

System Design and development of Sales & Operation Planning in Start-up Stage

A VS4 Thesis Project by Kevin Hai Hoang Nguyen



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Abstract:

Dette 4.semester projekt er det udvalgte emne til at omhandle start-up virksomheders vej til at forvandle deres forretningsideer til at fungere i praksis. De valgte emner fokuserer på design af systemet og udvikling af Sales & Operation Planlægning og de strategiske påvirkning.

Rapporten understreger vigtigheden af analyse redskaber til at estimere efterspørgsel, diverse omkostninger, identificering af nødvendig processer, udvikling af kunde-, leverandør og distributørforhold samtidig med virksomhedernes forhold giver begrænset investeringsmuligheder i ressourcer. Flexibilitet og teamwork er derfor særligt gældende til at håndtere opgaverne. Fokus er først design af systemet for derefter at kunne udvikle Sales & Operation Planning processerne før man kan begynde at udvikle en produktionsplan.

Kevin Hai Hoang Nguyen

Pieces Pages:

53

By signing this document, each member of the group confirms participation on equal terms in the process of writing the project. Thus, each member of the group is responsible for the all contents in the project.

Preface

This is a 4th semester project on the master's degree program of Operations and Supply Chain Management at Aalborg University. The report is written by the author between 1st of February, 2018 to 1st of June 2018.

The project is a Master Thesis, which means the theme are chosen by the author. The initial problem should ensure getting knowledge about operations management techniques to manufacturing companies to analyze systems and structures of companies, whether it is in the industrial or public industry.

The project is done in collaboration with Crickster, in which the author used them as a case company. All data is gathered company visits or email correspondences. In addition the project will also deal with start-ups in general, in which different articles and books will be used to present.

Introduction

The topic of this master thesis project is focused around the methods, analysis, processes within Operations Management to design a system in which the starting point is development of Sales & Operation Planning for entrepreneurial start-up companies. "Crickster" is an entrepreneurial start-up in Aalborg will be use as the case company and as an example to display the content. The report is written generic to emphasize the content can be apply to any start-up.

The initial problem description explains the motivation for the theme and content of this report. The problem statement will be formulate as a question with research questions, which guides the reader and display the focus of the report.

The report structure consist of a description of the chosen key areas and the relation between them and relevance in order to answer the problem statement.

The content of the report consist of the analysis, in which the chosen key areas will be analyze in with the offset in an entrepreneurial company in their start-up stage. The sum-up of the (chapters) key areas will be gather in an independent chapter.

The strategy impact of the key areas will be present in the beginning and end of the report before the conclusion.

In the end the conclusion chapter will highlight the main points to answer the initial problem statement.

The report will use the literature from books, articles and web sites as the starting point of the analysis and compare it to entrepreneurial start-up.

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Case company description

Crickster was founded in 2016 in Aalborg by four students from Aalborg University. However it was first in April 2017 they launched their first official product, which was a meal worm product for topping and snacks. Before launching they had several prototypes or samples to be tested at a local diner in Aalborg. Crickster currently offers the following insect products:

- “Insnack333” (Natural Umani, Taste of Italy, Taste of Mexico and Cocoa) meal worm topping/snacks.
- “Flourpro” (Caterpillar and Cricket) Caterpillar and Cricket flour used for baking or supplement for protein drink.
- “Inbite 555” (Cocoa) date with the use of worm flour.
- “Wholepro” (Caterpillar and Cricket) freeze dried insects used for toppings or snack.

The Crickster company has since its beginning driven by innovation and entrepreneurship (All four members have entrepreneurship master background from AAU). By offering insect as a source of food, Crickster is one of the “first movers”, which gives them an advantage of capturing the market. Other advantages Crickster might benefit from is headstart in getting access to the resources, first movers tend to have better time establish a brand/relationship with the customers and greater expertise with their products than late-movers.

Initial problem description

The motivation for initiate this project is based on the perception that the literature for entrepreneurial start-ups of physical products does not deal with the “path” or directions to operate a newly started entrepreneurial company. Furthermore, the literature does not reflect what focuses a start-up must have, but rather indicate all areas of the Operations management and planning to be equally important. Start-ups are usually small independent companies with limited resources in terms of workforce and capital, which is not consider in the different operations management literatures.

The report will analyze different areas, which are vital when establishing the operations of an entrepreneurial company. The identified areas consist of System design, Sourcing & Distribution, Customer Relationship & Forecasting and Sales & Operation planning. Here the report will also present how different strategies affect the directions and actions in these areas. The System Design consist of the Product Design, Capacity Planning, Process & Layout Selections and Design of Work Systems and will also be divide in these areas. The Sourcing & Distribution consist of the supplier relationships and the movement of goods to customers. The Customer Relationship & Forecasting consist of the customer information, customer agreements and estimating demand. The focus is the development of the Sales and Operations planning and production plan to match supply with demand on a tactical level. Crickster will be use as a case company, since they are a new start-up company started by newly graduate students. The question is how start-ups such as Crickster design the operations and develops the planning, which lead to the following initial problem question:

What are the require steps for an entrepreneurial start-up to take in order to transform their ideas to an output (product)?

1. Which considerations and actions will new start-ups face from the beginning?
2. What are the focuses for start-ups in the different areas of System design, Sourcing & Distribution, Customer Relationship & Forecasting and Sales & Operation Planning.
3. How will the strategies impact on the decision making in the different areas and (S &OP) planning currently and in the future?

The first two research question will be answer together from chapter of Product Design to Sales & Operation planning, while question 3 will be answer mainly in the Business strategy chapter and Strategy Direction. This is done to separate the strategic decisions with decisions within Operations Management. Obviously the strategy will impact the decision making in the operations strategy and management, which is why the strategy also will be mentioned in the different chapters (*Stevenson. William. 10th edition 1994. Operations Management. McGraw Hill. Chapter 2*).

Report Structure

This chapter will explain the structure and content of the chapters of the report. The report will be divided in a generic view of entrepreneurial start-up companies and the case company Crickster. The sequence is generic first and then uses Crickster as an example (marked with a box). The following chapters present areas of focus for the start-ups to manage before starting their business. The sequence of the chapters are therefore also made to emphasize a logical approach to support the management/planning.

The entrepreneurial life stages: The purpose is to present the life stages of entrepreneurial companies, because it determines the different focus and conditions. The start-up stage will however be the focus in the report, because it is the first stage.

Business Strategy: To understand how the operations are running and designed, it is important to look at a level "up". The business strategy is important for the start-ups, because it tells about the market conditions in which they operate. Understanding and knowing the market, customer group and competitors, the company will deal with depicts the direction for the entrepreneurial in their start-up stage and the operational strategy.

Operational Strategy: From the business strategy the business plan must be transformed into actions, which the operational strategy deals with. The focus is within Operations Management required and the design of a system and the development of planning. The choice of the chapters is based on the importance in the start-up stage, which get the operations up running. This should also be explained within the individual chapters. Here the System design will be broken down to several fragments (Product design, Capacity Planning, Process & Layout Selection and Design of Work Systems) to get a better understanding of the elements within System design. The remaining chapters Sourcing & Distribution, Customer Relationship & Forecasting and Sales & Operation Planning will not be divided.

- **Product Design:** The Product Design is one of the first things, which must be designed. It is the design of the product, which lies the foundation for the remaining operations. It is essential, because it must satisfy the needs of the customer group. In order to identify these customer needs, the entrepreneurial must do some research/analysis, which will be present in this chapter.
- **Capacity Planning:** Based on the product design the next step is to determine the required capacity and costs to produce the products. The considerations and financial analysis and forecast will be present in order to find a Capacity Set-up. The challenge for the start-up in comparison with established companies will be dealt with in this chapter.

- **Process and layout selection:** This is the next step after determine the specific capacity requirements, because the process and layout depicts the degree of flexibility and volume. Different process and layout types exist to match the desired purpose will be present. This area depicts the flow and lead time, but also what the start-up must take into consideration.
- **The design of work systems:** After choosing a process and layout type, the work content needs to be specify. This is about documenting the required work content and the jobs related to those processes. The theory behind job design, method analysis and work measurement will be present. For start-ups the focus and job design will require more flexibility and focus will be dealt with in this chapter.
- **Sourcing & Distribution:** This chapter could also come in the beginning, but the focus for start-up is usually their internal operations, which is the reasons this chapter comes later. The purpose with the Supply Chain chapter is discussing the dependency from the start-up to external operations. Here the entrepreneurial company must establish a relationship with a supplier or suppliers to deliver their materials. There exist different types of relationship between supplier and company, which will be present. Distribution is also an area, in which must consider how to deliver their products to the customers. Discussion of what kind of relationship and distribution set-up which are relevant for start-ups will be present.
- **Customer relationship & Forecasting:** With the chosen product design, capacity set-up, process and layout type, the sourcing of supplier and distribution set-up, the operations are ready to run. The next important thing is selling the products to customer target group, which can done by establishing customer relationships. Establishing customer relationships are an important activity in order to get customer agreements for start-ups in order to survive. The principles of customer relationship management will be present and the importance of this. In addition, it will present how customer relationship support estimating demand and the principles behind forecasting on different planning levels. The situation for start-ups is different compared to already established companies and focus, which this chapter will present.
- **Sales and operation planning:** As the forecast is prerequisite for the Sales and Operation planning. This chapter focus is, in how the start-up can use Sales and Operation planning to make a production plan. This enable those to plan (estimate) resources, production, revenue based on forecast. The production plan should help the start-up plan in consideration of external conditions (drivers for performing S&OP), which also be present in the chapter along with processes of Sales and Operation planning. Different planning methods and production strategies can be use to work out the plan in consideration of different costs to choose the best. Furthermore, it will show the financial aspect

also must be consider to account for fluctuations in sales. In the end of the chapter, it will present different metrics to control and use to modify the operations plan. The development of the Sales & Planning is interesting for start-up, which will be dealt with in the chapter.

- Sum up: Summaries of the key areas/chapter. This concern the chapter from Product Design to Sales & Operation Planning will highlight the main points from these chapters to answer the research question 1 and 2.
- Strategic directions: This chapter will answer the third research question and present the strategies impact in general of the System Design, Sourcing & Distribution, Customer Relationship & Forecasting and Sales & Operation Planning. There will be present 4 scenarios after start-up stage. Assumption is the start-up enter the growth stage, in which the company expands.
- Conclusion: This chapter will answer the initial problem statement based on the analysis by highlight all the main points.

Analysis

Introduction

This analysis of entrepreneurial in their start-up stage will focus primarily on the design of the operations and development of planning. The chosen areas within Operations Management were System Design, Customer Relationships, Sourcing & Distribution (also relate to Supply Chain Management) and Sales & Operation planning. The areas are chosen in consideration of the situation of the entrepreneurial start-up, in which the focus is to transforms their (innovative) ideas into a product.

