PAPER
Enhancing the Business Model: Automating the Recommended Retail Price Calculation of Products

Bahjat FAKIEH[†a)], *Member*

SUMMARY The purpose of this paper is to find an automated pricing algorithm to calculate the real cost of each product by considering the associate costs of the business. The methodology consists of two main stages. A brief semi-structured survey and a mathematical calculation the expenses and adding them to the original cost of the offered products and services. The output of this process obtains the minimum recommended selling price (MRSP) that the business should not go below, to increase the likelihood of generating profit and avoiding the unexpected loss. The contribution of this study appears in filling the gap by calculating the minimum recommended price automatically and assisting businesses to foresee future budgets. This contribution has a certain limitation, where it is unable to calculate the MRSP of the in-house created products from raw materials. It calculates the MRSP only for the products bought from the wholesaler to be sold by the retailer.

key words: business model, initial cost, operating cost, product pricing, retailers

1. Introduction

The success in establishing and running a business is the ultimate goal of any business owner from a micro business to giant enterprises. Decision makers tend to invest in planning this intended success by a variety of methods from simply depending on luck to using their experience in hiring experts to plan or run the business.

Business planning is a key factor of business success because it provides a clear vision to the direction of the business. Experts tend to use different models and strategies to increase the likelihood of success and to minimize the risk by understanding several aspects, including the market, the business itself, competitors, consumptions, and expenses [1]. Several models and frameworks are utilized to understand the common aspects of the business to ease the planning and development, such as using a business model.

2. Business Models to Generate Revenues

The typical business model fits four essential categories, which are infrastructure, offering, competition and customers, and the profit formula [2], [3]. The infrastructure category discusses key partnerships, key resources, and key activities. The offering category highlights the value propositions, the customer relationship, and the possible delivery channels. Competition and customers discuss business competition, the provided solutions, customer segments and customer needs. The profit formula is presented in calculating the associated business costs and the possible revenue streams to generate income to the firm [2].

Another classification of the business model – which is widely known in the industry – is the business model canvas (BMC), which consists of nine sections. These sections are strategic partners, key activities, key resources, value proposition, customer relationship, distribution channels, customer segments, cost, and revenue [4], [5]. As mentioned above, the concept and the content of the model is almost similar.

The profit formula category might look simple by having only two factors to consider, which are the business costs and revenue; however, each of these factors is considered as an umbrella that covers several significant elements. The expected complexity of determining the associated costs and the revenue models make it more difficult to calculate the actual profit.

3. The Current Gap

There is a dearth of studies that includes all elements required to meet the business objectives of retailers, despite many factors and studies having had considered various factors, such as consumer promotions. As such, there is need for having a decision support system (DSS) where only store level data is relied upon and the capability for sales prediction as a function of prices as well as the inclusion of other promotional variables [6]. In online retail businesses, sites use recommender systems that suggest products that consumer could be interested in buying as a way of increasing revenues. These recommender systems have largely been successful; however, they have an inherent weakness. These recommender systems have not attained their full potential as they fail to take into consideration dynamic product offering properties that can significantly improve the product recommendation, and also its price. These characteristics include promotion indication, the price of the product, and the reputation of the seller in terms of quality products and fair pricing [7]. The algorithms and computer-based models that use Artificial Intelligence as discussed in the previous section may not be suited to all retailers, especially brick and mortar retailers. As such, a novel mathematical approach is needed that can be implemented even using a basic program such as a Spreadsheet.

This literature led to the key of this study, which shows

that one of the effective drivers in increasing the likelihood of a business to success is developing a comprehensive business model. This model consists of several elements, and one of those key elements of the business model is calculating profit that depends on subtracting the associated costs from the revenue as a result of selling the goods and/or services. Therefore, the aim of this research was to focus on the product cost, by facilitating the calculation of the minimum selling cost and to gain the anticipated profit.

