



Fruit and Vegetable Processing

Level III

Based on May 2019, Version 2 OS and
March.2021, V1 Curriculum



**Module Title: - Participating in Product
Development**

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Contents

LO #1- Research opportunities for new product.....3

Instruction sheet 3

Information Sheet 1- Identifying market characteristics 4

 Self check-1 7

Information Sheet 2- Matching market opportunities for new product development 8

 Self-Check – 2..... 10

LO #2- Develop a product proposal to meet market opportunity..... 11

Information Sheet 1- performing evaluation of competing products..... 13

 Self-Check – 1..... 16

Information Sheet 2- adapting existing formula to produce new product 17

 Self-Check – 2..... 27

Information Sheet 3- Determining method of assembly and presentation 28

 Self-Check – 3..... 33

Information Sheet 4- estimating cost of production..... 34

 Self-Check – 4..... 45

Information Sheet 5- presenting product concept 46

 Self-Check – 5..... 51

Reference Materials 54

**LG #43****LO #1- Research opportunities for new product****Instruction sheet**

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- identifying market characteristics
- Matching market opportunities for new product development

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identifies market characteristics
- Matches market opportunities for new product development

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If your performance is satisfactory proceed to the next learning guide,



Information Sheet 1- Identifying market characteristics

1.1..Definitions of Market

A market is a composition of systems, institutions, procedures, social relations or infrastructures whereby parties engage in exchange. While parties may exchange goods and services by barter, most markets rely on sellers offering their goods or services to buyers in exchange for money

“Economists understand by the ‘Market’ not any particular market place in which things are bought and sold but the whole of any region in which buyers and sellers are in such free intercourse with one another that the prices of the same goods tend to equality, easily and quickly.”

Business people tend to use the term 'market' to describe the groups of individuals or organizations that make up the pool of actual and potential customers for their goods and services. These groups fall into one or more of the following categories: geographic, demographic or socioeconomic, psychographic, behavioural or sectoral.

1.2. Essential characteristics of a market are as follows:

- One commodity
- Area
- Buyers and sellers
- Perfect competition
- Business relationship between Buyers and Sellers
- Perfect Knowledge of the Market
- One price
- Sound Monetary System
- Presence of Speculators

One commodity:In practical life, a market is understood as a place where commodities are bought and sold at retail or wholesale price, but in economics “Market” does not refer to a particular place as such but it refers to a market for a commodity or commodities i.e., a wheat market, a fruit market or a gold market and so on.

Page 4 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Area:In economics, market does not refer only to a fixed location. It refers to the whole area or region of operation of demand and supply

Buyers and Sellers: To create a market for a commodity what we need is only a group of potential sellers and potential buyers. They must be present in the market of course at different places.

Perfect Competition:In the market there must be the existence of perfect competition between buyers and sellers. But the opinion of modern economist is that in the market the situation of imperfect competition also exists, therefore, the existence of both is found.

Business relationship between Buyers and Sellers: For a market, there must exist perfect business relationship between buyers and sellers. They may not be physically present in the market, but the business relationship must be carried on.

Perfect Knowledge of the Market: Buyers and sellers must have perfect knowledge of the market regarding the demand of the customers, regarding their habits, tastes, fashions etc.

One Price: One and only one price be in existence in the market which is possible only through perfect competition and not otherwise.

Sound Monetary System: Sound monetary system should be prevalent in the market, it means money exchange system, if possible, be prevalent in the market.

Presence of Speculators: Presence of speculators is essential just to supply business information's and prices prevalent in the market.

1.3. Market structures

Market structure refers to the nature and degree of competition in the market for goods and services. The structures of market both for goods market and service (factor) market are determined by the nature of competition prevailing in a particular market.

Determinants:

There are a number of determinants of market structure for a particular good.

They are:

- The number and nature of sellers.

Page 5 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



- The number and nature of buyers.
- The nature of the product.
- The conditions of entry into and exit from the market.
- Economies of scale.

The number and nature of sellers: The market structures are influenced by the number and nature of sellers in the market. They range from large number of sellers in perfect competition to a single seller in pure monopoly, to two sellers in duopoly, to a few sellers in oligopoly, and to many sellers of differentiated products.

The number and nature of buyers: The market structures are also influenced by the number and nature of buyers in the market. If there is a single buyer in the market, this is buyer's monopoly and is called monopsony market. Such markets exist for local labour employed by one large employer. There may be two buyers who act jointly in the market. This is called duopsony market. They may also be a few organised buyers of a product.

The nature of the product: It is the nature of product that determines the market structure. If there is product differentiation, products are close substitutes and the market is characterised by monopolistic competition. On the other hand, in case of no product differentiation, the market is characterised by perfect competition. And if a product is completely different from other products, it has no close substitutes and there is pure monopoly in the market.

Page 6 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Self check-1	Written test
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Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Write the Short Answer Questions

1. List atleast four market characteristics?(4pts)

Test II: Write true if the statement is correct and false if statement is incorrect

1. Perfect competition in the market there must be the existence of perfect competition between buyers and sellers. (2pts)

2. A market is a composition of systems, institutions, procedures, social relations or infrastructures whereby parties engage in exchange?(2pts)

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

You can ask you teacher for the copy of the correct answers.

Score = _____
Rating: _____



Information Sheet 2- Matching market opportunities for new product development

2.1. Introduction

Marketing plays a critical role in sales. The marketing department introduces products to the consumer, and creates strategic messaging that elevates appeal and ultimately drives sales. The feedback and response from consumers is measured by the marketing team on a variety of levels. Advertising is one means of seeing what performs and what does not perform. Marketers will note trends and demand in their specific markets.

This plays into new product development, because the marketing team can work with product developers to create products based on that demand. It's the role of marketing management to make this connection, and to find an efficient way to communicate response from the marketing department to the product development team. That input should influence how the product development team approaches and designs its new line of products. Essentially, the team is able to design based on real market feedback and on competitor analysis

2.1. market opportunities for new product

Developing products targeting people:

- who are suffering from such chronic diseases
- high risk population
- Avoidance and prevention

Concept of product development

a) Obesity

Too much fat/calorie in foods

- Low fat/calorie

b) Diabetes

– Too much sugar/high Gastro intestinal(GI) foods

Page 8 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



- Low sugar/low Gastro intestinal(GI) foods

2.2. New product development in marketing

New product development (NPD) is the process of bringing a new product to the marketplace. product innovations created and brought to the market for the first time. They may be completely original products, or existing products that you have modified and improved

2.3. Product development opportunities

A product opportunity exists when there is a gap between what is currently on the market and the possibility for new or significantly improved products that result from emerging trends

Page 9 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Self-Check – 2	Written test
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Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Write at least two reason of produce new product development for target people ?(4pts)

Test II: Write true if the statement is correct and false if the statement is incorrect

1. Product opportunity exists when there is a gap between what is currently on the market and the possibility for new product development (2pts)

Note: Satisfactory rating above 3 points

Unsatisfactory - below 3 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

Page 10 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



LG #44	LO #2- Develop a product proposal to meet market opportunity
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Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- performing evaluation of competing products
- adapting existing formula to produce new product
- determining method of assembly and presentation
- estimating cost of production
- presenting product concept.

This guide will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- perform evaluation of competing products
- adapt existing formula to produce new product
- determine method of assembly and presentation
- estimates cost of production
- present product concept

Learning Instructions:



1. Read the specific objectives of this Learning Guide.
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4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, ask your trainer for further instructions or go back to “Operation sheets”.