The entrepreneurial life stages and business strategy is chosen to understand the conditions and environment of the entrepreneurial company. The stage of the entrepreneurial reveals how much resource and capital they possess and business strategy the guidelines to operate within. Besides dealing with the design and planning of the operations and capacity, the focus must be to sell their products as an start-up to survive, in which the business strategy defines the approach to the environment and competitors. The system design of the operations of manufacturing describes the require planning of the capacity and design phases before running the operations. After the system design, the start-up can begin to plan their supply based on the forecast and customer relationship. Here the development of the Sales and Operation planning process describes the planning before and after the operations is up running.

The limitations of the report is not to look into whether the entrepreneurial start-up can succeed with their innovative products and how to run an efficient marketing strategy and how to design a “good” product. As the focus is on Sales and Operation planning, which is on the tactical level and the impact from the business strategy, the report will not deal with the lowest level of planning, which is the Detailed Planning & Control.

As the focus is at entrepreneurial start-ups, the analysis will take the starting point there and focus on the conditions and challenges relate to them. In the end it will be discuss how the focus and goals changes in the strategy, when the entrepreneurial begins to “grow”.

The entrepreneurial life stages

In the book “Exploring Strategy Text & Cases,” (Johnson, Gerry. 2011. *Exploring Strategy Text & Cases*. Pearson, chapter 9) the author presents the “entrepreneurial life cycle”, in which companies experiences. The 4 stages are described as start-up, growth, maturity and exit. Some might companies does not make it through all stages, due to failure.

The Figure 1 describes four stages an entrepreneurial goes through given they survive. The first stage *start up* as the name indicates is the beginning, in which sources of capital to fund the business is crucial. There exist several sources for funding, which can be personally by the founders or by friends and family, bank loan, credit cards, government funding or investors. The *growth* phase describes the phase the stage where the business grows, which means entrepreneurs will rely more on management skills rather than producing, in which additional manpower and tasks are assigned to define positions. The next stage is *maturity*, which is the point the growth begins declining and being more steady. In order to develop a new growth the company might look for expansion into new business areas, which should based on assessment for success. If the success rate is assess to be poor, an exit might be more appropriate. The exit route indicates the investors or founding entrepreneurial will offer their company to outsiders, which can be arrange in two different ways. The first one is a trade sale of the company to another company. The second one is sale of stock of the company to the public (Initial Public Offering, IPO).

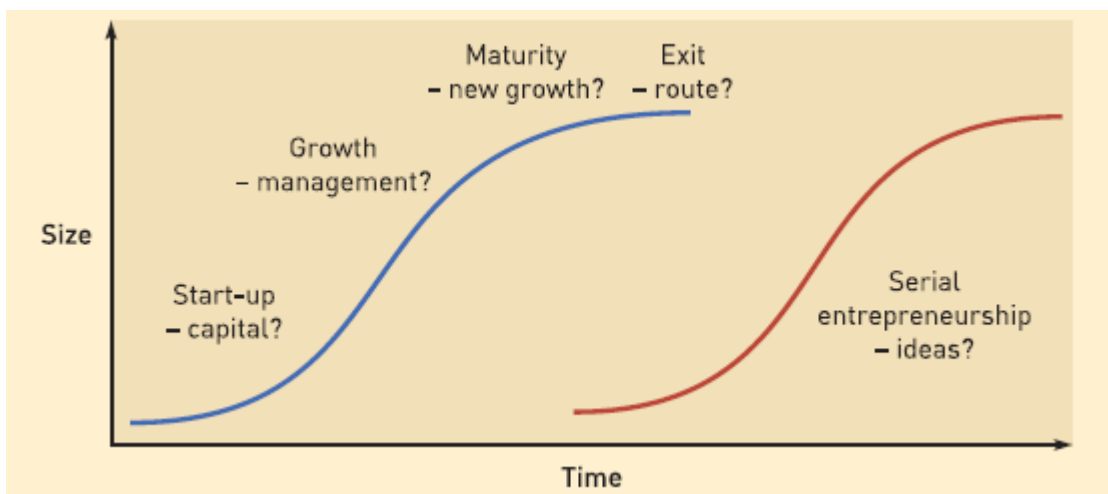


Figure 1 - The 4 life stages of entrepreneurial companies

In the case of Crickster they are still in the beginning of the life cycle, as start-up entrepreneurial since September 2016 and launching their first product since April 2017. On this stage its about finding capital to fund resources in terms of equipment, material, building, transportation and so on. Crickster are currently still designing the products and promoting their products.

Business level strategy

For entrepreneurial companies, which are independent and not owned or part of a big organization, funding happens in the way as mentioned in the previously chapter. The decision making of the geographical scope and the diversity of products and/or services will normally happen on the corporate level, but for entrepreneurial happen it is happening on business level, since the corporate level does not exist.

The business level strategy will decide the specific markets and/or industry the start-ups will launch their products/services (*Johnson, Gerry. 2011. Exploring Strategy Text & Cases. Pearson, chapter 1*). This strategy level seems most important for start-ups in the beginning in order for them to survive. Start-ups like Crickster will have to make important decisions on identifying the customers. This concerns demographics and industry characteristics. By identifying the customers, it will increase the possibility to satisfy customer needs and furthermore obtaining and sustain competitive advantage.

One of the first strategic decisions focus around how start-ups will position themselves in relation to the competitors/industry. Michael Porter's generic strategies describes how organizations and companies can apply 4 different strategies to gain competitive advantage (*Johnson, Gerry. 2011. Exploring Strategy Text & Cases. Pearson, chapter 6*). Organizations might choose to compete broad on a market or focused on a market.

The first is "Cost leadership", which is competing on the broad scope of the market with the focus on price. This is enable through standardized products, efficient processes or generic product to customers. For start-ups to apply this kind of strategy, it will require a focus of the cost. More specifically, it require the control and identification of cost in the value chain, which means breaking down processes and activities, such production, marketing, sales, procurement, logistics and human resources. By analyzing the value chain, it highlights areas where companies can be value adding and areas that can cut cost. For entrepreneurial in their start-up phase, it may seem more difficult since those processes and activities have not yet being fully developed. In the case of start-ups, making budgets helps making estimations for cost.

The second strategy is called “Differentiation”, in which competitive advantage is reached through providing products with unique features and characteristics. This strategy relies heavily on the focus of high quality, technological features and rapid innovation. A quick response (agility) to future customer needs and product development is required. Furthermore, an effective sales and marketing is in order for the customers to understand the benefits coming from the differentiated products. In order for start-ups to make a product that is unique, it may require different raw materials in terms of quality and/or characteristics and technology or processes. Depending on the product, it might require advanced pre-knowledge of the mechanics/technology to make the product. This can be a challenge for start-ups with limited resources in the beginning, while big companies and organizations have more resources and people dedicated in R&D/product development to do it.

The “Cost focus” strategy is similar to the “Cost leadership”, whereas “Cost leadership” competes on the “whole” market or broad, “Cost focus” tries to focus around a particular part of the market, also called a niche market. This can especially be appropriate for small companies or start-ups, which will avoid competing against bigger companies or organizations with bigger and better resources. By focusing on serving niche on the market, it enables you to focus more to serve customers better and with more satisfaction. This can lead to better pricing. For start-ups to apply this strategy, the things mentioned in the “Cost Leadership” also counts for “Cost focus”.

The “Differentiation focus” also tries to focus on a particularly part of the market, which can be strategically wise for smaller companies and start-ups to apply, since they can focus on specializing their products through increasing differentiation, because they understand customer needs. In order for start-ups to obtain this strategy likewise in the “Differentiation” strategy mentioned requires.

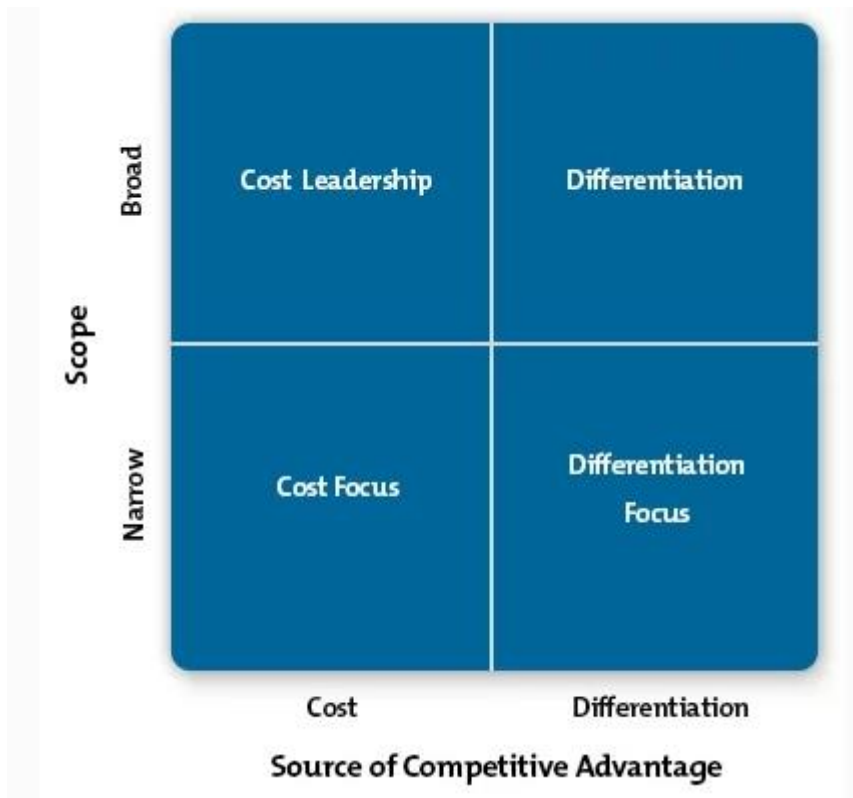


Figure 2 - Porter's Generic Strategies

The Figure 2 above is model, which summarize the scope of the market and source of competitive advantage.

The generic strategy of Crickster

Cricketers' platform is their insects, which all products are built around and therefore their specialization are the insects. With their platform Crickster offers a focus differentiate strategy with a limited variety of products series that is unique in a couple of different segments of the markets (snacks, pâte and flour). Their focus is make innovative products, which satisfies future customer needs.

To illustrate the competitor situation in the markets, Michael Porter has described 5 forces (*Johnson, Gerry. 2011. Exploring Strategy Text & Cases. Pearson, chapter 2*) (Figure 3), which gives the individual company and start-up a way to analyze their situation and how to work out their marketing strategy.

One of the first forces is the *supplier*, which have an impact on the competitive situation on the market. Some industries have a great variety of suppliers and some only a few to choose from. The fewer to choose from the less power from the company and the more suppliers the more power the company have. Some suppliers have close collaboration or owned by an organization. The choice of supplier can have an impact on the quality, price, features, design etc. on the product.

The second force is the customers, which have the power to put the entrepreneurial company under pressure. If there exist a lot of good alternatives on the market, the customers will most likely be more sensitive to price changes. However there are other factors that affect the customers bargain power, which can be the uniqueness of the product, the buyers awareness of other alternatives and availability of existing products.