In general, it seems that assigning the minimum selling price would seem an easy task to accomplish. However, this task relies on more than just setting any price above the purchasing price to gain the profit. The associated costs to the business act as hidden costs that must be covered when selling products or services. These costs are known in the business as cost-plus. Adding these costs to the retailer price follows the cost-plus pricing method [8]. This strategy is also known in the business as calculating the variable costs [9]. The added value to the sold products is based on a percentage rate to each item. This method helps to mitigate the likelihood of loss in the business that would be at risk if the business assigns prices using the fixed pricing strategy, which sets a specific price regardless of the additional costs [9].

4. Research Aim

This research aims to analyze the associated costs in the business by using the concept of the variable cost. This will lead retailers to see the real cost of their products or services, which ultimately assists in making better decisions to the business's success and continuity.

It is proposed to design an innovative intelligent system to work as an automated consultant to calculate the minimum selling price for retailers to sell products. This will assist retailers to plan their sale and to avoid any unexpected loss in the business. The proposed system aims to host all the related costs, consumptions and liabilities that are required to run the business, and it suggests a minimum price for each item in the physical shop or in the online shop.

5. Project Scope

Generally, the proposed project can be applied, as a concept, to any organization, regardless of the type, size, or physical location, either on premises or online. However, this project was developed for a more specific scope. From large to small, the project did not cover the large enterprises, as they have their own resources, departments and experts to determine the minimum price and to set and target business goals. Also, large enterprises have sufficient budgets and resources to mitigate the impact of any unexpected loss. Those power factors of large enterprises are limited when exploring most small or medium organizations. Therefore, the study targeted retailers within the small- and medium-sized enterprise (SME) scope.

Considering organizations as micro, small, medium, or

Table 1 SMEs classification in Saudi Arabia.

Type	Employee No.		Annual Revenue (SAR)
Micro	1-5		≤ 3 Million
Small	6-49	Or	> 3 Million & < 40 Million
Medium	50-249		≥ 40 Million & < 200 Million
Large	≥ 250		≥ 200 Million

large is varied among countries [10]–[13]. However, the concept of this study is applicable to most of those classifications.

This project will take the most global recent classified retailers as SMEs, which are the Saudi retailers as the studied case and that were classified by the end of 2016 [12]. The recent classification of Saudi SMEs was one of the main motivating factors to focus on them, because of the lack in research regarding SMEs in Saudi Arabia.

The government of Saudi Arabia classifies organizations into four categories, which are micro, small, medium, and large enterprises [12]. Table 1 below describes the classification criteria:

6. Methodology

As discussed above, the study aimed to automate the process of understanding the minimum profitable price to sell products or services by retailers within the SME category. It is not only a matter of developing a framework but also of understanding all the possible contributors in generating the additional costs. The design of this study consists of two stages.

The first stage was implemented in conducting a survey that targeted business owners and decision makers of the Saudi SMEs to explore the cost-plus generators in the business. The second stage focused on developing the anticipated framework to calculate the minimum product price to generate profit and to mitigate the loss.

The proposed research consists of six phases. The first phase aims to collect data and to understand the requirements. This stage focuses on exploring the possible additional costs that SME retailers face in the Saudi market. The collected data was analyzed in the second phase. The third phase focused mainly on developing a framework to calculate the recommended price. The system was developed in the fourth phase, and the fifth phase was dedicated to test the system. After testing the system, the price recommendation workflow was confirmed to be used in the last phase of this project.

Table 2 shows the link between each phase within the two main stages of this study.

The following two sections continue to discuss the methodology of the proposed system. Section 7 discusses the first stage, while Sect. 8 discusses the second stage. All six phases are discussed in stages 1 and 2.

