develop their own innovative ideas on products, and there are several applications which were developed from ideas created by developers at ASD.

One of the products is the movie application which is being developed in Tokyo right now. The project was initiated by two developers from a development team and a designer in Lund. In about a week's time they developed a working prototype, which was then presented to a planning team at UXP, the planning team appreciated the idea and it was finally rolled into an official project. Now, movie application is one of the important multimedia applications – a part of the top priority entertainment theme of the company.

Similarly, the current album application replaced the previously used Gallery application, a built-in lower quality application of Android. Just as in the case of movie application, developers at ASD came up with the idea, rapid prototyping was done, and then presented to the UXP. The idea was accepted and now album application is also a part of multimedia application receiving a lot of attention.

In a bid to promote innovation and a free flow of ideas the development organization in the month of November 2012 organized an innovation event called Hackathon. The goal was to organize employees to work on software projects. The theme was chosen as cloud computing and participants were asked to develop solutions in a short period of time. These solutions were then presented to other employee in an open forum, and a winner was chosen by the people. Hackathon was a success and it was expressed in the interview that more such events should take place. There are two more similar brainstorming activities, Innovation Forum and Crazy Friday, being carried out at ASD with the aim at encouraging developers to create new ideas. And there is no analysis on competitors or marketing done during or after these ideas being created.

However, there is a time constraint at ASD which makes these brainstorming and ideation activities difficult to be executed due to the reason as the interviewee C explained:

*"Every person is allocated 100%, so it is a disadvantage."*

## 4.3 Scoping/Build Business Case at UXP

At the scoping and build-business-case stage, competitor analysis and market analysis are two main researches for planners at UXP to undertake while they are searching for or evaluating new ideas. Using one of their signature services as an example, after a competitor analysis and market analysis was done, UXP realized that they were lying behind in the area and then decided to develop their own service as such in order to catch up with the competitors and fill up the gap.

*Market Research:* Planners closely follow technology and support forums to get a grip of how real users think about the software applications. It helps them in spotting technology trend and usage trend, and allows them to identify what users are most expecting and what users are mostly complaining about. Market research is one of the most important tools that planners at UXP adopt in order to make products more outstanding and differentiated, as the interviewee B said:

*"One of the criteria that has been in my consideration is what feature could be or is already requested by the customers, and the criteria or something similar. That increases the value for my products. I see that this would enhance my products in terms of differentiating or making it better, and that of course something goes up."*

*Competitor analysis:* is considered the one of the most important input for the planning process at UXP. The importance of competitor analysis is already established as an essential aspect of corporate strategy (Jain, 2000; Wind & Robertson, 1983). Planners scan the market competitors and make a comparative assessment of SM position in underlying area of mobile applications. It helps them in identifying if SM is lagging behind in a certain area. As an example, MyXperia app was born after a realization that competitors had a similar application in the area of cloud storage and access, as the interviewee B introduced:

*"First thing I did when I took it over is market analysis and competitor analysis, such as the most important input for further planning for this service. Because I realize pretty quickly that we are lying behind in this area, I look into details look into competitors, then I realize we are the last one in this area."*

And there is an annual budget plan which planners have to take into consideration while they are exploring ideas. Then, planners start to work more closely with ASD to obtain information needed for further detailed planning on the product project and build up a business case, such as rough estimation on the length of development time and technical feasibility as stated during the interview:

*"How much effort does, not very detail but rough estimate, this idea would cost the team to implement, this idea is month of work, and this we could do it pretty quickly. This is one criteria I use."*

During the interview with interviewee B at UXP, he also talked about constraints on resources which he experienced because he had to follow a budget plan and how UXP perceived these constraints:

*"We have a constraint on the resources so we try to be, ... There are situations where you have constraints, yes, then you try to play your cards right all the time, which might reduce the innovative way of doing stuff. You just don't want to play high in terms of trying out stuff that might not be something in the future."*.

Throughout the whole discovery/scoping/build business case stage, planners at UXP maintain a document called Experience Requirement Phrase which is a conceptual document where the new ideas are described in detail, the reason why SM should invest in the idea, market and competitor analysis, and what the new idea will achieve and how the company will benefit from it financially or organizationally. The Experience Requirement Phrase goes into UXP's planning process, and is presented to the Investment Board, consisting of top management teams from UXP and ASD, where the "Go/No Go" decision is made and resources are allocated in terms of the number of developers and the timeframe for the project.

After the "Go" decision is given, a product project is officially initiated and will be transferred from the planning stage at UXP to the development stage at ASD, and a specific development team will be signed to the project to develop the idea into an application or a service.

And currently due to the process at scoping stage and build business case stage, UXP encounters problems with early defined products with fixed budget and less flexibility for changes coming from later stages, as well as problems with constrained resources.

## 4.4 Development/Testing & Validation (ASD)

ASD is a software development division and its responsibility is to develop and deliver applications and services to the device projects within the firm. The main resource which ASD obtain is the software developers, their expertise on Android and web-based application development, and their tactic knowledge, as the interviewee C said during the interview:

*"Core competence is really good developer. Right now we are doing android and also competence in web-based applications. Then we have going to the cloud application. So for me, it's the developer, that's the core, they are the ones creating the value, and then they need different types of competence from Android, Java competence to server developments about security, setting up services, capability when it comes to services, taking into clouds, how can you use cloud and html5 competence, so it is lots of things."*

### 4.4.1 Product development

ASD brands itself as a software development organization with a single purpose to create a unique smartphone user experience; hence, ASD works intensively together with UXP under the development-testing & validation stage after a project gets a "Go" decision from Investment Board and resources are allocated.

While a product project is under the development stage, all of the development teams at ASD explicitly follow scrum development methodology. As scrum suggests, a product development project is broken down into several small iterative and incremental development cycles which are called sprints. The project is initiated by a planner called product owner from UXP, and a cross-functional team is setup at ASD to include all competences needed to accomplish the project, such as architect, TID, designer, developer and tester. The team is lead by an experience planner (product owner) and a team lead who is scrum master as well. Product owner puts requirements for the product into an application backlog as user stories, and the team estimates which user stories can be accomplished from the application backlog during a sprint and puts those user stories in a sprint backlog before a sprint starts.