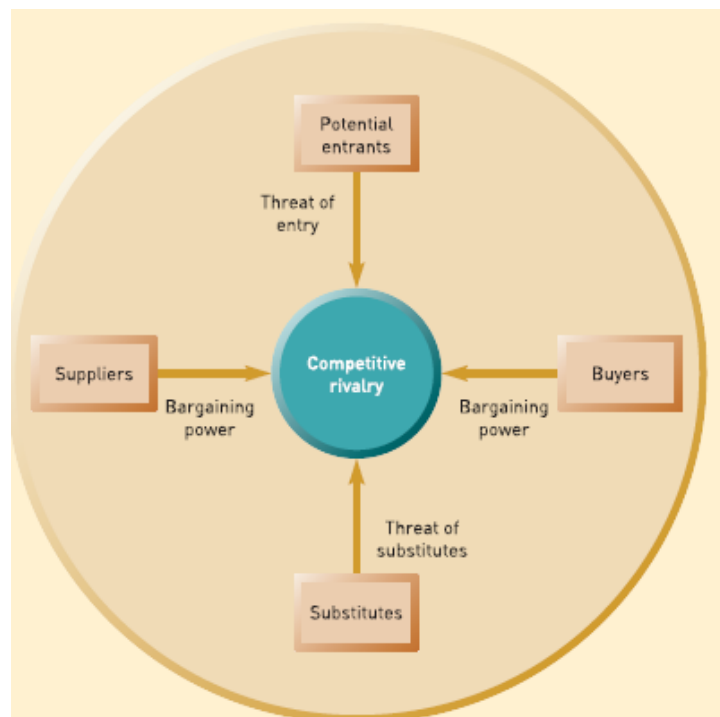


Figure 3 - Porter's 5 Forces

The third force is potential entrants or new competitors. In order for new entrepreneurial to enter a new business and be able to compete there are different factors, which are decisive. The first one is the *economy of scale*, to fund capital that can cope with the volume and reduced cost of already existing companies. In addition the entry can be more difficult depending on the complexity of the product. The second factor is *experience*, which already established companies tend to have, which can produce things more efficiently. Other factors such as *access to supply/distribution channels*, in which some industries where suppliers are loyal or owned by the companies. This can make it difficult more difficult for new entrants. Differentiation is a factor, which can give new entrants an easier entry, because they will a higher perceived product than the market. On the other hand if a establish company have a higher perceive product, this gives customer loyalty and makes the entry for new entrants more difficult.

The fourth force is substitutes, which according to the customers opinion can replace the product, which they are currently using. This happens when the product offers a similar benefit. The existence of substitutes can increase the competition and have an impact on the demand, because customers can choose alternative

products. Again customers awareness of substitutes, the uniqueness of the alternative, and availability of existing substitutes.

The fifth force is competitive rivalry, which are companies with similar products and service, which targets the same customer group. This force have the most significant impact on how attractive it is to operate in the industry. The extent of rivalry between the companies are define by the growth within the industry, the amount and size of the competitors, the degree of the product differentiation and capacity that exist. For any organization, company and start-ups, it is the whole picture, which is important to assess, when looking at the competition and attractiveness within the industry. Therefore, all forces should be taken into consideration, which have an impact on the competitive situation within the industry.

Cricksters' five forces

Crickster have two suppliers main suppliers, one in Holland called Kreca and the other one, Kalo in Denmark. Kreca supplies with the freeze dried insects used to produce Wholepro and flour used to produce Flourpro. Kreca is large organization, which produce and distribute insects worldwide. Kalo supplies them with the frozen insects used to produce the snacks. The supplier market are narrow, which gives them limited option for other suppliers. The products of Crickster can be purchase at retailers in wide range of supermarkets and directly from their webshop. Their products are in some degree unique because their exist similar products on the market, but with different tastings. In some supermarkets, their product are unique, which means the customer not necessary know about the existence of competitors products. The entry barrier for new competitors is relative low, since the technology behind the process of insects are not complex. Furthermore the investment of capital does not require unique or complex equipment. The insect snacks, flour and pâte are alternatives to the traditionally food, and therefore they can be easily substitute. Crickster have a 4 competitors, which also compete in the same market and geographical area. They are also entrepreneurial start-ups.

Operational Strategy

When an organization have define their business strategy and analyzed the competition within the industry the next step focus around how to plan or transform into action, on an operational level. There are several things, which are important in the operational strategy. The first thing is the operations management, which concerns about how the inputs transform to output (*Stevenson. William. 10th edition 1994. Operations Management. McGraw Hill. Chapter 1*). As the Figure 4 shows the inputs are all the resources and capabilities such as equipment, facilities, workforce, raw materials and information. The process or transformation of these inputs can be anything that adds value to the company, which is the output in terms of a service or a product. Managing all three aspects happens by feedback to ensure the goals or objective are kept.

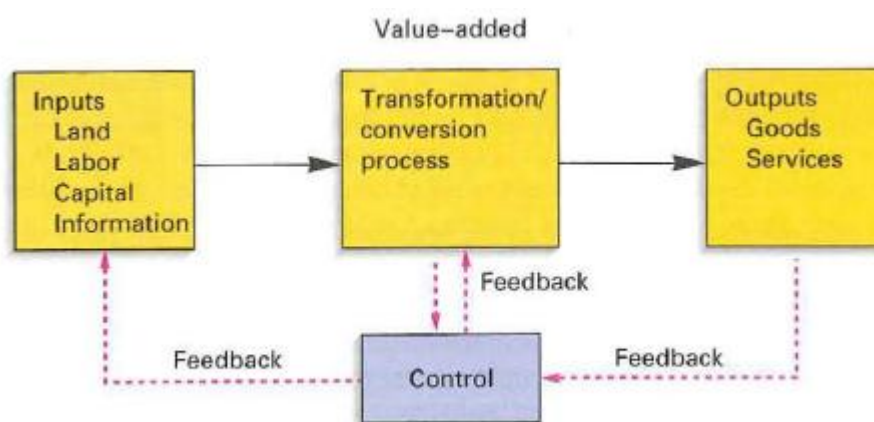


Figure 4 - Input Transformation Output Model

The second thing is the supply chain management, which focus around how and where raw materials, parts, part assembled or finish products are sourced and how it flows through the tiers to be deliver to the final customers. The Figure 5 shows that an organization or start-up will be interacting in a supply chain by taking the role of either tier.



Figure 5 - Supply Chain

For the start-up the first decisions arises in the scope of operations management. The decisions within operations management ranges from product and service design, process selection, facility layout and design of work systems.

Product Design

The Product Design is one of the first steps in the System Design, which deals with the core competencies in terms of the physical product. One of the first and most important reasons why a company exist focus on the product and which product(s) they are offering to the customers. The product design sets the condition and basis closely mention earlier in the Business Strategy. To design a product or service, which satisfies the customer needs must be the ultimate goal. However there exist several triggers for start-up to start its business or companies to redesign a product (*Stevenson. William. 10th edition 1994. Operations Management. McGraw Hill. Chapter 4*). These are:

- Economic (demand, cost reduction, low profit, high warranty claims)
- Social and demographic (population trends, aging baby boomers)
- Political, liability or legal (government changes, new regulations or safety issues)
- Competitive (market opportunity, new or changed products)
- Cost or availability (raw materials, component or workforce)
- Technological (components, equipment or processes)

The initial main force in entrepreneurial start-up is market opportunities. A lot of start-ups are driven by an innovative idea, which means converting new knowledge into a product or service into actual use. Based on their business strategy, the start-ups must ask themselves these following questions:

Is there a demand for it? (This include consider the potential size of the market and whether the demand is short or long term and how quickly/slowly will it grow)

Is it possible? The start-up have to assess whether they have the necessary knowledge, skills, equipment, capacity and supply chain capabilities to deliver the product. Here outsourcing may be part of the solution, when there is a lack of or insufficient in some of the inputs.

What level of quality is appropriate? In relation to the business strategy this should formulate what the customers can expect. In addition a look on how the competitors provide quality.

Does it make sense from an economic standpoint? This relates to the warranties, environmental issues, sustainability issues, cost and profit.

In order to answer those questions, product design occurs in a serial order of phases (*Stevenson. William. 10th edition 1994. Operations Management. McGraw Hill. Chapter 4*):

- Idea generation: Product design begins with ideas, which can come from three kinds of sources. Supply-chain, competitors or by research. The supply-chain consist of suppliers, producers, distributors and customers in which the ideas can be sourced. A big motivation factor is studying the competitors 'products and operation (pricing policies, warranties etc.) inspiration to make or improve a product. Research are dedicate and organized effort to increase scientific knowledge or product innovation through Research & Design, which can happen at universities, organizations or research foundations.
- Feasible analysis: This include market analysis for demand. For start-up this can be done through establishing customer relationship or customer agreements. An economic analysis, in which include estimating development cost, production cost and profit potential. Furthermore a technical analysis of required capacity and workforce needed.
- Product specifications: A detail product description of the function and design of the product through documentation. This is here the entrepreneurial start-ups innovative idea must be validate and agreed upon in account for the business strategy/marketing.
- Process specifications: When the product specifications have been define the next step is to figure out, which required operations that are needed to produce the desired product. Furthermore available resources, workforce and equipment must be consider along with cost and profit potential. Here the legal restrictions very often needs to be kept. The legal regulations are different from industry to industry.
- Prototype development: Once the product and process specifications have been completed, the next phase is testing by producing one or a few units of the product. The main point in this step is to identify any problems in relation to the product and process specifications.
- Design review: In relation to the previously phase assessment and validation among the members whether the product have the desired design and function. Necessary changes to the product and process specifications will be made in collaboration with account of finance, marketing and operations.
- Market test: With the prototype or limited output, the company or start-up will try out promoting or sell the product to the customer target group. The main point is to get feedback and determine the customer acceptance. If the feedback is considered to negative, the start-up can consider to return to the Design review phase.
- Product introduction: The product is ready to be launched. Production of the products and marketing starts.

- Follow up evaluation: At some point necessary changes will be assessed in consideration to operation, product and marketing. Develop/refine forecast.

Depending on the business strategy the start-up will need to consider whether they want to offer standardize or customized product. The choice of design has an impact on whether cost or differentiation is the focus. Some start-up only have one or low product design variety to choose and other a lot. There are two ways in which companies can enable a focus on both cost and differentiation, also called mass customization, which are delayed differentiation and modular design. Delayed differentiation is producing the products partly by standardizing processes until the last stage or stages, in which customer specifications are known. Modular design is grouping parts into modules, which enables modules or parts to be replaced or switched by another set of modules.

The essential for any company and start-up is designing products, which satisfies customer needs. This requires understanding and translating customer needs into technical product requirements. Part of this is understanding customer perception of the quality of the product design. The Japanese professor Noriaki Kano made a model for product and service design, which describes three categories of quality customer perception. The Kano model (Figure 6) describes three categories, which lead to satisfaction, excitement and dissatisfaction. The first category is the basic quality or must-have, which describes attributes that are expected by the customers, and if they are not present will lead to dissatisfaction. The second category is the quality performance or the “more is better”, that describes adding more attributes can increase the satisfaction, but also lead to dissatisfaction if the extra attributes are perceived unnecessary by the customers. The third category is the excitement quality or the delighters are attributes, which “surprise” the customers if present, and if not present the customers will not be unsatisfied, because it is not expected.