6.1 Stage 1: Conducting a Semi-Structured Survey

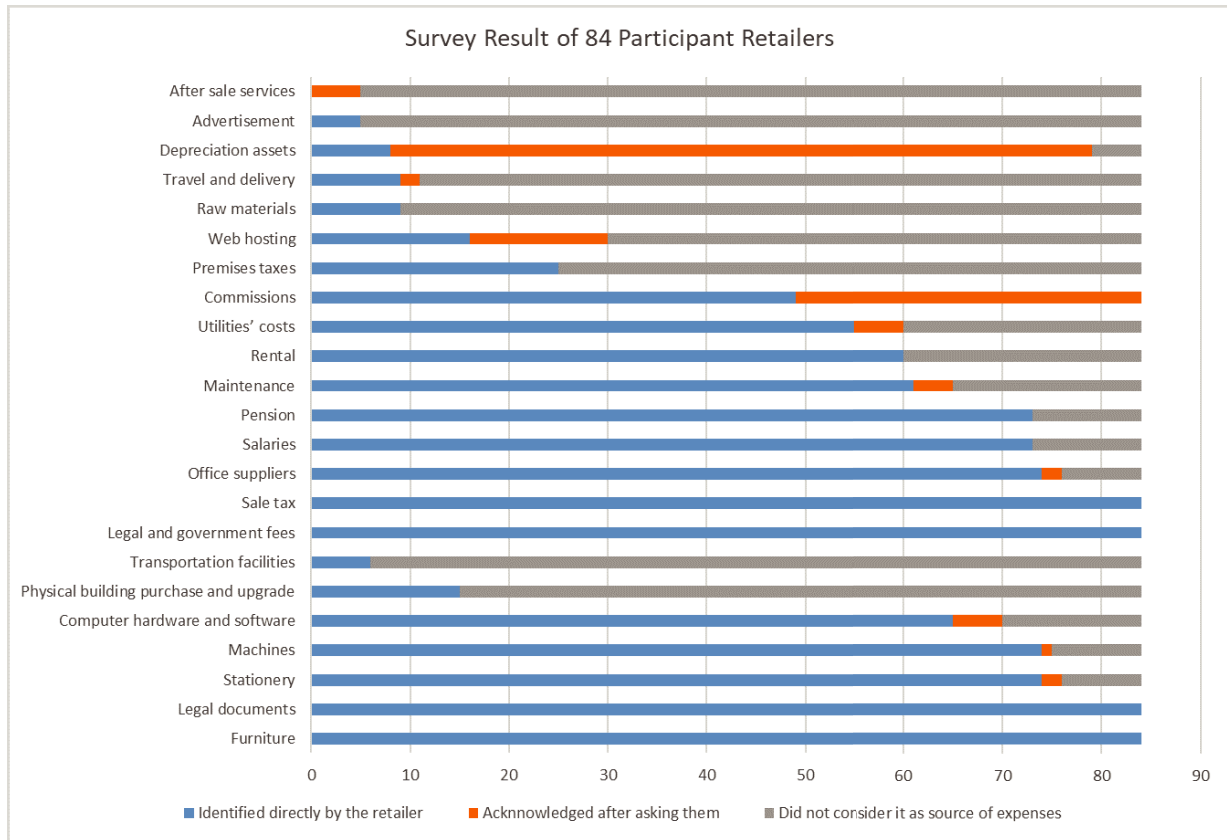The first stage of this study was dedicated to conducting a

Fig. 1   The accumulated survey result

very simple semi-structured survey to ask the organization regarding the initial costs and the operating costs (CAPEX and OPEX) [14] and to expose the additional costs that should be considered when selling products and services to generate profit. The survey is considered as semi-structured, as the participants were asked to circle an item from a common list of expenditures, and they were given a free space to add any extra uncovered source of expenses.

The survey mainly targeted business owners and decision makers in SME retailers in Jeddah city. Jeddah was selected for this study because it is the second largest city in Saudi Arabia after the capital city, Riyadh. Additionally, Jeddah is considered as the tourism and the economic capital of Saudi Arabia [15]. The convenience sampling method was used to explore the easiest-to-reach businesses, where the benefit of this phase is just to explore the most common expenses in the retail industry in general.