Page 12 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Information Sheet 1- performing evaluation of competing products

1. Perform Evaluation of competing products:

A competitive product analysis is an evaluation and comparison of your competitors' products and how your own products stack up. A thorough competitive product analysis involves looking at many dimensions, including functionality, reliability, and use cases

Evaluation of competing product through :

- Observation
- Taste product
- Strength and weakness opportunity and threat (swot)

Taste test

Taste tests are one of our most popular research methods. These tests involve consumers tasting products within a controlled environment and then giving their opinion, also referred to as Central Location Tests (CLTs). This is a quantitative research method and can be used to understand how well a product performs against competitor alternatives or to establish if a new recipe is worse, as good or better than the original.

Taste tests are typically conducted 'blind' – meaning that the panellists will be unaware of the brand that they're testing. This is the most effective way of taste testing, as it ensures there's no bias that might occur because of a panellists pre-conceived opinions or ideas about a certain brand or product.

There are two main types of taste test. Single Product Tests involve panellists testing one product and giving their views. These tests can be repeated over time, allowing you to become aware of any changes in their tastes or perceptions of the product. Or Comparison Tests which involve panellists trying more than one variation of the same

Page 13 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



product, this is ideal for determining which formulation consumers prefer or to understand how your product performs against competitor alternatives.

1.2. Competitors for product development

Primary Competition: These are our direct competitors, which means they're either targeting the same audience or have a similar product or both.

Secondary Competition: These competitors may offer a high- or low-end version of our product, or sell something similar to a completely different audience

1.3. Method of competitor product analysis through

- a) Identify competitors
- b) Gather information about your main competitors
- c) Analyze the competitions strengths and weakness
- d) Talk to your competitors directly
- e) Identify your competitive advantage

a. Identify competitors:

A competitor is someone who targets the same market segments as you with a similar product. As such, an advertisement company could operate next to another company that also sells advertisement without competing.

Types of competitors

There are three types of competitor. These are as follows

- Direct competition
- Secondary or indirect completion
- Substitute competition

b. Gather information about our main competitors

Once we've identified your main competitors, we'll want to gather as much information as possible about them. Gather information about products and sevice, pricing, positioning & branding and market reputation.

Page 14 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Our Business	Product Quality	Product Fidelity	After Sales Service	Customer Service	Price	Shipping Speed
Competitor 1						
Competitor 2						
Competitor 3						
Competitor 4						
Competitor 5						
Competitor 6						

Figure -3. Competitive product analysis

FACTOR	My Business	Strength	Weakness	Competitor A	Competitor B	Competitor C	Importance to Customer
Products							
Price							
Quality							
Selection							
Service							
Reliability							
Stability							
Expertise							
Company Reputation							
Location							
Appearance							
Sales Method							
Credit Policies							
Advertising							
Image							

Figure 4. evaluation of competing product format



Self-Check – 1	Written test
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Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: choice

- 1. Which one of the are one of our most popular research methods?(1.5pts)
 - a. Observation b. competitor c. taste d.all

Test II:write short answer questions

- 1. Write at least three method of competitor product analysis.(5pts)

- 2. List out at least two types of competitors.(3.5pts)

Note: Satisfactory rating above 5_ points **Unsatisfactory - below 5**

You can ask you teacher for the copy of the correct answers.

Score = _____
Rating: _____



Information Sheet 2- adapting existing formula to produce new product

2.1. Adapting existing formula to produce new product

Product adaptation is the process of modifying an existing product so it is suitable for different customers or markets. An adaptation strategy is particularly important for companies that export their products because it ensures that the product meets local cultural and regulatory requirements. Adaptation is also important for companies that want to introduce new products but do not have the funds or resources to develop completely new items. The top four factors driving product adaptation are culture, market development, competition and laws.

Product adaptation is also an important strategy for dealing with competitive threats. If competitors introduce new products that outperform your offering, they may take market share from you. By analyzing competitors' product specifications, you can identify aspects of your own products for improvement. You also can respond quickly to competitive threats, rather than taking the time to develop new products.

Understanding Recipes

Recipes standardize the structure of all information that describes production of one or more products. Recipes have:

- Formulas that define the relationship of material resources, including products, ingredients, and byproducts.
- Routings that define the relationships of nonmaterial resources, including labor and equipment operations with activities and their associated resource. Routings are optional.
- Processing instructions that encompass the work instructions needed to produce the products.

Page 17 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Adapting existing formula:

- Ingredients list in order by decreasing weight
- Almost always listed as percentage but recipes are tested many times to make sure they work the same way before they are used for customers.

Conversion factors:

it is the number that comes from dividing the yield want by the existing in a recipe.

Parts of recipe includes: product, yield, portion size, ingredient quantity, preparation procedures, cooking temperatures and cooking time. Both recipes and formulas contain all ingredient list. The list includes all ingredient that will be used in the equipment.

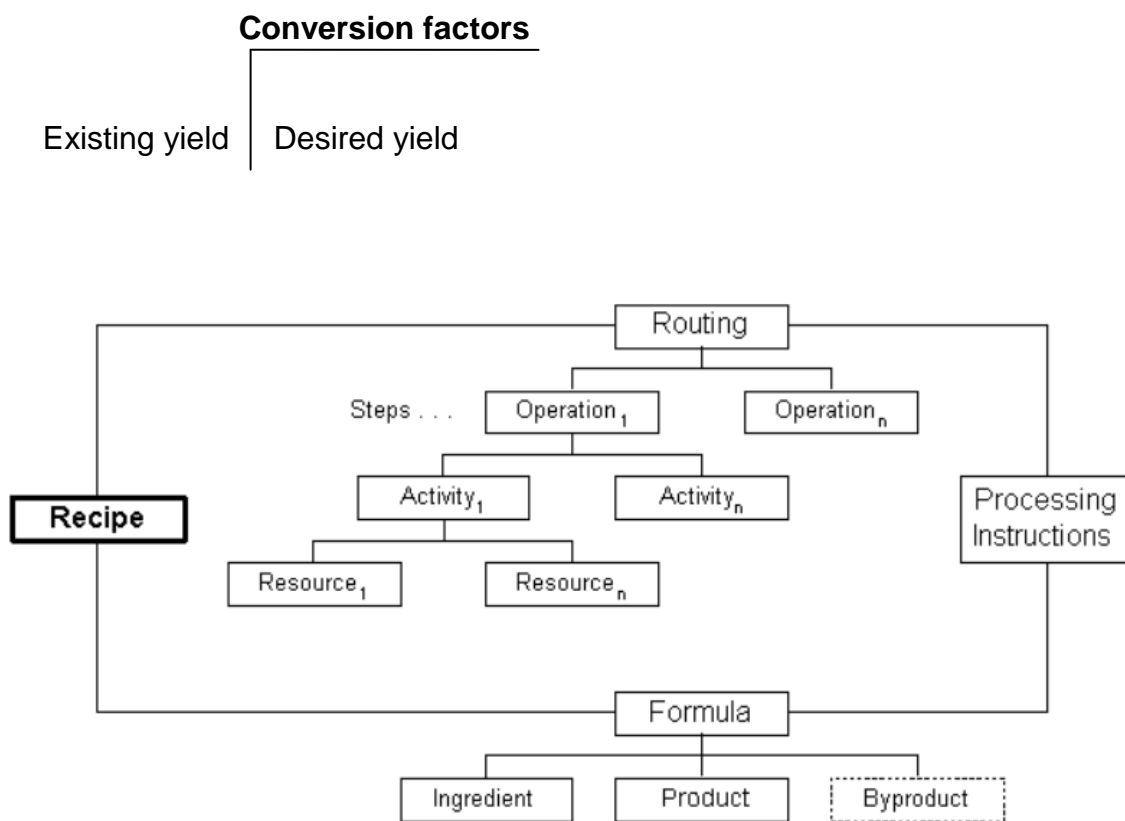


Figure -5. Existing formula/recipe to produce new product



Customer Research

The need for product adaptation in a foreign market is majorly related to customer needs. In fact, the same is true of any market. By comparing the features that customers consider important with your current product specification, you can identify gaps and opportunities to improve the product's appeal. Comments on product review sites or through social media interaction can help you identify customer preferences, and local experts can help to identify cultural variations that may exist between domestic customers and those in foreign markets. Your sales representatives also may be able to recommend changes that customers have requested.