The product design of Crickster

The concept of Crickster are the insects, which means all products consist of insects. Their product series of snack, flour and pâte with different tastes gives them to mass customize, because the tasting can be added in the end when the customer preference are known. With a product mix of different insects like meal worm, cricket and caterpillar gives them the opportunity to change the product by interchange the insects. As the products are categorized as food, there are certain legal regulations, which Crickster must keep. Documenting all ingredients and their source as well as expiry dates are required by law.

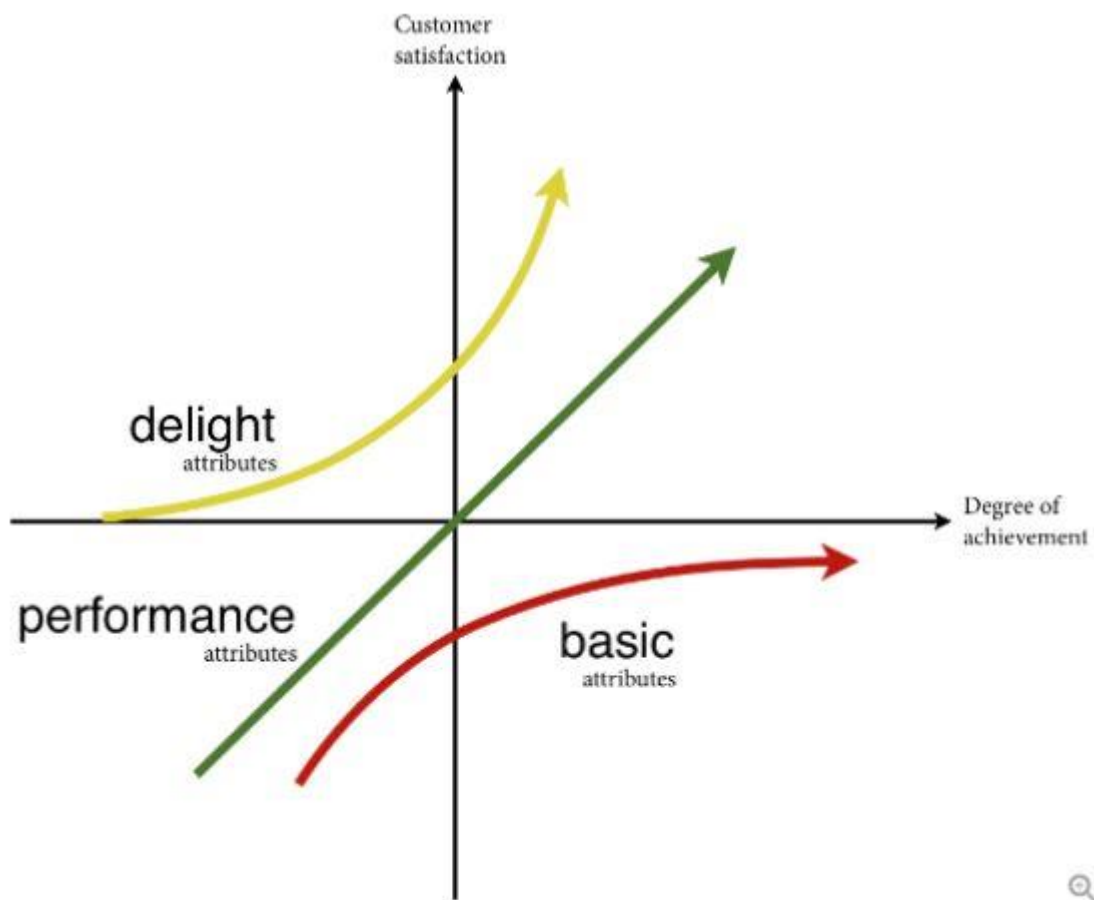


Figure 6 - The Kano Model

Capacity Planning

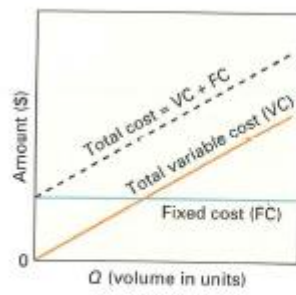
The strategic capacity planning was briefly mention in the previously chapter, is the next step of the System Design. It is affected by the product and design phase, and is an area which are important for a start-up assess what that are require in align with the strategy and product design. The strategic capacity planning includes making decisions regarding the measurement of capacity, how capacity requirements are determine and assessment of capacity and its alternatives (*Stevenson. William. 10th edition 1994. Operations Management. McGraw Hill. Chapter 5*).

Decision such as the capacity required to produce the products, how much of those to match demand, investment cost and operating cost, expected return and assess pros and cons (flexibility and sustainability) of the chosen capacity decision. In some cases capacity investment are made continuously especially for entrepreneurial start-ups as the company grows. The strategic implications for capacity planning also affect the delivery speed and flexibility on a competitive level.

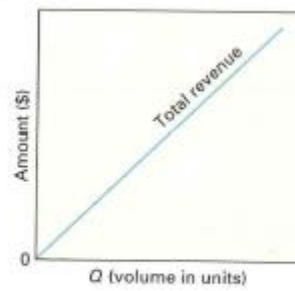
For start-ups the operating cost is often different compared to the traditional point of view, because the entrepreneurial often are independent business unit, salary are often limited or not incorporate in the cost in the start-up stage. This is often caused by the fact the entrepreneurial start-ups more limited resources than companies in the more matured stage or companies which are part of an organization.

Part of the capacity requirements the start-up must also consider which tasks they will do in-house and which they will outsource to another company. Factors such as available skills, equipment, machines, quality considerations, the nature of demand, cost and risks will have an impact on this decision-making.

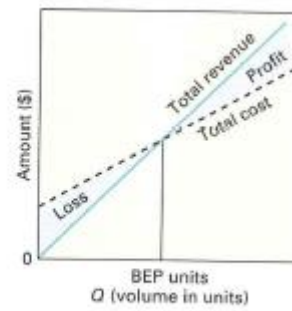
An important task for the start-up is to perform a cost-volume analysis in order to evaluate income under different capacity options (Figure 7). The purpose is to estimate the fixed cost, total variable cost, revenue per unit and total revenue in order to estimate when profit can be realized (break-even point) from different operation set-ups.



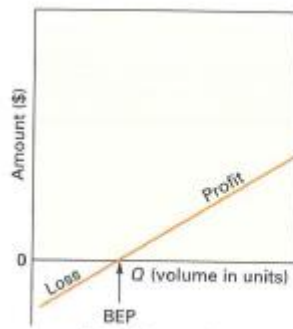
A. Fixed, variable, and total costs



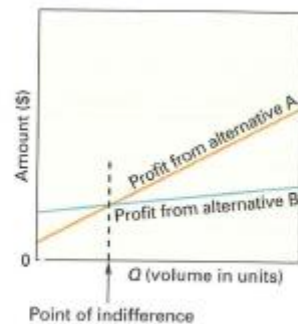
B. Total revenue increases linearly with output



C. Profit = TR - TC



D. Profit versus loss



E. Point of indifference for two alternatives

Figure 7 - Cost Volume Analysis

Process and facility layout selection

Once the start-up have chosen the most feasible capacity option the next step is process and facility layout selection. This concerns about the arrangement of the work place and how the whole operation set-up must be designed in alignment of the business strategy and goals. The members must determine which processes that are needed, because it affects the constellation of the equipment, machines and workforce.

Before choosing the process type, there is three basic issues, which will help the members in the decision-making. The first issue is product variety and related to the product and service design, in which how much variety will the processes/system need to handle. The next issue focus around the flexibility of the equipment/machines are required. In relation to the capacity planning the next issue is the output rate or the required volume of products expected.

Based on the answers to those issues, it will become clearer for process type to choose. There are 5 basic process types to choose from (*Stevenson. William. 10th edition 1994. Operations Management. McGraw Hill. Chapter 6*):

Job shop: With this set-up, the operations will handle a broad variety of products on a small scale. The work content can require a different process requirements or higher complexity. This require high flexibility from the workforce (skilled) or equipment.

The Figure 8 below shows the variety on the vertical axis and volume on the horizontal axis for the different process types.

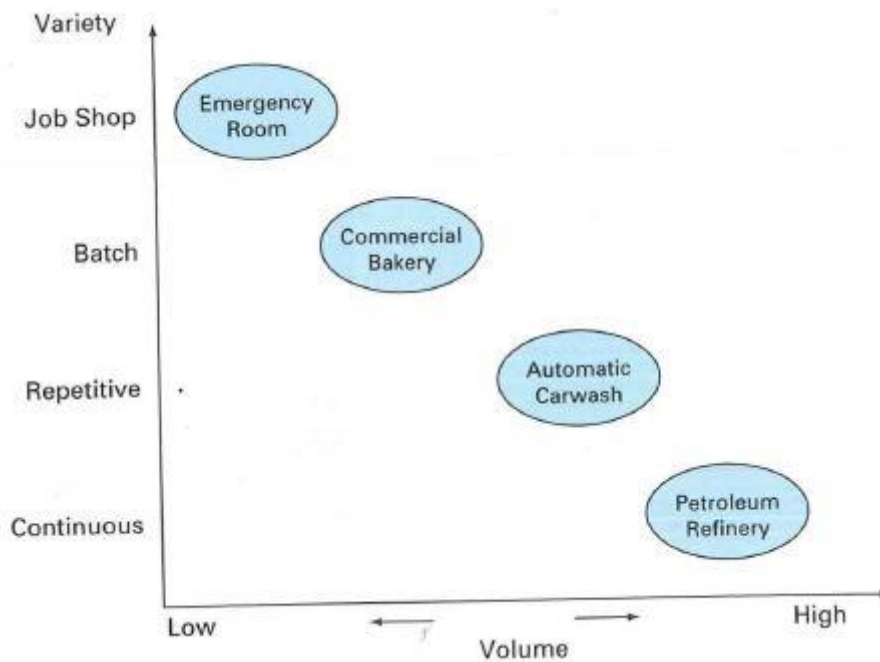


Figure 8 - Process types

Batch: This is used when the output level is more moderate but still able to handle a variety of products but fewer than job shop. The workforce and equipment can be less skilled or flexible compared to job shop.

Repetitive: This process gives the possibility to produce at high volumes, because the product variety are narrow or standardized. The workforce or equipment are not required to be flexible or skilled.

Continuous: The total opposite of the job shop, the focus is highly standardized process resulting in very standardized products. This enables to produce at a very high output level, because the processes also run non-stop.

Project: The four previously processes are ongoing operations, while describes some work content that are unique and are set to finish within a specific time frame. The process can range be a mix of some of the elements from the 4 other processes.