At ASD, each sprint is two weeks long. A sprint begins with a sprint planning meeting between the product owner and the team lead. At this meeting, the goals of the sprint are identified, and the tasks on sprint backlog are selected on the basis of priority from the application backlog which only product owner has access to and is responsible for. The team maintains an active list of sprint backlog. The development starts from the most important tasks at the top of the sprint backlog, and then the development team works through the complete sprint backlog from top to down. The team works with only one task at a time. Under each sprint, the development team and the team lead also hold a daily meeting to discuss the progression of the tasks, and the product owner could attend it as well. And a retrospective meeting among the product owner, the team lead and the development team is held by the end of each sprint to review and reflect on the team's key learning during the sprint which is very important for ASD.

Furthermore, the development team is fully responsible for making products ready for release, and a new version of a product is released every sixth week. In order to develop products with high quality, lots of testing is done by development teams internally during each sprint to save time on sending testing to testing center in Beijing, and some testing is done by testing center in Beijing after sprints. After testing is done, development teams will make changes on products according to the test results.

ASD is seeking for higher agility during the development stage by increasing the efficiency of its execution process in order to achieve meeting market needs. It aims to shorten the delivery life cycle and have a flexible approach toward development by utilizing customer feedback effectively. Over the past year ASD has worked diligently to streamline the product development, it has learned and adopted the principles of lean startup.

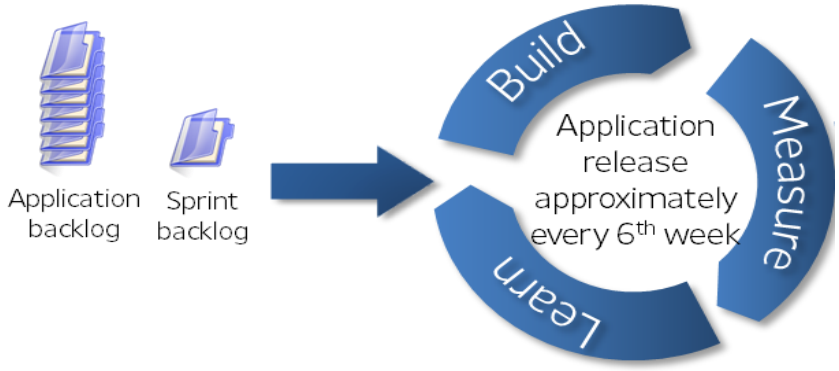


Figure 11: Closing-The-Loop (Apps&Services Development, 2013)

In conformity with lean startup, a new product development process model 'Closing-the-loop' was developed in close integration with the scrum methodology at ASD by the end of 2012 (Apps&Services Development, 2013). The basic idea behind 'Closing-the-loop' is that when an application or service is being developed, there are certain assumptions of how users will behave and what users will like about the features (Apps&Services Development, 2013). So, the goal of 'Closing-the-loop' is to test these assumptions to ensure that the team builds the right product and does not waste time on things that customer may not want.

The development team builds a product based on the application backlog and the sprint backlog where the requirements for the product are put in by the product owner. And they try to build a product with minimum viable features. After the product is built, it is released to the market through different deployment channels in order to reach end users, such as preload on mobile devices, as an update on SM's update center, or as download on android market, although the last two channels are not fully utilized yet at the moment.

The release of a product is followed by measurement where ASD will try to gain insights about customer behaviors through a quantitative measurement tool called Google Analytics and feedbacks from customers or operators are being used as well. But currently the measurement step is not being implemented yet. Learning is the last step in this loop where validated learning on the measurement and feedbacks takes place and the product is redefined accordingly. Furthermore, the loop begins its next iteration where the learning is accommodated into the build and distributed through the next release.

A new version of an application is released every sixth week in order to secure a closed feedback loop and enable measuring and learning customer behavior (Apps&Services Development, 2013). Moreover, ASD shortens its release period from 6 months to 6 weeks.

### 4.4.2 External partners

During the development stage except in-house applications developed by ASD, ASD also actively interfaces with several external entities - software vendors, partners, and 3rd parties (Apps&Services Development, 2013). For example, ASD outsources certain projects to software vendors; ASD co-operates with partners to integrate their offering into the SM

experiences, such as Facebook integration; as well as ASD co-works with the 3rd party to include their offering in ASD's products and often with no or little change driven from ASD, such as ASD co-works with Accurate Weather who provides real-time weather report to the weather widget from ASD.

### 4.4.3 Decision-making

As the results from the Entrepreneurial Health Audit (Bisht and Sun, 2012) point to the fact that the top-level management team does not take risks on decision making which also implies that ASD has less tolerance towards failure, and a large proportion of employees think ASD does not support small experimental projects which might clearly fail. Further, it was also expressed in the survey results that there is a little managerial support for risk-taking.

However, at ASD's development process risk-averseness and certainty weighs more than the innovativeness, as the interviewee C said during the interview:

*"If we spend time on something that will not go to the market or is bad on the market, of course there is a risk because there might be waste,…We don't want to take such risk today, I guess."*

It also came out during an interview that failure is not perceived well within ASD. This is particularly true for ASD in Lund, where a product is termed as failure if it does not perform well in the market. During the interview, the interviewee C said:

*"In our, at least in Lund, it's considered as a failure, if you put something on the market then it's not good. In other cultures, it might be a great knowledge you have, you have tried this out, and you have learnt so much, you have gained competence. I would like to go with that one, because every failure is a golden opportunity to learn things, to try the next thing, so I would be happy to try something out just to be able to see how the market works, and if it doesn't work, no, take it back and try the next thing, sooner or later it will be a hit. I think you need to fail lots of times before you success."*

Hence, at the development stage, even though ASD and UXP work intensively together with each other, and suggestions from the development teams are welcome and taken into consideration as well, it is still the planners (product owners) from UXP who make the final decisions on products, such as what is included and what is excluded. As the interviewee D stated:

*"The planner is still accountable for what to do, so the end decision is still with the planner."*

As a software development division, ASD is facing constrains coming from UXP, which means that ASD cannot develop whatever ideas they have, but they have to follow and fulfill UXP's plans. Although ASD works closely together with UXP and their suggestions are

being welcomed and considered at UXP, UXP is still the ultimate one who makes the final decisions on the products.