The operational expenses should be considered when selling to generate profit. However, if the firm plans to recover the capital expenses, those expenses should be considered as well in a form of additional costs to the products when calculating the minimum selling price. As several literature pieces would lead to a similar concept, the common CAPEX and OPEX were adapted from many sources, such as [16]–[18].

The survey included 84 retailers who are classified as SMEs according to Saudi's regulations [12]. Generally,

Table 2   Stages and phases of the developed system.

Stage	Phase	Phase	Outcome
1	1	Data Collection	Collected data from 84 Retailers Convenient Sampling Method was used.
	2	Data Analysis	Exploring the market's view
2	3	Developing a framework to calculate the recommended price	Understanding the proper technical algorithms
	4	Developing the system	Formulas were used to carry out the results
	5	Testing the system	Retailers were invited to test it. Five stores were happy to participate, and one was randomly selected
	6	Confirming the final workflow of the system.	System workflow

most agreed with the literature on the expected expenses of the business. The detailed result of the study is presented in Table 3 and a visualized summary of the result is illustrated in Fig. 1.

The values of each of the expenses in Table 3 are presented in four columns that came after the first two metadata columns. Participants were first asked to think about the possible expenses that their business encountered or would face in the future. Then, participants were given a list of common expenses to pick, and they were asked which ones they would add to their nominated list (see the second col-

Table 3   Stage 1: survey result

	Sources of Expenses	Identified directly by the retailer	Acknowledged after asking them	Did not consider it as source of expenses	Why not?
Initial Costs	Furniture	84	0	0	
	Legal documents	84	0	0	
	Stationery	74	2	8	Depend on the digital solutions only
	Machines	74	1	9	No need
	Computer hardware and software	65	5	14	They believe that they do not need it
	Physical building purchase and upgrade	15	0	69	Renting premises or online stores only
	Transportation facilities	6	0	78	No need. Mainly, the supplier is delivering to most retailers PLUS there is no delivery service to the customer from the retailer's side.
Operational Costs	Legal and government fees	84	0	0	
	Sale tax	84	0	0	
	Office suppliers	74	2	8	Depend on the digital solutions only
	Salaries	73	0	11	Sole Traders
	Pension	73	0	11	Sole Traders
	Maintenance	61	4	19	Not frequent
	Rental	60	0	24	Bought the premises or operating online only
	Utilities' costs	55	5	24	Not applicable
	Commissions	49	35	0	Including charity
	Premises taxes	25	0	59	Depends on the type of business
	Web hosting	16	14	54	Do not need
	Raw materials	9	0	75	Depends on the type of business
	Travel and delivery	9	2	73	No need
	Depreciation of assets	8	71	5	The supplier brought their assets to retailers. This type of retailers works as distributers only and do not need to buy depreciated assets
	Advertisement	5	0	79	Do not need
	After sale services	0	5	79	Most participated retailers do not provide after sale services

umn). The third column shows that some factors were still not considered as sources of expenses even after participants saw them in the survey, and this was a reminder to circle them, if appropriate. The last column interprets why some businesses still did not consider some factors as sources of expenses.

For initial costs, all participants agreed that buying furniture and paying legal documents' fees are common sources of expenses that should be considered. Eight businesses believed that they do not need any stationery as they depend purely on digital technologies to run their business. On the opposite side, it was believed by 14 SMEs that they do not need any computer-based equipment, and they prefer and are happy to run their retail stores manually. In addition, the collected data showed that 69 of those stores do not consider purchasing physical premises as a source of extra cost, as they prefer to rent spots instead or to operate purely online. Considering buying transportation facilities, such as a car or a motorbike, when opening a new store was limited as a result of this study. Table 3 presents data from 78 stores – about 92.8% of the sample – and found that they did not need to spend on transportation, and it was common for the supplier to be responsible for most of the logistics activities. Also, they did not/do not plan to provide delivery service when they open their stores.