The Table 1 shows some of the different costs, marketing and scheduling activities which are affected when choosing the different process types.

Activity/ Function	Job Shop	Batch	Repetitive	Continuous	Projects
Cost estimation	Difficult	Somewhat routine	Routine	Routine	Simple to complex
Cost per unit	High	Moderate	Low	Low	Very high
Equipment used	General purpose	General purpose	Special purpose	Special purpose	Varied
Fixed costs	Low	Moderate	High	Very high	Varied
Variable costs	High	Moderate	Low	Very low	High
Labor skills	High	Moderate	Low	Low to high	Low to high
Marketing	Promote capabilities	Promote capabilities; semi-standardized goods and services	Promote standardized goods/services	Promote standardized goods/services	Promote capabilities
Scheduling	Complex	Moderately complex	Routine	Routine	Complex, subject to change

Table 1 - Planning Values of Process Types

Part of the process selection is the process technology. The process technology have the advantage of making the processes more automatic and more efficient. There are three basic process technology (Slack. Nigel.2010. Operations Management. Pearson. Chapter 8):

Materials-processing technology: The technology transform or process the materials or products to desired output. It can range from automated machine, robots or computer-based systems.

Information technology: This type collects, stores, manipulates and distribute important information or data to the operations. This helps the company to measure and assess the operations. Information and data can come from different sources as the ERP-systems, internet or bar codes.

Customer-processing technology: This focus on the customers to interact with technology. Examples are web shops, e-ticket reservations, check-in technology at airports and order devices at fast food chains as McDonalds.

The process technology have the advantage of making the processes more automatic and more efficient. However acquire these technologies can be very costly, and for entrepreneurial in their start-up phase and with less capital it might be more difficult to fund.

Closely related to process types, which concerns about how the transforming resources are positioned to one another. The layout determines the flow or pattern of the materials and how they are moving across the different processes. The layout of the resources affects the lead time, waiting time and the cost of the operations. There exist 4 types of layout technology (Slack. Nigel.2010. Operations Management. Pearson. Chapter 8), which are:

Fixed-position layout: The materials are stationary, which means the equipment, workforce and machinery will move around the materials. Example is shipbuilding, patient surgery or motorway constructions.

Functional layout: Also called process layout, because similar resources or processes are grouped or placed close to each other. This can be done to achieve better utilization of the capacity. Examples are supermarkets, in which different kinds of food are grouped together.

Cell layout: The machinery, equipment and workforce are placed in cell to handle certain types of materials or customer requirements. Examples are bakeries within a supermarket.

Product layout: The set-up is dedicated to the individual product. Each material moves through the operations in a prearranged flow. Examples can be production of bread or beer assembly line.

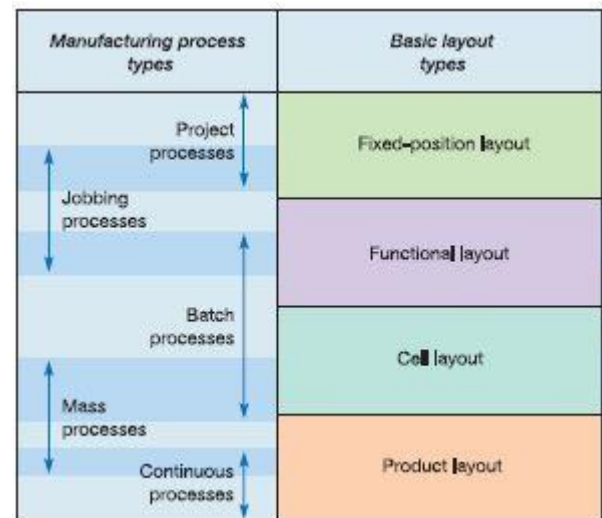


Figure 9 - Relation between Process Types and Layout Types

The Figure 9 above shows the relationship between the process types and layout types. As seen the process types overlaps, because process types not necessary only have one layout type option. What is important for the start-up is rather focusing on identifying the require processes, than finding the optimal flow, because they might be in stage where the product portfolio is increasing.

Capacity, process and layout selection of Crickster

Cricksters market test were limited to a café in the beginning and customer deal with a local supermarkets for testing. Therefore they have rented an office department with a small kitchen facility, which have worked as a canteen. Their initial measurement based on their insect snacks and insect flour, which have the same processes. They are produced in batches regardless of the flavor. The operations works in a functional layout with the kitchen set-up. All movement of materials and cooking are done by manual power and information flows through phone calls or by email. Since they have their own web shop, customers can purchase the products directly from their web shop.

The Design of Work Systems

When the product design, processes and layout have been chosen the final step of the System Design is the Design of the Work Systems. This consists of job design, method analysis and work measurements (*Stevenson. William. 10th edition 1994. Operations Management. McGraw Hill. Chapter 5*).

Starting with the job design it concerns about formulating the work content. This requires defining the functions required and the methods and responsibility to these jobs. The concept of job design was provided by Frederick Taylor, which concepts include method analysis (tasks and methods included in the job) and work measurement (the desired time to perform the tasks).

It can be denied that product design, processes and layout affects the functions required. If the product are standardized or similar characteristics and repetitive processes with an assembly line layout the work content will be less flexibility. Vice versa with a high product variety with a job shop processes with a fixed position layout the work content requires more flexibility and most likely more skilled workforce.

Regardless of product design, processes and layout for many entrepreneurial start-ups, the job work content will be rather wide and requires flexibility due to the limited resources and capital. On the start-up phase the members and founders will require them to put-on more tasks and more responsibility. This is solved by job rotation or job enrichment. An entrepreneurial start-up the members will have more autonomy and maybe move between different functions, than more established companies with more resources. The members will need to work similar to team based work, where they are self-managing with overlapping skills to perform complex tasks and important decisions.

Method analysis focuses on how the different tasks are performed. For jobs or tasks development of a method is often required. The basic steps in method analysis are:

1. Identify the required tasks/activities to perform the job along with equipment, machines and materials.
2. Document the activities based on the information.
3. Implement the methods.
4. When the activities are performed, an analysis of the job is performed.
5. Review and propose new methods continuously if necessary.

Work measurement is important to determine the operation cost and for the capacity planning, because it measures the duration it should take to finish a task. This can be done by stopwatch study. Different work samples can be collected given different working conditions such as experienced, skills, tools, machines or time periods (busy/stable).

For the start-ups no jobs exist, but are new so it has to be established a method. This can be challenging to due to limited experienced in performing the jobs. Most entrepreneurial start-ups the members have the autonomy to identify the best method by error and trial, which might not give the best method on the first “try” performing the job. In addition the same challenge counts for the work measurement, which must be done continuously as the start-up find it necessary to determine the length of time. The members of the entrepreneurial will collaborate together continuously in order to find the best method.

The work design of Crickster

The company only exist of 3 members working full time, which means the work content is very wide and a lot of rotation among functions and flexibility are require. Even though they have a limited workforce, they have certain areas that they have the responsibility. One member manages product design & development and production. The other member manages graphic design and web communication. The third member is responsible for sales and marketing. With only three persons to manage different functions, they have a lot of autonomy and decisions are agreed upon even though they have their respective responsibility. In their product design phase they made research to gain information on how to produce their products and the equipment require. Other than this, method analysis are not present.

Sourcing & Distribution

Usually no companies works entirely independent, when delivering a product to its customers. The start-up will most likely have to have a supplier or suppliers, which can deliver some raw materials or components. The supply chain concentrates on every activities involving delivering the products to the final customers, which extends to supplier and distributor. The facilities typically includes warehousing, factories, processing centers, distribution center, retailers and offices. Not all facilities are present in every supply chains (Stevenson. William. 10th edition 1994. *Operations Management*. McGraw Hill. Chapter 11).

The focus for the start-up is to find a supplier or suppliers, which delivers materials that aligns with the business strategy of the company. The establishment of relationship with the suppliers can take different forms. Factors such as the components and its technology, the market of supplier and the supplier itself. However Bensaou made a model, which count the investments of the company or buyer and the supplier to describe, which influence the type of relationship (Bensaou. Ben. 1999. *Portfolios of Buyer Supplier Relationships*. Sloan Management). Figure 10 describes 4 kinds of relationships, depending on whether it is low or high investment from the respectively sides.



Figure 10 - Bensaou's Buyer & Supplier Relationship

Market Exchange: Both sides have a low investment, because both side have many substitutes and typically involves highly standardized products. There is no or limited sharing of information and technology.

Captive Buyer: The investment from the buyer's side are high, because the products are either complex or big importance to the buyer, while the investment from the supplier is low. This can be due to the fact the supplier is bigger than the buyer is or is dependent on the service of the supplier. Furthermore, the supplier might have monopoly or there is limit competition on the market to deliver it.

Captive Supplier: This describes the opposite of the Captive Buyer, in which the supplier are dependent of the buyer as its customers, which can be due to the buyers size (market share) or limited substitutes for the supplier. The products can still be complex, but the buyer have either the possibility to change or use several suppliers.

Strategic Partnership: This relationship describes the closest kind of relationship, in which where both sides have high investment in each other. This involves customized materials or products to the buyer, because the products are complex. The length of the relationship are often long-termed and the information and technology sharing is high.

Another area to consider is the shipment of incoming materials and outgoing products. The choice of shipments method are influenced by the cost, availability, time and product type. The shipment methods are train, trucks, airplane and boats. Some product type such as fresh food require quicker shipment, while others does not have urgent shipment. The strategy can also affect the method of shipping, for instance if having a low cost strategy you will try to minimize shipping cost, which can give slower shipment and vice versa. The other option is to outsource the distribution to a company, that are specialized in the logistics management. This means overturning warehousing and the logistic planning. For entrepreneurial start-up outsourcing the logistic is common, because it enables them to focus on their main business and require less investment.

As a start-up with limited resources and capital and big market share, it can be challenging to have the control of the supplier. Naturally, it also depends on the specific investment of the product or material required from the supplier, which dictates the relationship type. However the start-up is usually not in the position to due to its size, which means their relationship will be similar to Captive Buyer. Strategic Partnership is also an option if the company have a technology or product, which are mutually dependent on each other.

Supply Chain of Crickster

As mentioned before Crickster sources insects from two suppliers. The suppliers are big importance for the company, because they provide them with the raw materials, which are build around their insect platform. The two suppliers are international companies, which provides insects to a range of other companies. Crickster are more independent of them, than they are of having Crickster as buyer. Heir relationship must the characteristic of Captive Buyer.

In terms of the logistic tasks these are primarily handle by Nordisk Tang, which handle the big orders. The smaller orders are handle by the use of DHL or GLS. For other small orders in the local area, they have their own small truck to use.

Customer Relationship & Forecast

For companies it is important to manage relationships with their customers, but for start-ups it is important to establish the relationships. The purpose with customer relationship management is about maintaining and obtaining customer relations by gathering customer data to improve the relationships. With the relationship and agreement, the company can use the customer data to estimate the demand (*Vollmann. Thomas. 2004. Manufacturing Planning And Control Systems For Supply Chain Management. McGraw Hill. Chapter 2*).