Export Research

Adapting products for export can be an important strategy for expanding your business. It gives you the opportunity to increase revenue by entering new markets for your existing products. However, to be successful, you must carry out thorough research into the markets you are considering and the potential impact on your business in terms of the time and cost to adapt products. Adaptation strategies for export territories must take account of a number of factors, including cultural preferences, price, quality standards, measurement systems, service and support

2.2. Adapting existing products, services and ideas

Aside from inventing a new product or service, an entrepreneur may also consider adapting an existing product or service to satisfy a demand for a new or previously unknown customer trend.

Page 19 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Adaptation

It is the process of changing an existing product or service so that it is suitable for different customers. This can often be seen as a less risky business option than launching a brand new product.

One form of adaptation is when a product is changed or altered to appeal to different customers. For example, a restaurant may change its menus and serve a wider range of foods as customers' tastes change. One example of this is the move by some restaurants to offer a larger range of vegan dishes.

Types of adaptation

Types of adaptation include:

- a) Changing a product's brand name, packaging or logo to keep it up to date. Subtle changes to a brand name or to the packaging of a product might be all it takes to boost sales of an already successful product into a new market.
- b) Changing the format of a product, for example, a cereal manufacturer might start selling cereal snack bars. Altering the colour or style of a product in response to new fashions and trends in the market. For example smartphone manufacturers continually improve on the original design of the first smartphones, each year making improvements on design and performance in new versions of their products.
- c) Adapting the strategies used for promotion and advertising of goods and services. This might be achieved through special offers, discount codes or changing advertising to focus on social media or TV.
- d) Some products can be adapted with new innovations. For example, the mango jam, jellies and other new products has been adapted and modified to suit vegan consumers in response to the growing demand for sugar-free fruit products.

2.3. Main ingredients used to produce competing products

- Fruit or vegetable product
- Artificial flavor
- Food additive
- ,artificial sweetener
- Food colouring
- Preservative
- Sugar substitute

Page 20 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



2.4. **New fruit products targeting different ethnic and demographic groups:**

In the minimally processed fruit category, some companies have started developing new package designs for their produce to meet demands of specific demographic groups, for example, fruits in a tub or bowl designed for children. Some fruit juice and juice drinks are also aimed at specific demographic groups. Fruit drinks for school children, for example, are designed to be convenient and include juices fortified with vitamins and minerals.

2.5. **definition new product**

'New products' can be: products that your business has never made or sold before but have been taken to market by others. product innovations created and brought to the market for the first time. They may be completely original products, or existing products that we have modified and improved

The term new product can mean different things. Six different categories of new products can be

Categories of New Products

- New-to-the-world Products (***really new*** Products)
- New-to-the-firm Products (new Product Lines)
- Additions to existing Product Lines
- Improvements and Revisions to existing Products
- Repositionings
- Cost Reductions

Page 21 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021

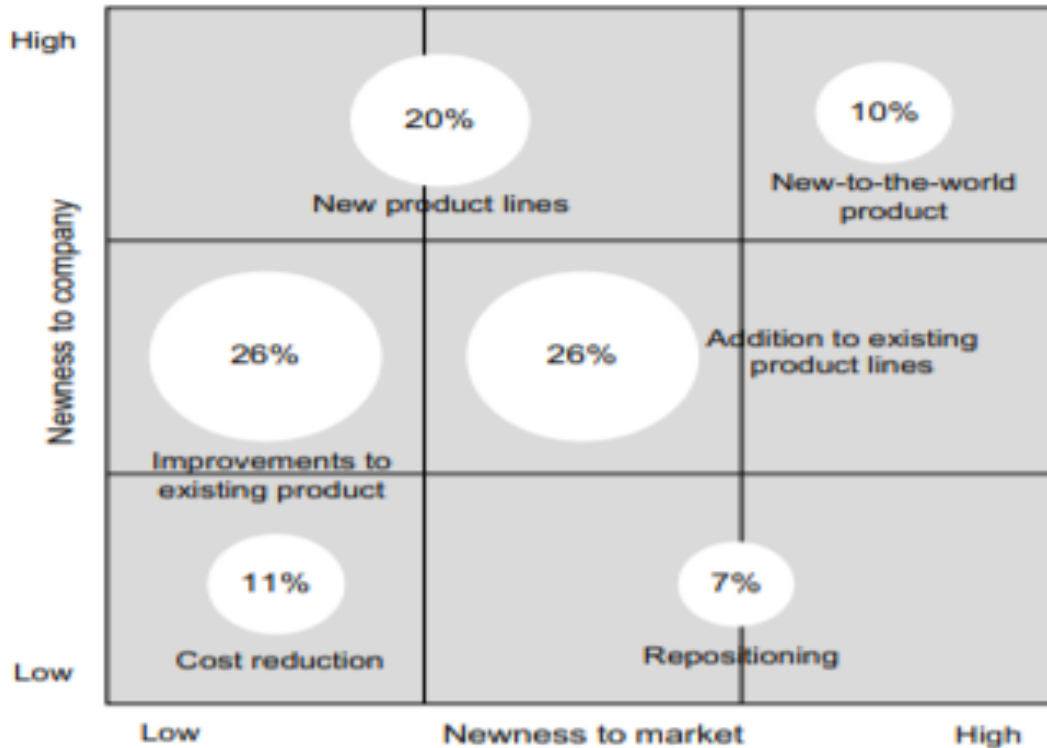


Figure-3. Categories new product vs newness to market

Description of figures:

New-to-the-world product – True innovations that are new to the firm and create an entirely new # market (10%).

New product lines – A product category that is new for the company introducing it, but not new to the # customers in the target market because of the existence of one or more competitive brands (20%).

Additions to existing product lines – New items that supplement a firm's established product line. This item maybe moderately new to both the firm and the customers in its established productmarkets. They also may serve to expand the market segments appealed to by the line (26%).

Improvement in existing products – Items providing improved performance or greater perceived value brought out to replace existing products. These items may present moderately new marketing and production challenges to the firm, but unless they represent a technologically new generation of # products, customer are likely to perceive them as similar to the products they replace (26%).



Repositioning – Existing products that are targeted at new applications and new market segments # (7%).

Cost reductions – Product modifications providing similar performance at lower cost (11%)

2.6. Product development strategies

Product development strategy is the means to mitigate risk in developing a product concept, to improve the fit between products and markets, to overhaul a product line, and to increase the sales of existing products by enhancing it.

2.7. Product development

Product development, also called new product management, is a series of steps that includes the conceptualization, design, development and marketing of newly created or newly rebranded goods or services.

Product development are

- Develop or design original or new products
- Modify, better or improve existing products
- Additions to existing products
- Cost reductions

The objective of product development is to cultivate, maintain and increase a company's market share by satisfying a consumer demand. Not every product will appeal to every customer or client base, so defining the target market for a product is a critical component that must take place early in the product development process. Quantitative market research should be conducted at all phases of the design process, including before the product or service is conceived, while the product is being designed and after the product has been launched.