The result of the operational expenses revealed that all stores in the sample were aware of the periodical legal and government fees as well as sales tax. Sales tax was intro-

duced recently by the local government and is an additional cost. The most interesting data in Table 1 is related to the depreciation of assets and for commissions, which appeared as hidden costs for a significant number of participants. The table shows that 71 stores – 84% – did not think about depreciation until they read it in the conducted survey, and 35 stores did not think about commissions. It seems that there is an awareness issue.

Although some sources of expenses were identified only by a limited number of the sample, such as after-sale services that were acknowledged by only five stores, but those expenses were also considered when developing the proposed algorithm, as there is still a possibility of additional costs. As a result of this study, the common channels of the initial costs are the physical building purchase and upgrade, computer hardware and software, furniture, stationery, legal documents, machines, and transportation facilities, such as cars, buses, and motorbikes. The operational costs might come after the business starts running, or it could be linked to the initial costs. Examples of the OPEX can be classified into two categories: the business expenses and the sales expenses. The business expenses include depreciation assets, legal and government fees, premises taxes, office suppliers, salaries, pension, rental, web hosting (if available), maintenance, and utilities' costs. The sales-related expenses include sales tax, commissions, advertisement, raw materials, travel and delivery, and after-sale services.
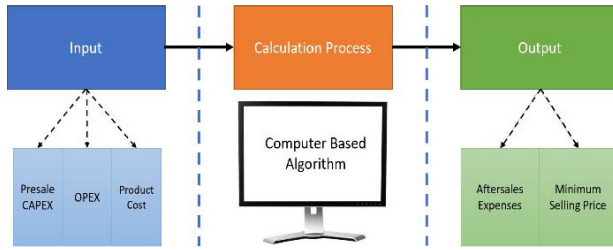
Fig. 2 Research conceptual framework

The nominated expenses are used to fill the template of the suggested system. Additionally, businesses are able to add more expenses when using the system, as they could have different or additional expenses.

6.2 Stage 2: System Development

As discussed early in this paper, calculating the profit seems as easy as subtracting the total cost from the total revenue. However, the presence of several factors adds to the product cost, to form the cost-plus value [8]. Both the expected and possibly the unexpected expenses should be considered and calculated as they affect the final price tag. Therefore, the conceptual framework was designed to understand the general minimum price calculation ecosystem, as in Fig. 2.

Both input and output components will be discussed in the sections below. The description of the calculation process is included within the input and output sections.

6.3 The Input Component

As shown in the Fig. 2, the input component aims to collect all the possible expenses including CAPEX, OPEX, and – of course – product prices to see the approximate real total cost of running the business. This process is summarized in the following formula:

$$\text{Total Business Cost} = \sum (CAPEXs + OPEXs + \text{Product Prices}) \tag{1}$$

The first step of the proposed algorithm asks businesses to declare the price for a list of possible expenses that were collected from the literature and from the field survey. As discussed earlier, those expenses were classified as CAPEXs and OPEXs. Then, the price of all products – multiplied by the number of items – is added to the expenses list. The system then collects and calculates the approximate total cost of business expenses. Note that the reason for describing the total as "approximate" is because the business might forget to enter some items, but it is not related to the accuracy of the system.