It is important that companies can match their supply with demand by estimate both current and future demand. In the end, the goal is to anticipate promise delivery dates by managing the supply and capacity. The forecast are made on at least 3 levels which are strategic, tactical and operational level. In the figure XX the Sales and Operation planning symbolize the tactical level and Master Production Schedule the operational level.

The strategic forecast is made for the entire year and is heavily based on all products and judgement. The forecast made for the Sales and Operation planning ranges from a few months to a year for different product series or families and cover number of periods into the future (Table 2). The master production schedule is made the most detailed forecast, which disaggregate product families into individual products to the specific weeks and days.

Here customer plans or customer agreements gained through customer relationship are important. The entrepreneurial start-ups have a challenge because they do not have any historic sales data or customer trend information. This means they rely more on the customer agreements and qualitative assessment with marketing and communication functions. Therefore their forecasting must be done more careful, when estimating. The start-up must take into account if product or series are continuously introduce, which means the forecast would be revise constantly. Even though the start-up choose to stick with the same product series for a year, it still hard to forecast on future demand, due to the uncertainty of the customer reception of the products. The Table 2 below shows a framework for forecasting on the three levels and the frequency of decisions on the three levels.

Nature of the Decision	Strategic Business Planning	Sales and Operations Planning	Master Production Scheduling and Control
Level of aggregation	Total sales or output volume	Product family units	Individual finished goods or components
Top management involvement	Intensive	When reconciling functional plans	Very little
Forecast frequency	Annual or less	Monthly or quarterly	Constantly
Length of forecast	Years by years or quarters	Several months to a year by months	A few days to weeks
Management investment in the forecast(s)	Very large	Moderate	Very little
Cost of data processing and acquisition	High	Moderate	Minimal
Useful techniques	Management judgment, economic growth models	Aggregation of detailed forecasts, customer plans	Projection techniques (moving averages, exponential smoothing)

Table 2 - Decisions in the 3 Planning Levels

Customer relationship and Forecast of Crickster

The team of Crickster have been spending much time in their start-up stage to promote their products to the customers. Different samples have been delivered to different retailers in order to establish customer relationships and in the end a customer agreement. The primary channels used to promote have been through social media as Facebook, Instagram and Youtube to get in contact with private customers. Customer agreements made with Dansk Supermarked and Salling are reached.

The forecast of Crickster are mainly based on entering orders, which means future demand for the entire year is not made. The forecast are based on a couple of weeks ahead. In practice the strategic forecast is not made due to the fact they are continuously trying to get customer, which means the strategic forecasting would need to be revised more than once. However they have planned their product launches for the entire year, which gives them indication when to increase the output rate during the year. The sales and operation planning are revised more frequent, as Crickster launches new product families/series, which means they know which periods or months to increase output rate. The challenge is the forecast because customer demand are still relative unknown. If Crickster were to make detailed forecast the reliability would be rather poor, due to the limited data and by the fact of new products introduced to the market.

Sales and operation planning

This is the final chapter within Operations Management, which is about planning the production, when the system have been design and establishing of customer, supplier and distribution relationship. The prerequisite is forecasting, which is support by customer information here amongst. The next step focus around the development of the Sales & Operation Planning. But first the concept of Sales & Operation Planning:

The Sales and Operation Planning are perform by using information and collaboration among functions in management of marketing, financial and demand (production) to balance demand with supply in a time horizon with spans from a couple of months to a year. If demand is higher than supply, the cost might increase due to overtime and higher transportation cost. Other consequences are lost revenue because the demand is not fulfill or lack of quality or errors in the rush to deliver the products. Vice versa, if the supply is higher than demand more inventories built up and layoffs might be necessary to decrease the production rate. Furthermore, it might also result in price cuts or discounts (*Vollmann. Thomas. 2004. Manufacturing Planning And Control Systems For Supply Chain Management. McGraw Hill. Chapter 3*). The planning process also exist to signal early warning, when there is imbalance between the demand and supply. The planning of volume works on an aggregate level in order to estimate production rate, which means volumes are group in product series or families. Besides production rate overall sales rate, aggregate inventories and order backlogs (customer order for delivery in the future). The Figure 11 summarize the output form the Sales and Operations plan (production plan), when all the processes (light grey) are used as input to perform the Sales and Operation planning.

S&OP – Input & Output Process



Figure 11 - S &OP Input Output Process

It is important to point out that the Sales & Operation planning is a continuously process, which should be perform at least once a month, when actual demand is known in order to revise the production plan, which is one of the output of the Sales & Operation Planning process. The Figure 12 describes the step by step guide of SOP planning process (Vollmann. Thomas. 2004. *Manufacturing Planning And Control Systems For Supply Chain Management*. McGraw Hill. Chapter 3). The following text describes the Sales & Operation Planning process:

1. Run the sales forecast reports. By the end of the month the start-up can gather sales data for actual sales, production and inventories. For start-up the gathering sales data are an important step towards developing sales forecast in the future. Furthermore the data can be used to sales analysis reports and eventual changes to sales forecast.
2. The demand planning. Along with sales data the start-up must take into account for new products, promotions, price changes, competition and economic changes, large customer orders when revising the forecast for the time horizon of months or a year out. The start-up have a challenge due to the limited historic sales data one month, while other companies have several months or years data on existing products as input for forecast.
3. The supply (capacity) planning. The production plan for the product families is made with account for any changes to the sales forecast and inventory levels and customer backlog orders. The start-up

might experience the production not to be feasible due to capacity constraints (demand exceeds supply), which makes it necessary to adjust the production plan.

4. Pre-SOP meeting. Normally this phase or step involves different representatives from different functions meeting, but for a start-up these representatives will be the same people involved as in the previously steps. The purpose of the meeting is decision-making regards the balance between demand and supply. Discuss any problems with the production plan and evaluate any actions to solve the problems.
5. The executive SOP meeting. This meeting involves the top management of the company or organization, which in the case of start-up is still the same people involving in the decision-making. The start-up must make a decision from the previous phase for the production plan. This involve reaching agreements regarding any changes production, capacity or spending changes.

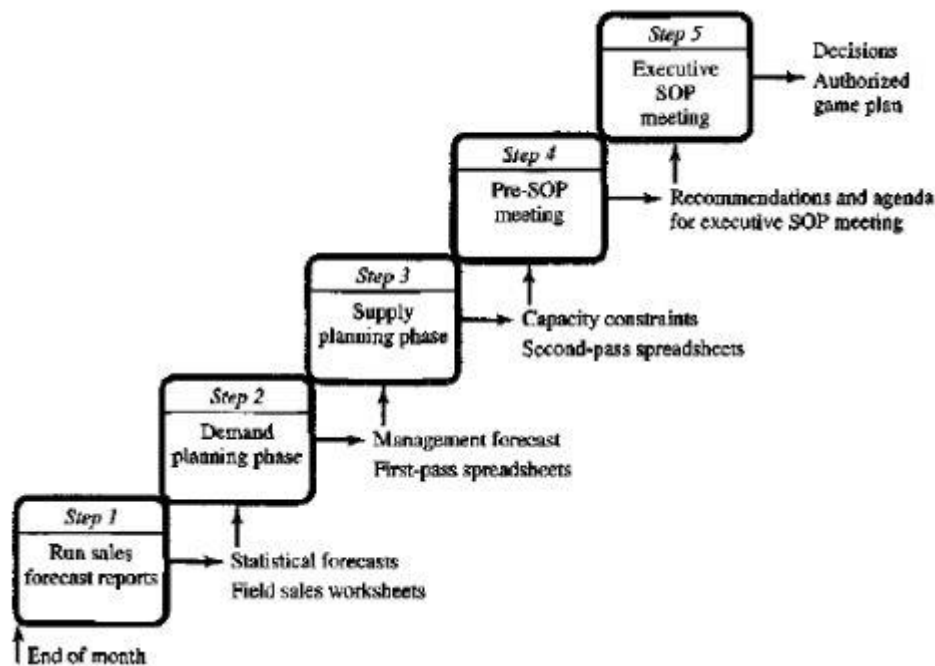


Figure 12 - S & OP Planning Processes

The Sales and Operation planning process is a discipline, which should be routine and develop by the start-up. To perform it once month can be beneficial, but depending on external changes (political, market, social, technology or competitors) might also indicate when to do Sales and Operation planning. This is done accommodate for backlogs and avoid back-order and stock-outs. The drivers for revising the production plan and sales plan are listed below:

- New competition (competitive force influences)

- Consumer demand (market and social trends)
- Price changes (cost increase/decrease on raw material)
- Technology (might give higher output rate)
- Regulation (new rules about certification, documenting or tax)
- New management (would like to revise the production plan)
- Mergers/acquisition (gives different resources and product mix)
- New product introduction (should enter into the plan)

In one literature when performing SOP there exist two planning method to the sales and operation planning (SOP), which are top-down planning and bottom-down planning (*Bozarth. Cecil.2012 3rd edition. Introduction to Operations & Supply Chain Management. Pearson. Chapter 10*). The choice of approach depends on different circumstances. The top-down planning is the most common approach. The aggregated forecast dictates the resource requirements for each product family at the individual periods. Another way top-down planning becomes appropriate is if the product mix require similar resources. Here the supply available is more or less the same from period, which gives the same product mix for the individual period. Later, these resources can be further divide to the specific products and order in the master production schedule. The bottom-up planning is characterize by a supply of products, which are unstable or products require different resources. Instead of aggregate forecast, the requirement of resources is estimate individually for each product family and then added up to get an overview of the resource requirements.

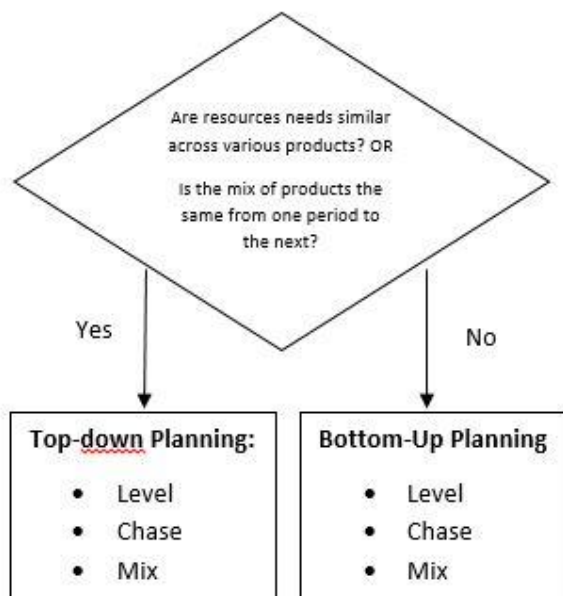


Figure 13 - Top-Down Planning & Bottom-Up Planning Decisions

The Figure 13 shows when to choose top-down and bottom-up planning. Furthermore it shows three kinds of production strategies, which differ from each other on how production and inventory levels are allowed to vary.