## 4.5 Launch Stage (ASD)

Release is the last stage in the product development process. At this stage, ASD delivers its applications and services to different device projects within SM. The release windows, the period in which new versions of apps and services are delivered, are matched towards product (devices) project plans in the SM development product portfolio (Apps&Services Development, 2013). The apps are released as part of App Suites, which is used to group similar applications together. e.g. Album, Walkman and Movies form a part of entertainment suite. All apps and services are planned and delivered using individual deployment plans. Additionally all apps in suite are tested together for quality assurance (Apps&Services Development, 2013).

In order to fully implement 'Closing-the-loop', ASD needs to reduce the coupling with the device projects in order to be able to release their products directly onto the market sooner. The interrelationship between the device and the software is a complex one, due to the notable difference in the hardware configuration of various devices the software has to be customized according to the specifications of the device. Since software is delivered as preload with the phone at present, it requires development teams to adjust their products timelines and releases to the device projects due to that the device projects have a six-month launch period but the software currently has only six-week release period. This is a challenge for ASD as the interviewee D said:

*"When we deliver to the phone projects, we do we call it the preloading, then we deliver our applications many months before the product's release, so the time to get the applications to the market is very long, so it's not only that we deliver the applications every 6 months, it's also that once we deliver it, it takes long time to get to the market. So there is no chance in the world to get this close the loop when we do the preloading."*

To solve this problem, ASD decides to facilitate their over-the-air update capability which enables them to send their product to end users as a single application over the air through SM's own online update center, and also allows them to update application as many times as necessary, but it is not in place yet. As the interviewee D explained the idea behind this is:

*"So that's the idea to use already launched products, and use them as a vehicle to get applications onto the market. Then we still have to do the preloading, so we will still continue to do that."*

However, as the company's strategy is to develop a business model which results in increased sales of mobile devices rather than the software itself, it is clearly stated that ASD will have to continue delivering their applications and services to the device projects like the interviewee E said:

*"I think we will always have to do the preloading and we will never get away from it because we need to launch our products including applications."*
Due to the current pre-load launch model, ASD is having difficulty with product launch which takes tremendously long and is not flexible enough for ASD to complete "Closing-the-loop" in time.

The following figure summarizes facts related to causation and effectuation at different stages of Stage-Gate:

| Process stage | Characteristics of work method |
|---|---|
| Ideation | UXP -- short and long term planning, based on traditional methods; set the goal and look for resources, - goals-driven and resources acquirement (causation);<br>ASD -- make use of developers' expertise, knowledge, experience and skills, - means-driven principle of "Who I am" and "What I know" (effectuation); |
| Scoping | UXP -- market research, financial assessment, technical assessment, based on traditional planning tools, - competitive market analysis (causation); |
| Build Business Case | UXP – competitor analysis, value proposition, technical feasibility, financial analysis, detailed product definition, - expected returns, competitive market analysis (causation); |
| Development | ASD – Scrum, Lean Startup, partnership with 3rd parties and vendors, - affordable loss, partnerships, leveraging contingencies (effectuation); |
| Testing & Validation | ASD – Scrum, Lean Startup – leveraging contingencies (effectuation); |
| Launch | ASD – pre-load to device projects (causation). |

Figure 12: Summary of facts related to causation and effectuation at Stage-Gate

# 5. Analysis and Discussion

In this chapter the data of the empirical research at the case study company presented in the previous chapter will be analyzed in terms of the research question. First of all, it needs to identify where effectuation logic and causation logic take place at each stage of the product development process. Hence, it will be discussed how effectuation and causation interfere with each other. The analysis will mainly focus on identifying which logic the two organizations are following under each stage and how these influence each other. Subsequently, the analysis will clarify how causation and effectuation influence each other in the Stage-Gate process and how they both influence the process itself.

Effectuation and causation are two opposite logics (Read and Sarasvathy, 2005) which have been argued by researchers that they can exist simultaneously in a corporate context (Dew and Sarasvathy, 2002; Svensrud and Åsvoll, 2012; Duening, et al., 2012). Effectuation approach is a means-driven approach (Sarasvathy, 2001a) based on effectual logic emphasizing control in order not to predict the future (Sarasvathy, 2001b). Causation approach is a goals-driven approach (Sarasvathy, 2001a) based on causal logic emphasizing prediction in order to control the future (Sarasvathy, 2001b). In a corporate, in terms of the growth of opportunity, there is a strategic shift from effectuation towards causation (Svensrud and Åsvoll, 2012); in terms of Stage-Gate, effectuation principles can be integrated into the process to become more flexible, adaptable and innovative (Duening, et al., 2012); in terms of decision-making, effectuation can provide an additional set of tools to the decision makers other than causation and they can exist in different problem areas(Dew and Sarasvathy, 2002). Therefore, in the following sections, the different stages of Stage-Gate will be examined by effectuation and causation in terms of product opportunity growth, product development process, and decision making. And since the traditional management follows goals-driven approach, expected returns, competitive market analysis, and predictive planning in order to avoid contingencies, it is considered to be a causal environment. Based on this, it is considered that the overall environment for product development at SM is causal due to that SM emphasizes rational planning through market research and competitive analysis in order to achieve its pre-defined goals which are based on prediction of the future.

## 5.1 Discovery

### 5.1.1 Ideation at UXP

The findings presented in chapter four show that UXP follows a causal process (Sarasvathy and Dew, 2005) at the ideation stage. A directive focus area or guideline is being given from the SM top-level management team as a target goal which UXP is aiming to achieve. And this focus area or guideline is being translated into more concrete directions at workshops organized among planners. Whereby, goals are clearly defined (Sarasvathy, 2001a, 2008) and an active search for new ideas in relevant areas starts. This obviously indicates that UXP closely follows a goals-driven approach of causation at their opportunity recognition phase (Sarasvathy and Dew, 2005; Fisher G., 2012). As well, UXP holds a long-term roadmap up to

one to two years which serves as a general guide trying to predict the future two years ahead (Wiltbank, et al., 2006; Sarasvathy, 2008) with only one purpose of avoiding uncertainty and lowering the risk (Wiltbank, et al., 2006).