In detail, calculating the capital expenses contains the items' price and the quantity. While the CAPEXs are paid before operating the business, there is no need to add a recruitment variable to calculate repeated payments. However, returning the CAPEX from the revenue might not be planned in a single year. The business might attempt to return it in a shorter time or in a longer time. Therefore, the return period of the CAPEX was considered and therefore, the annual CAPEX is the total CAPEX divided by the number of years. To be more precise, the total CAPEX is multiplied by 12 months and divided by the number of the anticipated months to return the capital expenses from the revenue. This leads to the formulas that are used to calculate the total and annual CAPEX as the following:

$$\text{Total } CAPEX = \sum \text{Item Cost} \times \text{Quantity} \tag{2}$$

$$\text{Projected Annual } CAPEX \text{ to Return}$$
$$= \frac{\text{Total } CAPEX}{\text{Anticipated months to return}} \times 12 \text{ Months} \tag{3}$$

The operational expenses have a similar concept to the capital expenses. However, the OPEX would have some recruited payments, such as for renting, salary, and utility, as mentioned in this paper. Therefore, a variable is added to calculate the expenses over a specific time period. As used in the CAPEX formula, the OPEX formula below considers the monthly period. However, the business can change it to its desired timeframe.

$$\text{Annual } OPEX = \sum (\text{Item cost} \times \text{Expected monthly quantity} \times 12 \text{ Months}) \tag{4}$$

Product cost is the third step in feeding inputs to the proposed system. Several variables were included to achieve a precise product cost. Those variables are the item name and category, item price, and the expected purchased monthly quantity. Also, the business should specify the number of months to buy each product, as several products are considered as seasonal and not required every month in the year, leading to the calculation of the total expenses per year of each product. Additionally, the contribution ratio of the total cost of each product to the total products' purchasing expenses will be calculated. This ratio will help to distribute the additional business costs on all products based on their ratios. The product cost formulas are:

$$\text{Annual product cost} = \sum_{1}^{n} (\text{Item cost} \times \text{Monthly quantity} \times \text{No. of months}) \tag{5}$$

$$\text{The cost ratio of each product to the total cost} = \frac{\text{Annual product cost}}{\text{Total cost of all products}} \times 100 \tag{6}$$

Where n is the product number.

6.4 The Output Component

The sections discussed above stated that the intermediate component – the calculation process – is described within the input and the output component sections. The intermediate component – the calculation process –plays a significant

role to present the output result and to determine the minimum selling price. The results from the calculation process of the input costs were essential at this stage.

Calculating the minimum sales price for each product passes through three stages. Those stages were implemented using the formulas 7, 8, and 9 to identify the minimum selling price per each product. Thus, retailers should not go below this price in order to cover all the considered expenses. It is understandable that in some situations, retailers might have to set a price to sell specific products below the real cost for several reasons, such as renewing the stock or if the product is due to expire, which is common in the retailing industry. As will be seen later in this paper, retailers would still end up, in the financial period, with the desirable profit even if they lost profit in some products, by understanding the real costs of all products and by covering the loss from the other products and services offered.

In the first stage, the proposed algorithm suggests distributing the total of the projected annual CAPEX and OPEX costs on the products, based on the cost ratio of each product, to the total cost.

$$\text{Stage 1} = (\text{Annual } CAPEX + \text{ Annual } OPEX) \times$$
$$\text{The cost ratio product to the total products cost} \tag{7}$$

The literature and the conducted survey stated some associated sales-related costs. Those expenses are calculated in the second stages. The ratio of the sales tax PLUS commission rates will be added to find the minimum sales price. Additionally, according to Islam practice, Muslim-owned businesses are required to pay 2.5% to poor people annually to support them. This allocated amount is called "zakat" or "zakah." Therefore, most survey participants were asked to consider the zakat in calculating the minimum selling price. As a result, the solution is shown as the following:

$$\text{Stage 2} = \text{Stage 1} +$$
$$\frac{\text{Stage 1} \times (\text{tax} + \text{commission} + \text{zakat})}{100} \tag{8}$$

At the final stage, note that the calculated result of stage 2 shows the additional cost of all items of each specific product. Therefore, it is required to divide the result of stage 2 by the product quantity number to obtain the minimum selling cost or the minimum COGS for each product. Additionally, the shipping cost – if available – is added to the price of each item, as shown in the formula:

$$\text{MRSP} = \frac{\text{Stage 2}}{\text{Item quantity}} + \text{Shipping cost per item} \tag{9}$$

It is common in the retailing industry to comply with manufacturer or distributer's regulation in suggesting a specific COGS for some products. This concept is known as the minimum advertised pricing or MAP. This concept was considered when designing the system. After calculating the minimum recommended price, the business has the option to write the actual price for each item. The system will calculate the actual gross income and compare it with the minimum suggested gross (the total revenue of all items at the system suggested cost). This will give the business information as to whether the COGS will cover the total expenses or not.