Level: Production level is fixed during every period, in which inventory is used to manage the difference between production and the sales forecast. This is used, when changing production level is very costly and inventory cost is low.

Chase: Production level is changing from period to period to match sales forecast. This strategy is suitable when holding inventory is very costly or the cost of changing production level is low.

Mixed: Production level and inventory level is changing. It is a mix between these two extremes.

The planning values, which are based on known historic data, experience or agreements is used to calculate resource requirements from the sales forecast. The purpose is to estimate the required working hours and the required workers. The cost of plan can be estimated from the estimated resource requirements. Cost for production, hiring and layoff cost and inventory is calculated.

Product planning values:

- Regular production cost: Cost per unit.
- Overtime production cost: Cost per unit.
- Average monthly inventory holding cost: Cost per unit, per month.
- Average working hour per unit: Hour

Production planning values:

- Maximum regular production per month: Units
- Allowable overtime production per month: Units

Workforce planning values:

- Hours per month per worker: Hours
- Estimate cost to hire a worker
- Estimate cost to layoff worker

For start-ups these planning values can be a challenge, because the workforce of the start-up may not have experience in the production, which makes it difficult to estimate average hour per unit and production cost. Hours per month per worker can be easier to find, because it is determined by mutual agreement among the

workers and the company. The start-up must use the method analysis and work measurement (described in The Design of Work Systems) to estimate average working hour to produce a unit.

The planning values can help the company to quantify the effect of the chase, level and mixed production strategy. The difference between level strategy and chase strategy, is level strategy might hold more inventory resulting in higher monthly inventory cost. While chase strategy might result in higher cost related to hire and layoff of workers and overtime cost. For an entrepreneurial start-up to hire and layoff workers might not be possible or makes sense from a financial view. Compared to big companies and organization having larger capital than a smaller entrepreneurial start-up, they can easier implement chase strategy in its “purest” form. Level strategy might be easier for the start-up to implement in practice, because they can work with same constant workforce and are independent on hire people from outside. Depending on the product, it might not beneficial to hold up too much inventory, especially for start-ups having a new product and therefore forecast not too reliable. This is why the mixed strategy might be more beneficial because it have both elements from the chase strategy and level strategy. While level uses inventory to handle fluctuations in demand and chase uses hiring, overtime and layoff, the mixed strategy will use all three methods to handle fluctuations. However, the difference is that mixed strategy will make management policies for the maximum inventory level, amount of workers to be layoff in a period or maximum overtime and hiring allowed for a period. This constellation might help reduce trade off cost from the hiring, layoff cost, overtime cost and inventory cost between the level and chase strategy. Therefore the mixed plan can be done in different ways, because the goal is to develop the best plan. The Figure 14 shows an example of production plan with a mixed strategy. Notice that plan is express in months and inventory is increasing during periods, while hiring also exist.

MONTH	SALES FORECAST	SALES (IN LABOR HOURS)	SALES (IN WORKERS)	ACTUAL WORKERS	REGULAR PRO-DUCTION	ALLOWABLE OVERTIME PRODUCTION	OVERTIME PRO-DUCTION	HIRINGS	LAYOFFS	INVENTORY/BACK ORDERS
				100.00						100.00
January	750	15,000	93.75	100.00	800.00	80.00	0	0.00	0.00	150.00
February	760	15,200	95.00	100.00	800.00	80.00	0	0.00	0.00	190.00
March	800	16,000	100.00	103.00	824.00	82.40	0	3.00	0.00	214.00
April	800	16,000	100.00	106.00	848.00	84.80	0	3.00	0.00	262.00
May	820	16,400	102.50	106.00	848.00	84.80	0	0.00	0.00	290.00
June	840	16,800	105.00	106.00	848.00	84.80	0	0.00	0.00	298.00
July	910	18,200	113.75	106.00	848.00	84.80	0	0.00	0.00	236.00
August	910	18,200	113.75	106.00	848.00	84.80	0	0.00	0.00	174.00
September	910	18,200	113.75	106.00	848.00	84.80	0	0.00	0.00	112.00
October	880	17,600	110.00	106.00	848.00	84.80	12	0.00	0.00	92.00
November	860	17,200	107.50	106.00	848.00	84.80	12	0.00	0.00	92.00
December	840	16,800	105.00	106.00	848.00	84.80	0	0.00	0.00	100.00
Totals:	10,080				10,056		24	6	6	2,210.00

Figure 14 - Example of Production Plan

As the Sales and operation (production) plan reflects the cost and resources used, the capital (financial aspect) must also be taken into consideration. The start-up must assess if they have the require capital to fund their plan. Net cash flow is define as the flow of DKK (danske krone) into or out of the company in a period. In form: $\text{Net cash flow} = \text{cash inflow} - \text{cash outflow}$. The inflow represents the revenue transformed from the production, while cash outflow represents regular production cost, inventory-holding cost and overtime cost. With the cash flow analysis the company can estimate how much to generate, cost and debts (negative cash flow) in different months in the production plan.

Controlling the sales and production plan

In order to be measure the production plan it is important that the production plan is revise, and there several metrics or measurement to be use to evaluate, which are list below (<https://www.slideshare.net/anandsubramaniam/sop-process>):

- Actual sales vs. forecast
- Inventory vs. plan
- Cost vs. plan
- Backlog vs. plan
- Production vs. plan
- Delivery vs. target
- Profit vs. plan

The different performance measure of the production plan require that the plan have been implement. The control should be perform periodic. If actual sales for a period is lower than forecast, this should be consider changing the forecast. If inventory levels is higher than planned, this can be due to higher production rate. The cost can be in suddenly changes in capacity, than planned. Backlog might be cancel or not come later or before than planned. Delivery performance might indicate lack of supply, due to higher sales than expected. All these measurement should be control and if not control and modify be fatal for the survival of start-up.

Sales & Operation Planning of Crickster

The Sales & Operation Planning of Crickster is not fully develop yet due to the uncertainty of the demand forecast. Planning values are use to a minimum by only incorporating the fixed cost, because the members do not pay salary to themselves The current production strategy is similar to chase strategy, because the demand is currently much lower than the supply (capacity). The members are planning production according to the backlogs or known orders (entering orders). Apart from the known orders, the planning in the future considers the samples and prototypes of new products.

Sum up

As the report was worked out on the basis of the initial problem statement + research questions (shown below), this chapter will summarize the main points from the analysis of the different chapters to answer research question 1 and 2. Because the questions are closely linked to each other the questions will be answer together.

1. Which considerations and actions will new start-ups face from the beginning?
 2. What are the focuses for start-ups in the different areas of System design, Sourcing & Distribution, Customer relationship & Forecasting and Sales & Operation Planning.
- The first chapter dealt with the Business Strategy, in which the first and most influential decisions are made because it affect how the rest of operations must be aligned with. The industry, customer target group and which generic strategies an entrepreneurial will use to differentiate sets the guidelines and conditions. After the business strategy, the operational strategy was initiate.
 - The Operational Strategy deal how these ideas can be transform into a product, as describe in the initial problem description. The starting point was on the System Design, in which the Product Design was the first area present. The product design phase showed the importance of prototype and testing to get feedback on the product as well as feasible analysis to estimate demand.
 - The next step was Capacity Planning, in which cost-volume analysis to estimate fixed and variable cost with different capacity set-up. An important note for start-ups is also to be aware of the require skills and what should be done in-house and out-house because a start-up might not have enough capital and/or skills to do everything.
 - With the chosen capacity, the start-up must determine the arrangement of the machines, equipment, people with a layout and the flow of materials with the processes. The different layout types and process types might help the start-up to decide how flexible or efficient the operation require. But most important for start-up is to identify the require processes to produce the products.
 - The Design of Work Systems dealt with tools to identify and able to estimate the best methods and measurements of operations. This might not be the focus for a start-up or possibility due to the limited experience of performing the task and lack of knowledge/skills. There is no doubt that flexibility is an important characteristic for an start-up, which means a lot of job rotation but also autonomy due to limited workforce. The members will work more like a team by interfering or overlapping each other functions/tasks.

- The following chapter concern about Sourcing & Distribution, in which establishing a relationship with a supplier is essential. The main point is that relationship is heavily influence on the industry, the density of supplier and the position of the buyer/supplier. For a start-up they will usually manage the small role and dependent of the supplier. The distribution focus on how the products are deliver to the customer. Dealing with the distribution and logistic is an area, which can be extensive and require much investment. For a start-up outsourcing this area might be preferred in order to focus on their main business.
- Customer Relationship & Forecast, is about using customer information to estimate future demand. The customer information can come from current order, but most important through customer agreements can help estimating the demand. For start-up with limited historic sales data, the focus is primarily to acquire customer agreements through establishing customer relationships and promoting. Forecasting might therefore be based more on qualitative assessment for example the strategy directions (which will be discussed later) will support this.
- The Sales and Operation planning area was the focus of this report, which dealt with working out a production and sales plan by matching supply with demand in a time horizon ranging from months to a year. The production plan can be work out in different ways dependent on which production strategy applying. The type of production plan affect the inventory level, production level and cost. One of the main point is to find the most feasible (net cash flow analysis) and less costly production plan in consideration of the resource and capital of the start-up. The must important main point or focus of this chapter is the start-up learn the steps and development of the processes of performing the Sales and Operation planning. This require they focus on estimating the planning values, which is the costs relate to running the production (also support by net cash flow analysis). If the start-up does not manage the sales and operation planning to a certain degree its not only more costly, but might also be decisive for their existence.

The strategic direction after the start up stage

This chapter will answer the last research question in order to conclude the main points to answer the initial problem statement in the conclusion: ***What are the require steps for an entrepreneurial start-up to take in order to transform their ideas to an output (product)?***

3. *How will the strategies impact on the decision making in the different areas and (S &OP) planning currently and in the future?*

The research question have already been partly answer in the chapter Business strategy. It shows that the operational strategy and the business strategy must be align. The business strategy creates the condition and how the company can be successful or competitive. The operational strategy will use the ideas to create the methods and actions to fulfill this formulate core competencies. Afterwards presentation of the different areas of System design, Sourcing & Distribution, Customer Relationship & Forecasting and Sales & Operation Planning were present to point out that the strategy business strategy comes before and have impact of the design, management and planning of the operations. This answer how the strategy sets the direction, in which the operations must follow currently. Moving on this chapter will give an strategical perspective of impact of the strategy in the future. Given that the start-up survive and enter the growth stage, which is define as the entrepreneurial start- up must begin to employ more workers and consider to going from doing “everything” to focus more on the management (Johnson, Gerry. 2011. *Exploring Strategy Text & Cases*. Pearson, chapter 9). When entering a new stage the company must at some point decide in which strategic direction they will go.