As ideation sources for UXP, operators, customer's feedback and request from other units provide very detailed information to planners about what the market wants and what customers want. To satisfy these "wants" is the goal for UXP to achieve, and once again, it is indicated that UXP is taking goals-driven approach from causation (Sarasvathy, 2001a, 2008; Brettel, et al., 2012). However, through its social network (Wiltbank, et al., 2006) UXP expands its ideation sources from planners' own creativity to reading comments from customers, receiving requirements from operators or other units at SM and getting suggestions from developers at ASD. These idea sources outside of UXP can be seen as stakeholders coming on board with their new means in effectuation process (Sarasvathy and Dew, 2005) or new partners who UXP builds up partnership with to generate more and better ideas according to partnership principle of effectuation (Sarasvathy, 2001a, 2008). This indicates that effectuation does take place in certain area, even though the overall logic is causation at UXP.

### 5.1.2 Ideation at ASD

Sarasvathy (2008) proposes that effectuation advocates for "creating something new with existing means", and these existing means are defined as "Who I am", "What I know", and "Whom I know" to include identity (competences and experience), tactic knowledge (expertise and skills), and network (social network) (Sarasvathy and Dew, 2005) at individual level and organizational level. There is no pre-defined goal or opportunity being given in the beginning (Sarasvathy, 2001a). The findings in chapter four indicate that effectuation logic is the principle that ASD follows deliberately at idea generation stage, as the interviewee C said during the interview in chapter four:

*"Core competence is really good developer. Right now we are doing android and also competence in web-based applications. Then we have going to the cloud application. So for me, it's the developer, that's the core, they are the ones creating the value, and then they need different types of competence from Android, Java competence to server developments about security, setting up services, capability when it comes to services, taking into clouds, how can you use cloud and html5 competence, so it is lots of things."*

Two good examples from ASD are the movie application and the album application. Both ideas were created by developers at ASD without any directive guideline, market research competitor analysis or any traditional planning methods which UXP usually takes. These developers' experiences, expertise and skills were their only tools or resources to generate new ideas, and these resources are considered to be means by effectuation (Sarasvathy and Dew, 2005; Wiltbank, et al., 2006; Sarasvathy, 2008). And both of these two applications became one of the most important applications at ASD or even at SM and came into the SM's

strategy, since they align perfectly with SM's strategy and overall direction of focus area. As interviewee C also mentioned during the interview that:

*"We want to fully utilize developers' knowledge and their creativity to come up with some new and innovative ideas which could be different from UXP."*

Similar to these two applications mentioned above, Hackathon, Innovation Forum and Crazy Friday are different brainstorming activities encouraged at ASD in order to deploy ASD's main resource – developers in terms of their experiences, expertise, skills and knowledge (Sarasvathy, 2001a; Sarasvathy and Dew, 2005). All three activities do not give a clear goal or definition of what exact kind of products they are looking for, on the contrary, they ask developers to fully use their creativities and expertise to come up with any kind of ideas. As for what kind of ideas would be generated by developers, it all depends on which developers are grouped together as a team. Commitments from team members in each team decide which ideas could be created by the team. Therefore, the final outcomes are unknown and unpredictable to everyone in the beginning (Sarasvathy and Dew, 2005). And there is no market research or competitor analysis needed at any time during these activities. These activities indicate that ideation section at ASD is an effectual process (Sarasvathy and Dew, 2005). Additionally, the ideas coming out of these activities are more innovative than the ideas coming from UXP.

### 5.1.3 Discussion

Causation logic (Sarasvathy, 2008; Sarasvathy and Dew, 2005) is fully followed by UXP throughout the ideation stage in a large scale, but effectuation does occur at the place where UXP utilizes its organizational network to build up a partner-like relationship with other external entities. This provides empirical evidence for that effectuation can occur in a causal environment, which is in accordance with what Sarasvathy and Dew (2002) argue that effectuation and causation are two situational reasoning and they can exist in parallel in different problem areas.

As a software development division, ASD takes a completely different approach to generate new ideas from the approach UXP takes. ASD follows means-driven principle of effectuation (Sarasvathy, 2001a) and the effectual process (Sarasvathy and Dew, 2005) at the ideation section to an extreme extent. There is no interference between effectuation and causation taking place. It can be argued that ASD, as an R&D organization, has a tendency towards effectuation during ideation while UXP, as a planning organization, has a tendency towards causation with effectuation occurring in a small scale. Research by Wiltbank, et al. (2006) explains that causation seeks to lower risks by avoiding unexpected contingencies. And while ASD presents its ideas to UXP in order to get a "Go" decision, UXP will follow the causation logic to evaluate the ideas which are created following effectuation logic, which means that if the ideas do not fit into UXP's current focus areas which come from the top-level management team of SM or long-term roadmaps, a "No Go" decision is most likely to be made. As the interviewee B from UXP explains:

*"Sometimes there is an idea like "Woowoo", but of course if it is really a wild idea, we need to evaluate it, of course if it is something that adds value to the product or if it is something that matters to the customers, if it is durable and it is feasible then you have some kind of understanding what the idea means and you can probably put it into your current position."*

It seems to be recognized by researchers (Jaruzelski, et al., 2011) that employing effectuation in terms of agile product development techniques at the beginning of the product development process is critical for opening up for new ideas through intensive stakeholders' involvement. Svensrud and Åsvoll (2012) also argue that effectuation logic has its greatest value at the initiation phase of the opportunity growth while causation logic is at its lowest value; and with the opportunity's growth, company's strategy tends to shift from explorative effectuation to predictive causation. And this might be due to the company has clarified its focus and shifting towards goals-driven causation will reduce potential development risks and minimize the waste which can be the result of extensive testing to eliminate bugs. And that will be the case if ASD gets a "Go" decision on its ideas from UXP. As a large established corporate, SM tends to be highly risk-averse towards its brand image and corporate reputation which are considered to be SM's important intangible assets (Omar, Williams Jr. and Lingelbach, 2009), and these are conditioning factors for the causal environment as well. In another word, causation logic in large corporate can suffocate effectuation logic and innovation from taking place at idea discovery stage.