2.8. Seven stages of new product development

Page 23 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



1. Concept/idea generation
2. Feasibility study and design planning
3. Design and development
4. Testing & verification
5. Validation & collateral
6. Manufacture/launch
7. Improvement

Concept/idea generation:- This is the concept and ideation stage during which a product's functional and performance requirements can be defined along with buyer personas or 'the voice of the customer'.

Feasibility study and desing planning: The feasibility phase gives management an opportunity to evaluate a project's potential success, reviewing and refining the business case from various angles. During this phase, the project team reviews product design concepts.

Design and development: In this phase, formal engineering specifications are created. Verification and validation plans are developed for the future. These are the final quality checks that will systematically determine that all agreed deliverables are present and working in the end product.

Testing & verification: Comprehensive testing of the final product takes place to evaluate the robustness of the design and its ability to meet customer and performance requirements. Verification takes place against the design requirements identified in stage 2.

Validation & collateral: Validation takes place against the customer needs that have been identified at the ideation stage. Collateral is finalised and prepared to support the manufacture and launch phase.

Improvement :-The new product becomes part of the company's portfolio. Ongoing product management ensures the product is subject to continuous upgrades and improvement.

2.9. Classification of new product

Page 24 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



- 'Me-too products
- Line extension
- Reposition
- New form existing products
- Reformulation of existing products
- New packaging of existing products
- Innovative products
- Creative products

'A **'me-too product'** is a product that is basically the same as an existing one, but produced by another company. This category of new products represents the largest group of new food products.

Line extensions. These are new variants of an established product. Typical examples are new flavours for existing products or new tastes in a family of products. The design process of these products can be characterised by relatively little effort and development time, small changes in the manufacturing process, little change in marketing strategy and a minor impact on storage and/or handling techniques.

Repositioned existing products:- These are current products that are again promoted in order to reposition the product. For example, by the increased attention for health products, a margarine brand was repositioned because of its natural high content of tocopherol. The development time for repositioned products can be minimal and only the marketing department should put efforts in capitalising the niche market.

New form of existing products: These are existing products that have altered to another form (e.g. solved, granulated, concentrated, spreadable, dried or frozen). For instance, dried soups. These products may require an extensive development time because the physical properties of the product change drastically.

Reformulation of existing products: This group concerns current products with a new formula. Reasons for reformulation can be reducing costs of ingredients, irregular supply of certain raw materials, or the availability of new ingredients with improved characteristics.

New packaging of existing products: This involves accepted products with new packaging concepts. For example, the technique of modified atmosphere packaging created opportunities to extend the shelf life of many food products.

Page 25 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Innovative products: These are defined as products resulting from changes in an existing product otherwise than described above. The changes must have an added value. The design process is generally longer and more expensive when more product changes are required. Marketing can also be costly because consumers may have to be educated to the novelty.

Creative products; also called true new products: This type of products is described as one newly brought into existence, i.e. a never-before seen product. Typical examples are novel protein foods (or meat replacers) that are produced from vegetable proteins. Creative products commonly require extensive NPD, tend to be costly (much marketing effort, new equipment) and have a high failure chance.

Page 26 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Self-Check – 2	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

- 1. Mention at least three product development stages?(3pts)
- 2. Write at least two types of adaptation? (2pts)

Test II: Write true if the statement is correct and false if the statement is incorrect

- 1. adaptation is process of changing an existing product or service so that it is suitable for different customers. (2pts)

Note: Satisfactory rating - 9 points Unsatisfactory - below 9 points

You can ask you teacher for the copy of the correct answers.

Score = _____
Rating: _____

Answer sheet

Test I

- 1. _____
- 2. _____

Test II

- 1. _____
- 2. _____



Information Sheet 3- Determining method of assembly and presentation

3.1. Method of assembly product development

Assembly is an important part of the overall manufacturing process and constitutes a large proportion of production time . In fruit manufacturing, a major proportion of assembly processes are done manually. Manual assembly is important as it involves human beings. The product design, and the respective assembly system design impacts individuals who perform the assembly.

Automatic product assembly

Once raw materials for manufacture have been hygienically processed, final products often require some form of assembly such as 'ready meals' and insertion in primary packaging. These procedures are traditionally accomplished manually as it is often claimed that the dexterity and flexibility of human operation is essential. Programmable robotic and automatic systems can clearly provide a high degree of functionality and flexibility, but traditional robotic grippers are generally inappropriate for the acquisition and transfer of food products, making it necessary to develop a novel set of grippers for the food sector. Ideally, such grippers should not only be designed on sound hygienic principles but also able to deal with multiple products on the same line without time consuming and complex tool changing operations.

Multiple products can be selected to form the desired product layout. When a satisfactory layout has been designed, production is started by pressing a button.

Page 28 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021

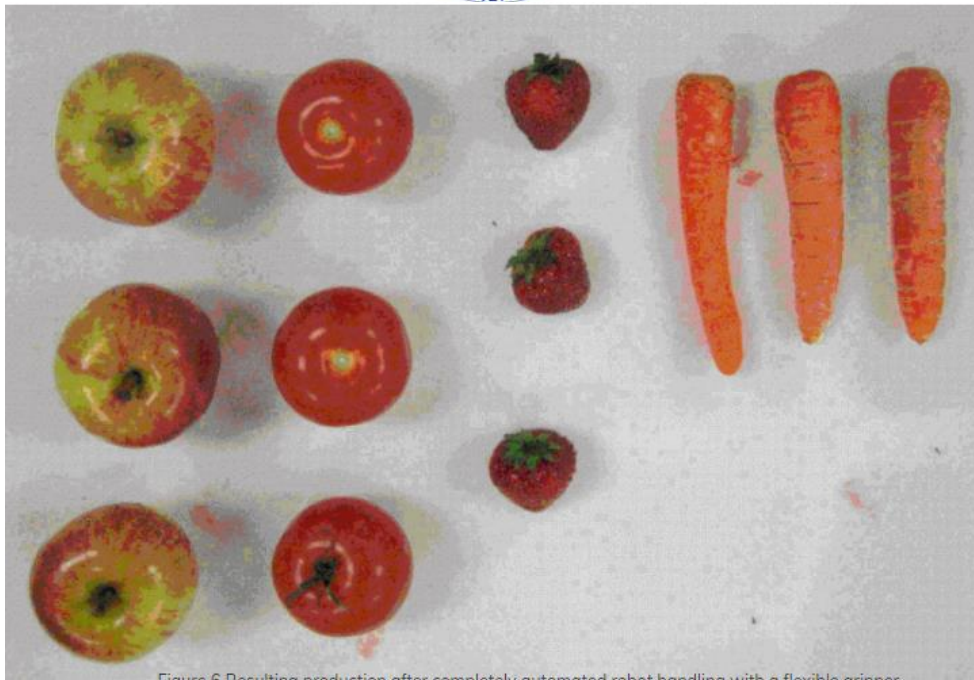


Figure 6 Resulting production after completely automated robot handling with a flexible gripper

Figure -6. Assembly multiple products

Assembly Efficiency

Two main factors that influence the assembly or subassembly cost of a product :

- No. of parts in a product.
- Ease of handling, insertion, and fastening of parts.