The Figure 15 is used to describe 4 different directions for a corporate strategy, called the product/market

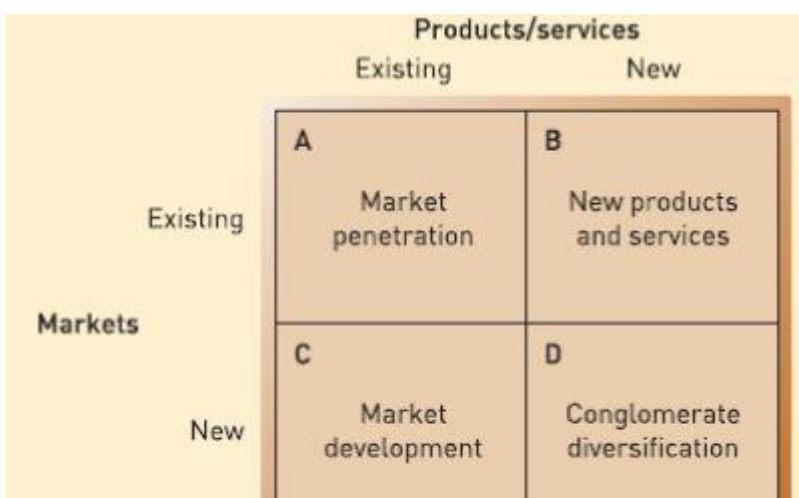


Figure 15 - Strategic Direction

growth strategy matrix (Johnson, Gerry. 2011. *Exploring Strategy Text & Cases*. Pearson, chapter 7). The starting point for the entrepreneurial after experience growth is zone a, in which they have “penetrate” the market to capture market share of the target market. However before this stage as a start-up, both market and product are consider “new”.

Depending on which of the direction the company choose, the strategy will naturally also have an impact on the System Design, Sourcing & Distribution, Customer Relationship & Forecast and Sales & Operation Planning. To answer the research question, it will present the impact from the four strategies.

Market Penetration:

- System design: if the entrepreneurial choose to continue, “penetrate” the existing market further with the existing products, the company must consider the scale up to increase the capacity in order to increase the production by move to a bigger facility/plant or increase machine/equipment. The process and layout might also need to be revise, whether to change the arrangement of the machines or flow to increase the output rate (economies of scale = decreasing unit cost). The work content will most likely also change, which means the members must change the way they work, which means more structure and less job rotation because they have specific functions.
- Sourcing & Distribution: Scaling up the production of the existing products will also mean scaling up the sourcing of supply or raw materials. This require negotiating a new agreement, in which the possibility enable a better deal with its supplier. The same counts for the agreement with the distributor, because it enable them to distribute bigger packages, which can decrease the unit price per sending.
- Customer relationship and forecasting: Before scaling up the company must consider whether there is enough demand to do it. This include revising the forecast method as well as analyze the sales data along and more promotion to strengthen the customers’ awareness of their existing products. This might also mean negotiating new customer agreements with the current customers and/or establishing new agreements.
- Sales & Operation planning: As the supply and demand increases of the existing the products this mean the sales and production plan need to be update. New customer agreements and backlogs will need to be incorporate in the new plan as well. The production strategies might also need to be revise with the increase capacity and more staff. This involve revising or adjusting the desire inventory level, maximum capacity per worker for the period and overtime.

Product development

- System Design: The product design phase is the initial starting point for developing new products. here the same steps are require as describe in start-up stage, in which feasible analysis, prototype and market test as important activities. Usually developing new products, will require the system to be design be more flexible. It depends on the design of the product, but assuming

the new products is target same market, it must also satisfy similar needs. The capacity set-up, the process type and layout type will need to be revise. The flexibility does also concern the members to handle a broader product variety, change the function, and work content of the members and employees.

- **Sourcing & Distribution:** The new products will usually also require the same materials, but those that differ must be source. If the new raw materials can be access through the current supplier, this might be preferable to enable a better deal. The agreement with the distributor might also need to be revise. It also depend on the volume, because develop new product does not necessary mean increasing the volume.
- **Customer Relationship & Forecasting:** Eventual new customer agreements or renewable agreements with its current customer including the new products must be incorporate in the new forecast. Here is should be notice that the development of a new product, which can be perceive as a substitute for the existing product, might decrease the demand for the existing, which should be assess.
- **Sales & Operation Planning:** The launching of the new product should be update in the production plan as well as revising the production plan, because the inventory cost, production cost and production time per unit will also change. Again, the production strategies must be update with the policies of desired inventory level, maximum capacity for the period and overtime.

Market development

- **System design:** Similar to the market penetration, the design must be design to a higher output rate. Because the products remain the same, but different market, it will not require much change if not any, of the product design. However expanding to other market will mean increasing the production. However, feasible analysis, prototype and market test would be preferable to test them to the new users or geographical market. A new geographical market might also requiring moving the location of the facility.
- **Sourcing & Distribution:** The market development might also result in sourcing a new supplier locate closer to the new market given that the facility also moves. If not case, the current supplier is still used. The distribution channel will most likely change by aiming for new users and/or new geographical market. A new agreement with the distributor or finding a new one might be necessary to reach new markets.

- **Customer Relationship & Forecasting:** Entering a new market means doing market research on the competitors and analyze the environment similar in the business strategy. The competitors and existent product might differ in another geographical market or another customer group. The business strategy should be revise along with the marketing strategy. The forecasting of new markets must take into consider the new business strategy, because of the different market. The must also develop new relationship to show their products, because they are at the same starting point as when they were a start-up. In a new market the products might be perceive as new.
- **Sales & Operation Planning:** The forecast will most likely be revise to account for increasing demand with its current market + new markets, which means the Sales & Operation planning process must perform again to work out a new production and sales plan. Again new policies regarding inventory level, overtime allowable and unit per worker per period must be revise. A new geographical market might also increase the delivery time, which should also be taken into account.

Conglomerate diversification

- **System design:** The strategy of develop a new product to a new market require for most changing in the design of the company and the design of the system. The product design phases describe in the start-up stage is similar. Again is the challenge of what to do in-house and outsource due to the lack of skills/knowledge about producing a new product in a different industry. This will most likely also require further investment and/or funding capital for a new capacity set-up, in which cost-volume analysis is require. The company must starting point is accurate the same as in their start-up stage regarding layout and process selection. The design of work system might require more hiring to managing and operate the business.
- **Sourcing & Distribution:** Sourcing of new supplier will most likely be necessary, but also depending of the size and product variety of the supplier. New relationships is characteristic within this area. This means change or require renewal of current distributors. It's the same process again as describe in the start-up stage.
- **Customer relationship & Forecasting:** Again the characteristic is new establishing of new customer relationships and agreements. Forecasting method must be develop in alignment of the business strategy and marketing strategy.

- Sales & Operation Planning: Since the production or facility will be different, the Sales & Operation planning must develop separate from the planning of the existing products. Besides formulating the policies or target of inventory level and output the different cost (planning values) mentioned in the start-up stage must be estimate. The production strategies must also be assess as well as net cash flow analysis.

Conclusion

This chapter will conclude based on the main points from the research question to answer the initial problem statement: ***What are the require steps for an entrepreneurial start-up to take in order to transform their ideas to an output (product)?***

As the starting point is entrepreneurial start-up the report took its offset of the condition and focus an entrepreneurial in their start-up stage. The capabilities, resources and capital are different compare to companies with organization behind (e.g. owned) or already establish companies. As a start-up the innovative ideas (formulate /address in the business strategy) must be find a way to transform them to a physical product. The focus describe were first the funding of their capital or business. Second to sell product in order to keep the business running. In order to do so the given theme encircle around Operations Management. Within this theme the System Design, Sourcing & Distribution, Customer Relationship & Forecast and Sales & Operation Planning. System Design was divide in smaller fragments of Product Design, Capacity Planning, Process & Layout selection and Design of Work System. These are the key areas to pass through in order to run the necessary operations to produce and deliver a product. The actions, steps and methods was found within these key areas. The sequence of all the key areas presents a logical approach but not necessary only “right” sequence in order to answer the initial problem statement. It can be argue that the key areas overlap each other or can be done simultaneously. For example a planning the require capacity does not necessary prerequisite the design of the final product is taken. By presenting the key areas one at the time, it gives an better overview of the require methods and actions within the individual areas, instead of mixing all key areas together.

From the chosen key areas within Operations Management, the report present the processes, actions and methods require within key areas. There is no doubt that the as a start-up the members with limited capital, resources and knowledge/skills the biggest challenge is that they cannot do everything and must prioritize what they are capable of and what is important. The first thing is the capital, which concern about the finance or funding of the business. With limited capital they cannot afford big investment and must prioritize and follow tight budget, which gives limited resources. Furthermore it also limit the possibility to hire extra people for expertise, knowledge and skills, which means the members must rely more on each other. Given that constellation, this will also have an impact in the key areas.

The Table 3 summarize the methods, analysis, processes, tools and so on describe in the different chapters. In addition it describes how should use these methods, analysis and tools in their situation as a start-up.

Key areas/chapters	Methods, analysis, process	Focus/approach for an start-up
Business Strategy	Generic strategies & Porters 5 forces	Core competencies, how to differentiate from competitors
Operational Strategy	Operations Management	Designing the system, planning the operations
Product Design	Feasible analysis, Prototype, Market test	Feedback, the core competence, what to do in-house (financial constraints), legal constraints, understanding customer needs
Capacity Planning	Cost-volume analysis, fixed cost and variable cost	What to invest and rent, expect profit, less investment (financial constraints)
Process & Layout Selection	Analysis of volume or/and flexibility require	Flexibility due to continuously launch of product, process/layout might change
The Design of Work Systems	Method analysis, work measurement	Team work, overlapping and compensate each other knowledge/skills
Sourcing & Distribution	Establishing a Supplier Relationship and distribution channel	Require raw materials and skills/knowledge/resources outsourcing, e.g. distribution
Customer Relationship & Forecasting	Customer information, relationships and forecasting, marketing strategy	Acquiring customer agreements, using customer information, development of forecast method, gathering sales data
Sales & Operation Planning	Theories of: S & OP processes, top-down or bottom-up planning, production strategies, production plan, net cash flow, evaluate cost, managing and control of plan	Development of S & OP Processes, estimating planning values, develop of policies evaluate production strategies (mix most feasible), financial

		constraints shown net cash flow, no worker cost or overtime cost and layoff
Strategic Direction	Product/market growth mix strategies	The next “step” in the growth stage and business strategy must be align with the operations and agreements, less job rotation, more management

Table 3 - Main points of the chapters and key areas

The Table 3 shows in general that the financial constraint given the start-up less resources than other establish companies, forces them to focus, prioritize and approach the operations different. They work with many unknown factors, uncertainty of their product feedback, no customer information, no historic sales data, less resources. This forces them to be more flexible to handle different tasks and decisions, focus on what they know and what they don't know (in-house and outsource), more careful on estimating cost, profit and demand. The financial aspect can't be denied especially to have an impact for start-ups.

The steps towards transforming the ideas to an input are in overall; designing the system in consideration of the desired output. Estimating cost, profit of the design of the system. The establishing of relationship with customer, supplier and distributor and then estimating demand. Estimating the planning values, formulating the policies and development of the planning processes before balancing supply with demand through planning and control.

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