## 5.2 Scoping

### 5.2.1 Scoping at UXP

At this stage, UXP still follows causation logic (Sarasvathy, 2001a, 2008) throughout scoping. Market research, as Wiltbank et al. (2006) propose, is part of a rational planning process for UXP to scan and screen available opportunities on the market for trends, then identify and evaluate these opportunities to capture valuable and high-quality ideas, preliminary financial assessment, and preliminary technical feasibility assessment from ASD, which is in accordance with Stage-Gate (Cooper, 1990; Cooper, et al., 2002b) as well. This confirms that UXP follows goals-driven principle of causation to meet market trends and customer's desires, and at the same time also to avoid or overcome unexpected contingencies and uncertainty (Sarasvathy, 2001; Wiltbank, et al., 2006; Brettel, et al., 2012) to maintain the initial goals (Brettel, et al., 2012) which causation suggests.

As the interviewee B concluded about the UXP planning procedure during the interview:

*"It is still old school kind of thinking."*

These notions aforementioned show that UXP takes on planning approach to try to predict the future in order to avoid uncertainty (Wiltbank, et al., 2006) involved in the product development which is exactly what causation advocates with exploitation of pre-existing

knowledge (Sarasvathy, 2001a). Pre-existing knowledge (Sarasvathy, 2001a) at the firm's level can be defined as customers, markets, core competencies and experiences, and these knowledge are being used by UXP to define their pre-determined goals and to pursue them in order to avoid or hedge uncertainty or unexpected contingencies (Wiltbank, et al., 2006) which could be surprising outcome of the product development (Cooper, 2008).

### 5.2.2 Discussion

As causation approach is carried out during scoping, such as market research, financial assessment in terms of expected returns or financial investment, and technical feasibility, the ideas are being evaluated and filtered, furthermore the high-quality ideas are selected and product definitions are outlined. Although ASD and UXP utilize different approaches at idea discovery stage, causation logic in terms of overall strategic focus at UXP is putting limits on the ideas, which is actually a good thing at the stage of narrowing down the scope and results in good ideas being realized.

On one hand, this helps planners to gain better understanding of the ideas on its potential market performance and possible financial benefits, and as well as sets a clearer goal for the action at the next stage. On the other hand, the shortcoming of having pre-determined products as goals is that the budget is assigned and fixed, and the scope of the products are narrowed down greatly, but the market response is still unclear until the device is preloaded with the products and launched on the market. By integrating means-driven principle and partnership principle of effectuation approach, the product definition is still open for significant changes which could be caused by requirements from operators or other units, suggestions from developers or customer feedback, and this can increase the chance for the products to become a success on the market. And inserting affordable loss principle of effectuation approach to scoping stage can result in a quicker and inexpensive evaluation process since certain investigation or assessments are not needed any more, such as market research and financial assessment. Concluding, scoping stage is taking causation approach but can be improved significantly by integrating effectuation constructs into it because the product definition will become more flexible and evaluation process will become faster and cheaper.

## 5.3 Build Business Case

### 5.3.1 Build Business Case at UXP

Cooper (2000) recognizes that there are a series of actions being undertaken at the build-business-case stage of the product development process, including, competitor analysis, feasibility analysis, "Go/No-Go" decision-making, detailed planning and resources allocation. This is in alignment with causal process (Sarasvathy and Dew, 2005) in terms of developing a business plan with extensive market research and competitive analyses, estimation of expected returns, defining detailed project goals and requiring resources (Sarasvathy, 2001a, 2008; Sarasvathy and Dew, 2005; Chandler, et al., 2011; Brettel, et al.,

2012). As well, Fisher (2012) proposes that causation consists of intentionality, opportunity identification and evaluation, planning, resource acquisition and the deliberate exploitation of opportunities. Therefore, this stage of the product development process at UXP is identified to be based on causal logic (Duening, et al., 2012).

Planners at UXP ask team leads at ASD to provide estimated information about resource investments (Wiltbank, et al., 2006) in terms of how long the project could take and how many developers could be needed to allocate. Due to the constraints on resources, the budget to follow and responsibilities over profit and loss, planners are obsessed with the single goal of a product launch (Duening, et al, 2012) and are required to "play your cards right all the time" (Interviewee B, 2013), and may miss early signs for possible failure. This increases the risk averseness which causation advocates (Sarasvathy, 2008) and decreases the innovativeness (Sarasvathy, 2001a, 2008) at UXP. As Duening, et al. (2012) recognize, this is a typical example of trying to control over an unpredictable future which is emphasized by causation logic. As another important criterion at UXP, competitor analysis undermines innovativeness due to it limits strategic implication to the traditional strategic management tools. Moreover, planners also need to investigate in which benefits SM as an established company will be able to receive from the project, in terms of financial profits or organizational benefits which is suggested by Sarasvathy (2001a, 2008) and other researchers (Dew, et al., 2009) as expected returns in causation logic. And expected returns serves only one single purpose of trying to control the future which is difficult due to the market dynamics. In contrast with expected returns, affordable loss from effectuation approach sets the limit on how much it is allowed to lose, which will increase flexibility on what ASD or UXP is allowed to develop, and reduce the possibility of eliminating a good idea at early stage.

With idea concept explanation, market research, competitor analysis, the estimation and expected returns for SM in terms of financial benefits or organizational gain, a conceptual document Experience Requirement Phrase is completed by planners and presented to the management team at UXP and the Investment Board in order to receive a "Go/No-Go" decision-making. The management team and the Investment Board act as a "gatekeeper" in this clear Stage-Gate model (Cooper, et al., 2002b) to ensure that the project is feasible and SM will gain benefits from it, which one more time states that UXP follows causation logic of planning. If the decision is "Go" from the Investment Board, then resources will be allocated in terms of a development team or a number of developers will be assigned to the project, and a short-term detailed action plan up to six months will be designed by planners to serves as a manual that analyzes and predicts more accurately the current situation of market, competitors and customers (Wiltbank, et al., 2006; Sarasvathy, 2008) and defines the products for planners and the development team to follow explicitly. The finding indicates that UXP undertakes goals-driven principle of causation approach once again which states resources are being allocated after the goals are defined (Sarasvarthy, 2008), and follows expected returns principle and competitive market research principle of causation approach to evaluate and select the final product projects.