3.2. Methodologies to Support Parallel Product and Process Design

to support companies in developing new products, (re)manufacturing and upgrading processes, which are sustainable throughout the complete life cycle, several engineering and human factor methodologies are described in the literature. These methodologies may be used during the development of new technologies, products and production processes

In practice, these methods are mostly used independently by different company disciplines (i.e., departments) for improving product or process design. Development of products and processes in parallel and with strong interaction between different disciplines: sales, product design, process engineering, and operations (operators from

Page 29 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021

manufacturing, assembly, maintenance) is essential for manufacturing but even more for maintenance, upgrading, and remanufacturing processes.

This assembly process map can be used to streamline product and process design. It can also be used to compare alternatives to the product structure and the structure of the assembly process in terms of their effects on lead times and productivity both at the concept level and during the detailed development stage.

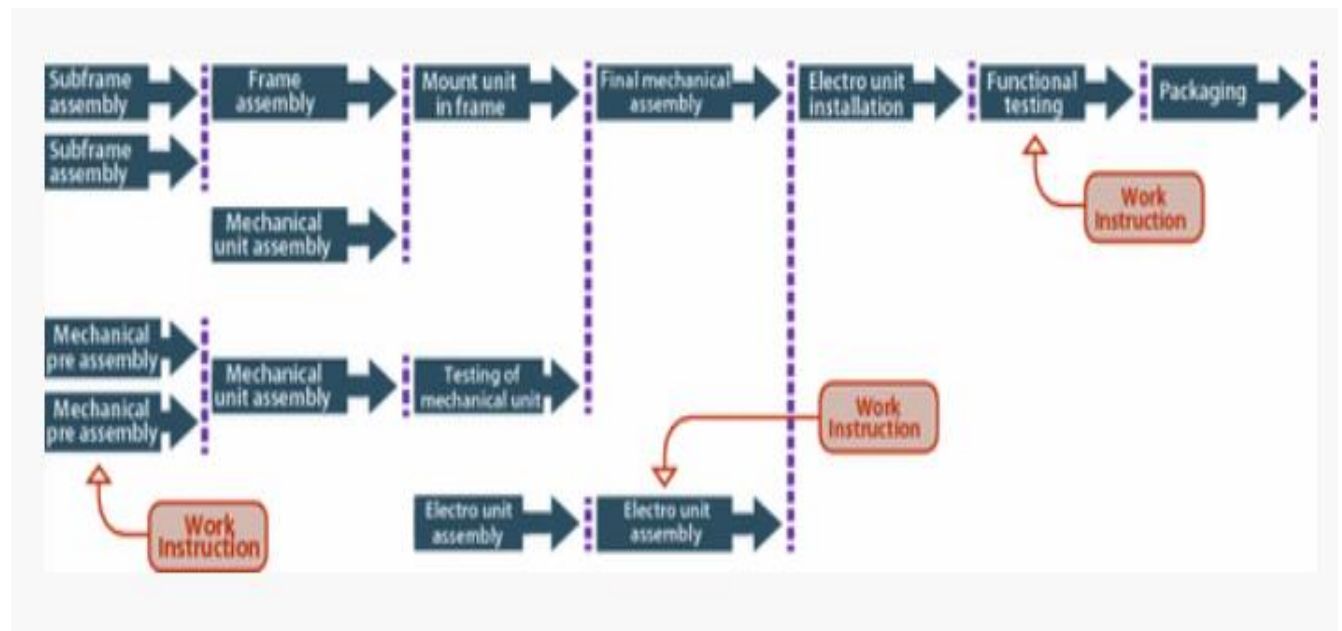


Figure -7. Schematic representation of the process steps of the (sub) assembly and testing stages

3.3. Method of product presentation

Product presentations are an important part of selling your product to prospective customers. In many cases, this will be the customer's first introduction to your company and potentially your product. First impressions are critical. There are also times when it is important to sell your product to the people inside your company as well as investors. Proper preparation is vital to presenting your product in the best light possible.



The objective of the product presentation is different depending upon the target audience and the presentation should be adjusted accordingly. It is important to know your audience and why they are interested enough to hear your presentation.

Product presentation are covers :

- Introduction of new product overview
- Company information
- Positioning
- Product description
- Clearly articulated benefits
- Successes
- Closing argument

3.4. Prepare product development proposal including

- Production process
- Castings and rationale
- Present product ideas

3.4.1. Production processes

Production process means a process, line, method, activity or technique, or a series or combination of processes, lines, method or techniques, used to produce a product or reach a planned result

Types of production processes:-

The four basic types of production process are: 1-Projects, 2-Batch production, 3-Mass production, and 4-Continuous production

Product development proposal:- A product development proposal is the start of our relationship with our design consultant. A well thought out and comprehensive proposal normally is an indicator that the design team has thought through our issues and will deliver a quality solution. Here are some key points that we should look for:



❖ **Engineering is about tradeoffs:**

- Cost
- Performance

- Schedule
- Volume targets

❖ **Proposal Should Include:**

- Problem Statement
- Required Information
- Project Deliverables

- Stages with dates
- References

Page 32 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Self-Check – 3	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Write two main factors that influence the assembly or sub assemble cot of a product?(4pts)
2. Write the three method of product development proposal? (4)

Test II: Write true if the statement is correct and false if the statement is incorrect

1. Product presentations are an important part of selling your product to prospective customers. (2pts)

Note: Satisfactory rating above 6 points Unsatisfactory - below 6 points

You can ask you teacher for the copy of the correct answers.

Score = _____
Rating: _____

Answer sheet

Test I

1. _____
2. _____

Test II

1. _____
2. _____



Information Sheet 4- estimating cost of production

4.1. Estimating cost of production

The implementation of a new product requires a series of activities. The more innovative the product is, the more complicated is the process. It consists of several main phases: idea generation, idea screening, concept development and testing, marketing strategy, business analysis, product development, test marketing and commercialization. Each of them has a large uncertainty in the results. New product development (NPD) process management requires the planning of each phase, taking into account the results of the previous phase. This requires continuous monitoring of the process and decision making. For this reason, management of NPD process is difficult

The success of new products is usually measured in terms of their financial results. Consequently, new product ideas can also be selected based on their expected financial results. Firms determine the upper limit of the budget for the new product development (NPD) process and only consider new products that require a budget lower than this limit.

Therefore, companies must analyze the financial profitable for each new product ideas. It is necessary to have a number of financial information in order to conduct this analysis. For instance, they need to know the financial returns that they can generate from a new product. Similarly, they need to know the amount of financial resources needed to design, develop, manufacture and market it. Because there are uncertainties associated with all these information they also need to have the probabilities of achieving the financial results and of meeting the established budget goals. Finally, they also need to have benchmarks with regard to the acceptable amount of financial returns and new product budgets so as to be able to assess the financial viability of a new product idea.

Page 34 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Although financial analysis can be highly beneficial in idea selection, it also has certain limitations. First, relying on short-term financial results may pressure managers to focus on financially justifiable ideas and to reject more promising but uncertain ideas, just because they are uncertain and are not easily justifiable. Second, many financial analysis methods cannot capture adequately the risks and uncertainties associated with new products.

Finally, this approach depends on a strong assumption that accurate financial information is readily available, which is not the case in many situations.