### 5.3.2 Discussion

As the findings above indicate, at the build business case stage, UXP follows goals-driven, expected returns, competitive market research, six-month detailed action plan, and exploitation of pre-existing knowledge from causation logic to a great extent (Sarasvathy and Dew, 2005; Wiltbank, et al., 2006; Dew, et al., 2009) as well as an obvious Stage-Gate. This point out that UXP, as a planning division, emphasizes causation logic during the build business case stage of the product development process. Moreover, since the decision-making is centralized at top-level management team at UXP in terms of product projects or at the corporate level in terms of focus areas, this mechanism is in line with causation logic and often to be considered unsuitable for fostering innovation (Schilling, 2010; Kuratko, Morris and Covin, 2011) due to it can potentially suffocate creativity within SM but achieve efficiency by following procedures and minimizing variation.

## 5.4 Development / Testing & Validation

### 5.4.1 Development / Testing & Validation at ASD

Vlaanderen, et al. (2011) recognize that scrum, as a software development methodology, addresses software development in a flexible and iterative way based on the idea that many of the processes during software development are unpredictable. Scrum is being practiced at ASD as the working method within development teams with the aim at being agile, incremental and iterative (Paul and John Singh, 2012) which is advocated by leveraging contingencies of effectuation (Brettel, et al., 2012) as well. The purpose of adopting scrum at product development process by ASD is to do incremental modifications and changes to products along the way while products are being developed (Vlaanderen, et al., 2011) in order to achieve the control over the means in terms of new learning, new knowledge and new commitments in the pursuit of uncertain and unpredictable final products (Duening, et al., 2012). This is congruency with what Sarasvathy (2001b:D1) states:

*"Effectuation, instead, is based on a logic of control, i.e., to the extent that you can control the future, you do not need to predict it."*

And in the effectual process, the final product is intrinsically unpredictable because there are new stakeholders coming on board with their new means and new commitments which the final product depends on (Sarasvathy and Dew, 2005). By the end of each scrum sprint, a development team at ASD holds a retrospective meeting with the product owner and the team lead to review and reflect on their new learning during the sprint. This new learning becomes the development team's new means in terms of knowledge or expertise which can be utilized in the following sprints or even future projects; furthermore, the means is broadened. After each sprint ends, new learning is being acknowledged, adaptation of the product is being made, and changes are being put into the next sprint backlog, then the next sprint starts. This cycle presents that ASD with scrum development method follows the effectual process which is a continuous cycle with new means on board or with new goals to achieve (Wiltbank, et al.,

2006; Read, et al., 2010) for the purpose of gaining control over unpredictable final products (Vlaanderen et al., 2011; Wiltbank, et al., 2006) and reducing the costs of failure (Wiltbank, et al., 2006).

By adopting scrum, ASD also aims at increasing development teams' learning ability which is considered to be the backbone of scrum together with adaptation (Paul and John Singh, 2012). This is in line with leveraging contingencies which addresses the learning school approach to be adaptive (Brettel, et al., 2012). However, the effectuation logic (Sarasvathy and Dew, 2005) is being implemented through taking scrum as work method at ASD.

ASD also follows effectuation logic (Sarasvathy, 2001a) through "Closing-the-loop" which is based on lean startup. ASD has chosen lean startup as its product development process to increase flexibility and agility on product development. By building products with minimum viable features - MVP (Ries, 2011), ASD is able to keep its investment in terms of the number of developers allocated to product projects at the minimum level. As the research by Dew, et al. (2009) indicates, "affordable loss results in more entry into entrepreneurship, but when failures occur, the losses are smaller"; and Wiltbank, et al.(2006) as well suggest to keep failures small and quick. When the situation like MVP fails on the market after the release occurs, ASD is able to lower the loss to the acceptable level, and is able to quickly react on the failures to go to next iteration in order to build a right product. Failure is seen as a learning experience by effectuation logic (Sarasvathy, 2001a), and each failure during the iterations contributes to the success of the final product (Duening, et al., 2012). But currently, failure is not perceived as learning experience by ASD, the reason is because UXP has the control over what to do with the products and is responsible for the loss if products fail on the market, and corporate culture which suffocates the effectual learning.

Effectuation logic advocates taking experimentation and leveraging contingencies by learning from unexpected (Sarasvathy, 2001a; Wiltbank, et al., 2006; Duening, et al., 2012). "Closing-the-loop" also encourages development teams at ASD to do small experiments by building MVP, putting MVP on the market to test assumptions on MVP, and doing validated learning through measurement on product's market performance in order to make adjustment or changes on MVP and then going into the next iterative cycle of "Closing-the-loop". Validated learning to do pivoting is overlapping with leveraging contingencies which addresses adaptive and incremental approach and reacting to the emergence of unexpected outcomes (Brettel, et al., 2012).

ASD builds up partnership with other external partners like software vendors, 3rd parties partners in order to either include their offerings into ASD's own product offerings or outsource certain product projects to them. Effectuation logic suggests that expanding means can be achieved by having partners' involvement in the innovation process (Sarasvathy, 2001; Wiltbank, et al., 2006; Brettel, et al., 2012).

As for product's testing and validation stage, it is integrated into the previous development stage, such as in-house testing done by development teams themselves during each sprint or

by testing center during “Closing-the-loop”. ASD also follows effectuation logic during testing and validation stage to improve product’s quality since the testing and validation stage is completely integrated into the development stage.