Information about the cost of future implementation of the new product is important. For this reason, it is urgent

to indicate the appropriate cost estimating techniques. The hardest part is to assess the future costs at the planning stage. A large number of uncertain information makes the cost can be evaluated only subjectively. The intuitive or analogical technique can be used. Intuitive techniques require adequate knowledge and experience. It is possible also to use the knowledge of experts, but in this case you should use the appropriate tool for analyzing expert judgment. This makes the method becomes laborious and expensive. Analogical methods require historical data. Cost estimation is possible on the basis of similarity to the previously executed process. They usually use regression analysis. The more features are compared the more accurate the results, but the calculations are more complicated. Design stage is the next place where the cost estimates may be important. In this stage the characteristics of the future utility of the product are determined. These features can be a cost drivers and can be

used for estimating the costs using the parametric method. The most accurate cost analysis results are obtained at the stage planning of the manufacturing process. Detailed description of the manufacturing process let to use the analitical method of estimation, because operational task and resources assigned to them are known. Activity Based Costing (ABC) and Features Based Costing (FBC) methods are often used as an analogical estimation techniques.

The idea of costs estimating in NPD process and proposed estimation techniques are shown in Fig. 1. Estimated costs are the basis for planning the next task in the process

Page 35 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



of NPD. Their level is also the basis of assessment of the correctness of the process and any deviation must be corrected immediately by the decisions taken.

Monitoring and control of costs must be carried out during the production process. Therefore, an important role is played by cost accounting. In the next parts of this article are examples of estimating the costs at the planning, product design and process design stages

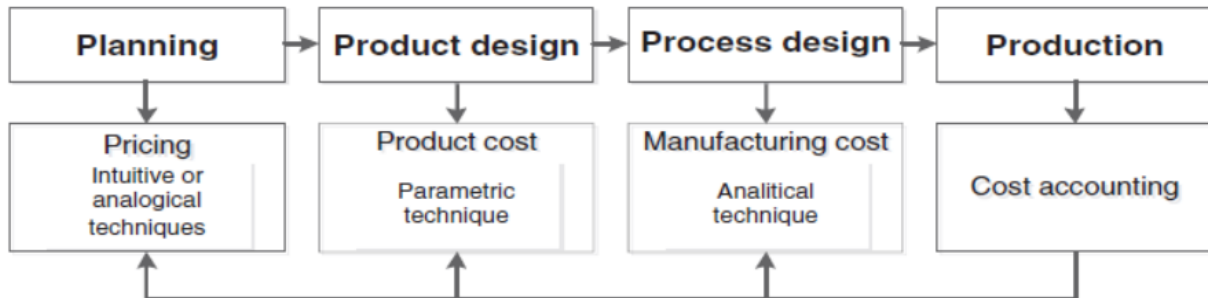


Figure- 8 costs estimating in new product development

4.2. Methods of Cost Estimation in product development

- Expert Judgement Method
- Analogous Estimating Method
- Parametric Estimating Method
- Bottom-up Estimating Method
- Three-Point Estimating Method
- Project Management Information System Method.
- Decision-Making Method

Expert Judgement (EJ) is used extensively during the generation of cost estimates. Cost estimators have to make numerous assumptions and judgements about what they think a new product will cost. However, the use of EJ is often frowned upon, not well accepted or understood by non-cost estimators within a concurrent engineering environment. Computerised cost models, in many ways, have reduced the need for EJ but by no means have they, or can they, replace it. The cost estimates produced from both algorithmic and non-algorithmic cost models can be widely inaccurate; and, as the work of this paper highlights, require extensive use of judgement in order to produce a



meaningful result. Very little research tackles the issues of capturing and integrating EJ and rationale into the cost estimating process.

Analogous Estimation uses a similar past project information to estimate the duration or cost of your current project, hence the word, "analogy". You can use analogous estimation when there is limited information regarding your current project.

Quite often, there will be situations when project managers will be asked to give cost and duration estimates for a new project as the executives need decision-making data to decide whether the project is worth doing.

In such cases, analogous estimation is the best solution. It may not be perfect but is accurate as it is based on past data. Analogous estimation is an easy-to-implement technique. The project success rate can be up to 60% as compared to the initial estimates.

Analogous estimation is a technique which uses the values of parameters from historical data as the basis for estimating similar parameter for a future activity. Parameters examples: Scope, cost, and duration. Measures of scale examples – Size, weight, and complexity.

Parametric Estimating: Parametric estimating, a more accurate technique for estimating cost and duration, uses the relationship between variables to calculate the cost or duration.

Essentially, a parametric estimate is determined by identifying the unit cost or duration and the number of units required for the project or activity.

The measurement must be scalable in order to be accurate

Bottom-up estimating: involves the estimation of work at the lowest possible level of detail. These estimates are then aggregated in order to arrive at summary totals. By building detailed cost and time estimates for a work package, the probability of being able to meet the estimated amounts improves substantially.. Bottom-up estimates take more time to complete, but they also are more accurate than either analogous or parametric estimates.

Page 37 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Three point estimating is a technique which utilizes an optimistic and pessimistic estimate to determine the ideal estimate value for a project task.

It allows known risks to be quantified and built in to the project budget.

Formula

There are two generally accepted formulas for three point estimates:

- Triangular Distribution
- Beta Distribution

4.2.1..Triangular Distribution: The simplest three point estimate is the simple average of the three values (known as the triangular distribution):

$$E = (a + m + b) / 3$$

Where:

- E = estimated cost
- a = optimistic value
- m = most likely value
- b = pessimistic value

Beta Distribution

The beta distribution places the final estimate closer to the most likely value:

$$E = (a + 4m + b) / 6$$

Where:

- E = estimated cost
- a = optimistic value
- m = most likely value
- b = pessimistic value

The triangular distribution is the default and should be used if there is no reason to use anything else. The beta distribution should be chosen when there is more confidence in the most likely value, that is, where the final estimate should be tighter to the mean

Three Point Estimating and Risk Analysis

The key benefit of three point estimating is the way it takes into account project risk.

The following procedure is how it works, From the very beginning:

1. The product success factors are determined

Page 38 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1 March, 2021
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2. Risks which might affect the project success factors are identified.
3. The risks are analyzed and prioritized to determine which are the most important.
4. The product is divided into tasks (a work breakdown structure).
5. Each task receives three estimates:
 - Optimistic. Assuming the risks do not occur.
 - Most likely. Assuming the risk occurrence level that is most likely to occur. Similar to other estimate types.
 - Pessimistic. Assuming that the risks occur.
6. The Three Point Estimating procedure is used to determine the final estimate for each task.

There are many situations where a risk results in a skewed distribution. For example, a risk might result in a cost escalation but no corresponding cost reduction if it doesn't occur. This would make the Pessimistic estimate farther away from the Most Likely value than the Optimistic one (that is, the Most Likely value is not directly in the middle) and result in a skewed distribution.

4.3. Financial and Cost Analysis for product development

Total capital investment of any plant can be including in its side both fixed capital investment and working capital investment.

Total capital investment= fixed capital investment + working capital investment

To estimate fixed capital investment of your plant, first find the cost of each equipment cost purchased equipment cost. The costs of equipment were found to be 2012 and it is converted in to 2013 cost using the cost index of both years.

Page 39 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



4.3.1.. Purchasing Equipment/ Machine Costs

Table- 1.1. Purchasing Equipment Costs (PEC)

No	Equipment/machine	Specification	Quantity	Unit price	Total cost	Remark
1	Refrigerator		1	20,000	20,000	
2	Refractometer	Hand held	2	1,500	3,000	
3	PH meter		1	2,000	2,000	
4	Juice extractor		1	3,000	3,000	
5	Thermometer	Food thermometer	1	200	200	
6	New empty bottle (250 ml)		200	20	4,000	
7	Weighing scale	10kg capacity		800	800	
10	weighing scale	1000 gram	1	2,500	2,500	
13	Measuring cup	Stainless steel	1set	300	300	
14	Measuring spoon	Stainless steel	1 set	300	300	
21	Wooden Ladle	Wooden(large)	2	50	100	
Total					46,400Birr	

4.3.2.. Raw Material and Ingredients Costs

Table-2. Raw Material costs

No.	Raw materials	Type/specification	Quantity	Unit price	Total cost	Remark
1	Fruit product (Orange pulp)	ripen orange	1,000kg	50	50,000	
2	Sugar	Unrefined Sugar	200kg	60	12,000	
4	Lemon	Yellow or sem green	1kg	300	300	
Total					62,300birr/month	



Purchased equipment cost (PEC)=46,400br

4.3.3. Estimation of Fixed Capital Investment (FCI)

Fixed capital investment = direct cost + indirect cost

A) Direct cost (DC)

1 Total purchased-equipment cost (PEC)= 40% of FCI

$$FCI = PEC/0.4$$

$$FCI = 46,400 \text{ birr}/0.4$$

$$FCI = \underline{116,000\text{br}}$$

Total capital investment (TCI) = fixed capital investment (FCI) + working capital investment (WCI)

$$TCI = FCI + WCI \dots\dots\dots \text{eq (1)}$$

$$\text{Working capital investment (WCI)} = 15\% \text{ of TCI} \dots\dots\dots \text{eq (2)}$$

Then, substitute eq (2) in to eq (1)

$$TCI = FCI + 0.15 \text{ TCI}$$

$$TCI = 116,000\text{br}/0.85$$

$$TCI = \underline{136,470.59\text{br}}$$

$$\text{Working capital investment (WCI)} = 15\% \text{ of TCI}$$

$$= 0.15 * 136,470.59\text{br}$$

$$= \underline{20,470.59 \text{ birr}}$$

4.3.4.. Manufacturing cost

Manufacturing cost = direct production cost + indirect production cost

A) Direct production cost

1) Raw material

$$\text{Total raw material cost} = 62,300\text{birr}/\text{month}$$

$$\text{Total raw material cost} = \underline{747,600\text{birr}/\text{year}}$$

2) Operating labour (OL) = 15% of TPC,

But this formula works for industry scale production. So we assume that it is very small, because it is small scale production. So we assume 40,000 birr/year for lab technician and 13,000 birr/year for house and equipment cleaning.

Page 41 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Operating labour (OL) = 40,000 + 13,000 = **53,000 birr**

3) Direct supervisor and clerical labour = 20% of OL

But we assume that it is negligible, because it is not industry/ large scale production. So it assumed to be zero

4) Utilities = 15% of TPC. This is for industry scale

But here we only assume electricity power and water consumption

Utilities = electricity power + water consumption = 4,000 + 3,300

= **7,300 birr/year**

5) Maintenance and repair = 6% of FCI

But we assume that it is negligible, because there is no huge machine that need maintenance and equipment are easily maintained. So, maintenance and repair cost assumed to be 3,000

Maintenance and repair = **3,000 birr/year**

Direct production cost (DPC) = 1+2+3+4+5

= 747,600 + 53,000 + 0 + 7,300 + 3,000

= **810,900 birr**

B) Indirect production cost (IPC)

Indirect production cost = fixed charge + plant over -head cost

A. Fixed charge

- Deprecation = 10% of FCI = 0.1 * 163,250 birr = 16,325br

B. plant over -head cost = 60% of OL

= 0.6 * 53,000 birr = 31,800 birr

Indirect production cost (IDC) = A + B = 16,325br + 31,800

= **48,125birr**

So, Manufacturing cost = DPC + IDC

= 1,503,500 br + 48,125 br

= **1,551,625 birr**

4.3.5.. Total production cost (TPC)

Total production cost (TPC) = Manufacturing cost + General expenses

❖ General expense

1) Administration cost = 4% of TPC

Page 42 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



2) Research and development cost = 5% of TPC

But we assume that 1, and 2 are negligible, because it is not industry/ large scale production. So it assumed to be zero.

3) Distribution cost = 11% of TPC

Here to distribute the product, we assume it 7,000 birr, so

Distribution cost = 7,000 birr

4) Interest = 5% of TPC

- But here we assume that the loan was 80,000 birr and the interest rate is 10%

Interest = $0.1 * 80,000 = 8,000$ birr

General expense = $1+2+3+ 4 = 0+ 0+ 7,000 + 8,000$ birr

=15,000 birr

Total production cost (TPC) = Manufacturing cost + General expenses

TPC=810,900birr+ 15,000 birr

TPC = **825,900birr**

4.3.6..Feasibility Profitability/Analysis

Gross profit = sales – TPC

Product= 600 Kg/month = 7,200Kg/y = 7,200, 000 g/y

Selling price estimation

- We took the current market selling price of Orange pulp marmalade

So, 450gm marmalade = 50 - 60 birr (in the market).

- But we assume the selling price of 450gm marmalade = 100 birr

450gm marmalade = 100birr

7,200, 000 gm. = X birr

X birr = $\frac{7,200, 0000 \text{ gm. marmalade} * 100\text{birr}}{450\text{gm marmalade}}$ = 720,000,000 birr

450gm marmalade

Sales = **1,600,000 birr /y**

4.3.1.1. Gross and Net profit

Gross profit = sales – TPC

Gross profit = 1,600,000 birr /y 825,900birr

= 774,100birr/y

Page 43 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Net profit = Gross profit – income tax

Income tax = 15% of sales

$$= 0.15 * 1,600,000 \text{ birr/y}$$

$$= 240,000 \text{ birr/year}$$

Net profit = 774,100 birr/y – 240,000 birr/year

$$= \underline{\underline{534,100 \text{ birr/year or } 44,508.33 \text{ br/month}}}$$

Page 44 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Self-Check – 4	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. List at least four method of costimation in product development?(5pts)

Test II: Write true if the statement is correct and false if the statement is incorrect

1. The success of new products is usually measured in terms of their financial results (2pts)

Note: Satisfactory rating above 4 points Unsatisfactory - below 4 points

You can ask you teacher for the copy of the correct answers.

Answer sheet

Test I

1. _____

2. _____

Test II

1. _____

2. _____

Score = _____
Rating: _____



Information Sheet 5- presenting product concept

5.1. product concept

The production concept is one of the oldest concepts of marketing and deals with the product component of the business, particularly product quality (efficiency and costs).

Production concept helps a company understand their product's qualities and features and improve on them. Every company wishes to make its product as eye-catching as possible and help the consumer make their decision quickly.

Many things go into making a product desirable, and thus the business focuses on those points.

The points are as stated below

1. Low production cost: purchasing the high-end raw material as lower costs so that more money can be invested in manufacturing.
2. Production efficiency: The factory must be able to roll out the product on time so that it reaches the consumer as soon as possible for sale.
3. The volume of production: The factory should be able to keep up with the demands of the consumer, which increases daily and also keep the quality of the product intact.

A product concept is a representation of a possible new product that outlines the benefits the product would provide to consumers. A business may create a written description, graphic drawing, short video or prototype of the proposed product. If the product concept's testing phase is successful, the company may begin producing and selling the product.

Testing

Page 46 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Businesses typically test product concepts by submitting them to consumers and evaluating their response. In most cases, a company chooses consumers who are members of the product concept's target demographic. For example, a business considering a new type of baby food would test the product concept with mothers of infants. To test a concept, the company may describe or demonstrate it. At the end of testing, the business collects feedback from the consumers who evaluated the concept.

Outcomes

Some concepts never evolve into products. If testing shows the target demographic is unlikely to buy the product, the business typically scraps the idea. However, if testing shows the target demographic reacted favorably to the product concept, the business may decide to manufacture and sell the product.