### 5.4.2 Discussion

ASD clearly follows effectuation logic in its work method scrum and its development process “Closing-the-loop” throughout the development stage in order to achieve its high agility and flexibility. However, at previous stages of the product development process, UXP follows causation logic, which makes the planners who are also known as Product Owners at ASD face causation process from UXP; and at the development stage, the planners have to face effectuation process from ASD. On one hand, they have to keep long-term roadmap, market research, competitor analysis, detailed planning and other causal tasks; on the other hand, they also have to cooperate with development teams at ASD with their effectual way of working. Since UXP focuses on expected returns of products (Sarasvathy, 2001a, 2008) and is the decision-maker over products, again, causation logic takes control over effectuation logic where ASD has to follow whatever decisions UXP makes. Further, it results in that product’s failure cannot be seen as a valuable learning experience at ASD as effectuation logic promotes (Sarasvathy, 2001a: Duening, et al., 2012). But, ASD has the control over how they want to get the job done, such as ASD can adopt scrum work methodology, implement “Closing-the-loop” and build up partnerships with external entities to co-work on product development, and this is where effectuation takes place. By combining causation and effectuation in two different stages of the product development process, it results in that products are being specified at the beginning of the process instead of keeping them more open and then narrowing them down as a funnel. Further, ASD is not sure about what it will take to deliver the products since they come from the device requirements in SM, and are defined by UXP which has to take budget into consideration and follows planning.

At the testing & validation stage, ASD follows effectuation logic as well and has full control over how they want to get their job done without any influence coming from outside of ASD.

## 5.5 Launch

### 5.5.1 Launch at ASD

At previous development and testing & validation stages, ASD has been following effectuation logic and adopting lean startup methodology (Ries, 2011) into its product development process named “Closing-the-loop”. However, ASD has to release its products to the device projects which are outside of ASD and have a much longer launch period than software releases. This causes the problem which is that ASD’s products are unable to be launched at the market until the devices are launched, and when the devices are launched, the software on the devices might have been out-dated or even out of the market, which can result in a declining sale of the devices. And since currently device projects are the only channel for ASD to release its products on the market, it is difficult for ASD to complete

"Closing-the-loop" where ASD is in line with effectuation logic to reach the market quickly, learn from the feedbacks quickly, adjust the products quickly to meet customer's requirement and finally gain the success of the products. Nevertheless, ASD is bounded to the device projects, where causation logic takes over; but ASD also aims at being able to release the products directly on the market, which means following effectuation logic.

### 5.5.2 Discussion

As the findings indicate, the ultimate goal for SM is to sell more mobile devices; therefore the responsibility for ASD is to add value to the mobile devices through the unique and differentiated experience provided by the software products developed by ASD. This is goals-driven causation logic which SM is following and limits the flexibility for ASD. If ASD complete "Closing-the-loop" which follows effectuation logic, ASD should release products directly on the market. However, it has not being realized yet, and what impact it will have on device projects is still unknown.

## 5.7 Conclusion

From the analyses aforementioned, it clearly indicates that Stage-Gate follows causation approach throughout the different stages at SM in order to achieve the control over the investment and product development process by setting clear goals in the beginning and predicting the future to avoid/overcome contingencies. It is important in a corporate context, since the company needs to know where they are heading to; nevertheless, it also suffocates effectuation thinking by setting boundaries on creativity and requirements on products, and causation approach in budgeting biases effectual product development. However, effectuation does occur at the discovery stage for ideation in order to be more innovative; and it occurs at the development stage in terms of product development method and process in order to be more flexible, faster and more innovative. And effectuation is needed at other stages as well so that the product development process can be greatly improved to achieve a greater product success rates and develop a more sustainable competitive advantage. So, causation and effectuation exist in parallel at discovery stage, and they interact with each other at three occasions: first is between ideation at ASD and scoping at UXP, second is between build business case stage and development stage, the last is between development stage and launch stage.

At the discovery stage of Stage-Gate, both effectuation and causation take place in parallel in order to identify opportunities, although they serve different purposes. Effectuation occurs at this stage in terms of means-driven principle in order to include as many potential ideas as possible due to it is difficult to predict the future since the market is dynamic and uncertain. Causation occurs at this stage in terms of goals-driven principle with the purpose of trying to predict the future in order to gain control over it. At this stage, effectuation and causation have little influence on each other due to the nature of ideation is its fuzziness. But causation approach has potential disadvantage at this stage because it can potentially eliminate good ideas to be realized due to following the clearly defined goals.

At the scoping and build business case stage of Stage-Gate, in terms of goals-driven, expected returns and competitive market research, causation acts as an overall strategic focus to evaluate and narrow down initial ideas created at the discovery stage. So, even those ideas generated according to effectuation approach will be evaluated and even eliminated by causation logic at these two stages. Having a general directive guideline helps to set the limits on the ideas and narrow down the scope, but by doing so, it can also eliminate potential market hits due to that they are out of focus areas. Causation approach advocates prediction on the future and rational planning with the aim of preserving the integrity of the company and its image on the market, therefore, putting potential ideas on the market for testing is not an option because it can put company brand and reputation at risk, which can result in good ideas being filtered out without having confirmed with the market first due to the market is characterized with dynamics and uncertainty. Furthermore, causation approach causes these two stages less flexible and less open for later changes, which sets limits on the further improvement or adjustment at the development stage and testing & validation stage.

The analyses indicate that the development stage and the testing & validation stage can be as effectual as it is needed in order to develop products faster. The development process and development method can be very iterative, agile and incremental, and testing & validation can utilize learning ability and leverage contingencies to a great extend. And effectuation approach at these stages makes the whole Stage-Gate process more flexible, iterative and innovative, which can lead to successful product development and create sustainable competitive advantage. However, due to the products are pre-defined at previous stages, it sets constraints on adjusting products with changes during the development and testing stages. As well, the development and testing & validation stages are constrained by the launch stage where causation approach is being applied, because the market responses are unknown until the products are finally launched on the market. Thus, the further changes on the products are not be able to be done till then.

As mentioned above, the launch stage follows causation approach in terms of goals-driven and overcoming contingencies in order to achieve successful product launch through rational planning and predicting the market. And this limits the flexibility at the development and testing & validation stages.

However, the product development process in terms of Stage-Gate follows causation approach in overall process, which executes strategic control and management over the product development at the firm's level. But, effectuation does occur at the discovery stage, the development stage and the testing & validation stage, which brings more product innovation into the product development, makes the product development as a whole more iterative, flexible, incremental, and innovative, and takes the product development closer to the market.

In conclusion, causation approach and effectuation approach influence each other in a way that combines managerial logic with entrepreneurial logic to satisfy the requirements and

specifics of software development. Causation defends the interest of bottom line and company brand, and effectuation defends the need for better development, less bugs and launching a better product to the market as well as react on stakeholders' feedback and learning through the development.

# 6 Conclusions and implications

## 6.1 Conclusions

This research study explored effectuation logic in Stage-Gate product development process in the context of a large-sized established corporate, and investigated how effectuation logic and causation logic intervene with each other in such a context. There are several indications through the analysis of the findings. First, effectuation logic does take place during the product development in a large-sized established corporate. This broadens the applicability and generalizability of effectuation logic from new ventures and entrepreneurship to large established organizations. Second, effectuation logic and causation logic can exist in parallel in different problem areas. For example, in the case study, effectuation logic occurs mainly during ideation and development stages at R&D where innovativeness has its priority, while the rest stages of Stage-Gate process still mainly follows causation logic; and effectuation logic could possibly occur at launch stage where it is a causal environment as well. Third, in general Stage-Gate itself remains causal which has negative impact on effectuation occurrences and furthermore could suffocate effectuation and innovation from taking place during the process.

## 6.2 Implications for future research

In this research study, the authors undertook a case study as the research design and a qualitative research method was employed. This indicates that the research findings in this study are bound to one single entity – the case study company. Therefore, additional quantitative research is suggested to confirm the findings of effectuation's occurrence in large existing companies and its generalizability. And this research covers the complete product development process of Stage-Gate, so in-depth research and analyses in each stage of the product development process can be future research opportunities. Specially, there is a potential study in effectuation logic at product launch stage.

Due to the case study company is a mobile device manufacturer, and the authors studied the software development process which requires a lot of iterations due to fixing bugs. It has its limitations due to the specifics of products, therefore, future research is suggested to study other product development process rather than software specific. And studies on effectuation and causation logics in other types of product development processes would be interesting and comparative.

Furthermore, the authors limited the research area of effectuation logic and causation logic to the product development process in a large established corporate. A future research is needed to investigate in the occurrence of effectuation logic in other areas or business units, such as marketing, or decision making at the firm's level in an established corporate, and further how they have impact on each other.

However, all future research mentioned above are the studies on the occurrence of effectuation logic in a causal environment and how they influence with each other (mainly how causation logic has impacts on effectuation logic). In order to completely understand the relationship between effectuation logic and causation logic, it would be interesting to study the probability for causation logic taking place in an effectual environment and how they influence each other in such a context (possibly how effectuation logic has impacts on causation logic).

## 6.3 Practical implications

The findings in this research study not only contribute to the effectuation theory, but also contribute to the practical product development process.

First, ideation stage can be significantly improved by applying effectuation logic to it, which means more innovative ideas or even radical ideas can be created through utilizing effectuation principles. However, effectuation logic should not replace causation logic in terms of following the company's general strategy. At the case study company, UXP and ASD should create a greater cohesion in order to include the best of two parts for ideation.

Second, effectuation is a means-driven logic (Sarasvathy, 2001a, 2008), therefore, it is important for an established company to optimize its means in terms of resources effectively and efficiently. In the case of ASD, it means that resources could be allocated based on the individual bandwidth and priority of tasks; and people can be moved around to execute a higher priority task, or to work on innovation initiatives. However, such an arrangement might require people to have cross-product knowledge and a wide variety of skills.

Finally, inserting effectuation constructs into product development process can cause conflicts between divisions, and it requires good communication to overcome them in order to achieve fluent cooperation throughout the whole process.

This research study is ended by pointing out that both causation and effectuation can co-exist within the confines of an enterprise as they have different problem space to solve. Causation logic adds to the organizational goals and helps it achieve its value proposition while effectuation logic has an important role toward fostering innovation.

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## Appendix 1: Interview Guide

Interview Guide for Release Managers at ASD:

1. What does your team do? What is your role in your team? Can you describe it?
2. How does your team work and communicate within the team and outside of the team?
3. What is the reward system related to the project development?
4. What do you think about the training programs provided by Sony Mobile?
5. What do you think about the innovation culture at your team and at ASD?
6. What is your team's strength? How can your team improve the work?
7. What kind of structural barriers do you face at work?
8. How can ASD realistically improve as an organization?

Interview Guide for Project Managers and Team Leads at ASD:

1. What is your role or job description at ASD?
2. How does your team work? What work method do you use within your team?
3. Where do the new ideas come from? What do you do with these new ideas?
4. How do you evaluate the new ideas?
5. How do you work with the planners at UXP? Are you involved in any idea generation activities regularly at ASD or UXP?
6. Do you work with the phone projects? If yes, how does it work?
7. Do you measure your applications after the release? If yes, how do you measure and what do you measure?
8. Have you ever killed any applications? If yes, which one and why do you decide to kill it?
9. How do you think about innovation at ASD?
10. Are there any constraints or barriers you face in your team? If yes, what are they and how do you solve them?

Interview Guide for Planners at UXP:

1. What is your job description as a planner at UXP?
2. How do you work as a planner?
3. How do you generate new ideas? Is there any specific tools you use to generate ideas?
4. What do your ideas come from? Are there any criteria for new ideas?
5. What is the approval process for new ideas?
6. How do you make decisions on making changes on applications or killing applications?
7. How do you do the planning? How long and how much details do you usually plan?
8. How do you work with the development teams from ASD?
9. How much is ASD involved in the planning phase at UXP?
10. Are there any constraints in your work and what are they?

Interview Guide for Senior Managers at ASD:

1. What is your role at ASD?
2. How do you position ASD within Sony Mobile now and in the future? And why?
3. What role does ASD have in the product development process?
4. Is ASD involved in any decision-making on the applications, what are they and why is it like this?
5. How does ASD evaluate new ideas or measure the existing applications? Are there any tools or process for it?
6. How does ASD promote innovation from bottom-up?
7. What do you think about risk-taking in product development?
8. What kind of barriers or constraints is ASD facing right now?
9. What is the current goal for ASD?