Considerations

Consumers' reactions to a product concept itself are not the only issues businesses must consider when deciding whether to make a new product. For example, consumers may react positively to a product concept but be unwilling to pay the business' intended price. In such situations, the company must determine whether the proposed price could be lowered. If it can't be, the business may decide to alter or discontinue the product concept.

Many enterprises take too myopic a view of what their product actually comprises and, therefore, their view of how it can be marketed is similarly myopic. We should think of a given product on three levels: the core product, the tangible product and the augmented product. The base level is the core benefit which, in essence, is what the customer really buys. It is productive to think of a product as merely the mechanism by which the benefit the customer is demanding is delivered. Thus, people do not buy toothpaste (the product), they buy confidence that their breath is inoffensive to others (the benefit); the farmer doesn't buy fertilizer, he buys extra grain in the store; a mother does not buy baby food, she demonstrates the virtues of a loving and conscientious mother, and a buyer of premium priced foods is not simply satisfying his/her hunger for food but also,

Page 47 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



perhaps, a hunger for status. Hence the need to know what the customer is buying and market those benefits, not products.

Care must be taken that any benefit that is marketed is valued by the potential consumer. Manilay relates how, in the Philippines, an improved milling machine which produced a better quality end product and reduced grain losses failed in the market place because broken and discoloured rice kernels were not perceived to be a problem by consumers, who were more interested in rice varieties and aromas. This example illustrates that it is the consumer and not the engineer, scientist or marketer who decides, in the market place, what is of benefit to him/her.

The core benefit has to be converted into a tangible product to become the carrier of the benefit. Corn oil, cotton shirts, poultry feeds, seed planters and meat pies are all tangible products. According to Kotler² tangible products have as many as five characteristics: a quality level, features, styling, a brand name and packaging. These too can be marketed to potential customers if they differentiate the product from that of competitors, so long as this differentiation is both meaningful and valued by consumers.

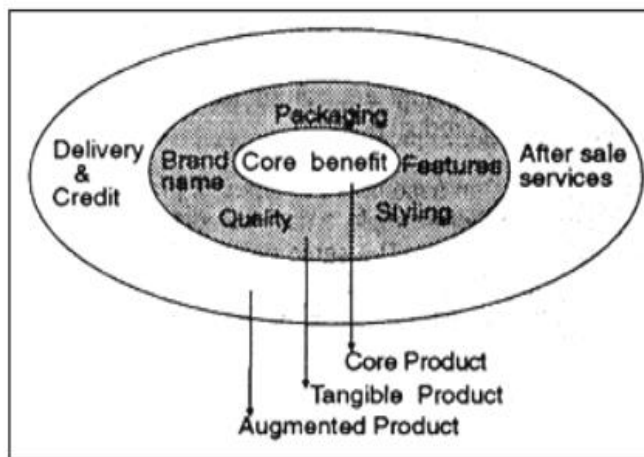


Figure-9. The product concept

Additional services and benefits might need to be offered to differentiate a product from that of competitors to give it a competitive edge. That is, an augmented product is offered. The cotton available to international buyers from the Zimbabwe Cotton Marketing Board is also available from other countries and suppliers. However,

Page 48 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Zimbabwe's CMB have augmented their product with an advisory service to merchants and spinners which helps them choose the right cotton for a specific application³. Similarly, the agrochemical manufacturer who builds in a metering device into his product's packaging is augmenting his product; the tractor manufacturer/dealer who gives an extended warranty or performs a pre-delivery inspection is augmenting his product, and the food manufacturer who offers wholesalers/retailers a sale-or-return deal on products which they carry is augmenting the product offered.

Product augmentation reflects a wider view of what the customer wants. Levitt suggests that:

“The new competition is not between what companies produce in their factories, but between what they add to their factory output in the form of packaging, services, advertising, customer advice, financing, delivery arrangements, warehousing and other things that people value.”

Product idea is converted into product concept. Product idea means possible product that company may offer to the market where as product concept is a detail version of the idea stated in meaningful consumer terms.

When develop product following criteria should be consider:

- Who will use the product
- What primary benefit should this product provide
- When will this product be consumed

Concept testing means presenting the product concept to target consumers, physically or symbolically, and getting their reactions

The problem you're aiming to solve and your market insight

When presenting your product idea, the first thing you'll need to do is present the problem you're aiming to solve within a certain market.

We have many different types of clients from many different industries. Some are first-time entrepreneurs who have never sold a product before and others are international companies who've created and sold many different products. All of them come to us because they want to make a product that helps improve people's lives it's their way of providing a solution to a meaningful problem they have encountered.

Page 49 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Coming up with solutions can arise from brainstorming ways of fixing a problem or just looking at existing products to see how you can improve upon them. For example, you could look at a product you have at home or at work and examine aspects such as difficulty of use, loudness, weight, cost, ergonomics, battery life, and so on.

Solution and product features

After you establish the problem, describe the solution (aka your product) and the features it should include.

Some of our clients come to us with sketches that show how they would like their product to be. They already have an idea of what they want regarding its aesthetics, function, and features they just need someone to design the solution for them.

Aesthetics, price point, and summary

This part of the document is where you include any aesthetics inspiration and the retail price point you'd like to sell your finished product for after it has been manufactured. Also, include a brief product summary, providing a list of bullet points that summarize the features you're looking for, along with any pricing brackets or tiers in case you have more than one variation of a product.

Competitors

Information on competitors are important so we know what range of products yo're trying to improve upon and how to achieve that without reinventing the wheel. With some research, you can refer to competitor products and cut R&D costs and time by using reverse engineering. you can also look into their online presence and read product reviews to see what customers are unhappy about that we could address.

Page 50 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



Self-Check – 5	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choice

1. Which one of the following is a representation of a possible new product that outlines the benefits the product would provide to consumers.?(2pts)
a. Product concept b. idea generation c. concept test d. "a" and "c"
2. Which one of the following criteria to develop product? (2pts)
a.who will use the product b. what primary benefit should this produce provide
c. "a" and "b" d.none

Test II:Write true if the statement is correct and false if the statement is incorrect

1. Monitoring is a process of determining how well our plans are being implemented.(1pts)
2. Personnel allocated to quality control need a very good understanding of the quality and qualitycontrol of raw material to be processed. (1pts)

Note: Satisfactory rating above 4 points Unsatisfactory - below 4 points

You can ask you teacher for the copy of the correct answers.

Score = _____
Rating: _____

Answer sheet

Test I

1. _____

Test II

1. _____

2. _____

Page 51 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



operation sheet 1: adapting existing formula to produce new product

Objective

To satisfy customer need by improving new product.

List of materials used for produce new product

- Fresh orange ,
- Lemon
- Sugar

processing equipment

- ✓ refrato meter
- ✓ pH
- ✓ juice extractor
- ✓ thermo meter
- ✓ weighing scale
- ✓ measuring spoon
- ✓ measuring cup
- ✓ wooden ladle

The following procedures should be taken into account to produce new product the process

Procedure

Step: 1 use appropriate personal protective equipment

Step: 2 develop idea generation

Step: 3 make feasibility and design plan

Step: 4. Design and development product

Step: 5. Test and verification of product

Step 6. Validation and collateral production

Step: 7.manufacture/launch product

Step 8: further improvement

Page 52 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



LAP Test	Performance Test
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Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 3 hours.

Task -1. Monitor new product development process



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Page 54 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



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Page 55 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



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Page 56 of 57	Federal TVET Agency Author/Copyright	TVET program title- fruit and vegetable Processing -Level-III	Version -1
			March, 2021



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