The final stage of this algorithm attempts to calculate the net profit of the business. The process goes through several stages. First, the business might alter the suggested prices to its preferred price for each item. Then, the total of the preferred COGS price is calculated by multiplying each preferred price by the quantity. Then, the difference between the COGS and the minimum recommended price is calculated to see the gross profit or loss. Finally, when making profit, the tax, commissions, and zakat – if available – will be subtracted from the gross profit to calculate the net profit. These steps are implanted in the following formulas:

$$\text{COGS of the preferred prices} =$$
$$\sum_{1}^{n} \text{Item preferred price} \times \text{quantity} \tag{10}$$

$$\text{Gross profit OR loss} = \text{COGS of the preferred prices}$$
$$- \text{ Minimum COGS of the system suggested price} \tag{11}$$

$$\text{Net profit} = \text{Gross profit} \times$$
$$\frac{100 - \text{tax rate} - \text{commission rate} - \text{Zakat}}{100} \tag{12}$$

7. Result

In order to test the proposed system, a retailer is randomly picked to participate in the survey stage to join a trial session of the system. The participant filled out the system fields independently, and the result was examined. The coming lines discuss the workflow of the system and the test results. Also, the following flowcharts were designed to simplify the process. Each task of the process was numbered to interpret it easily. Those numbers were mapped to the result table. Additionally, the rectangles in each flowchart represent a computer-based calculated task, while the parallelograms show the manually entered values by the businesses. Again, the calculated and the manually filled values were represented in the result tables using the letters C and M respectively.

7.1 The Capital Expenses

The first stage of the practical work was implemented to assign the capital expenses. As shown in Fig. 3, the process consists of eight tasks. The first five tasks should be filled manually, while the last three will be generated by the system.

The tasks of Fig. 3 could be summarized as the following:

- The steps 1 to 5 will be filled manually. The user enters the item sequence number, item name, item purchase
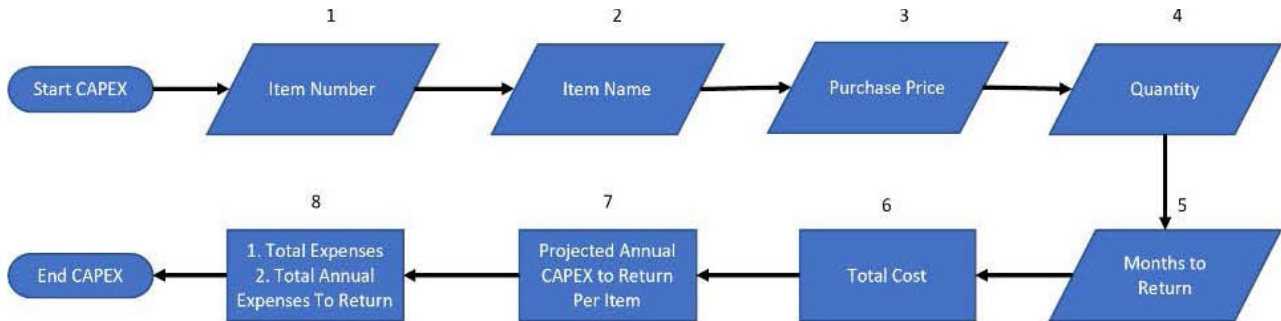
Fig. 3 Calculating the capital expenses
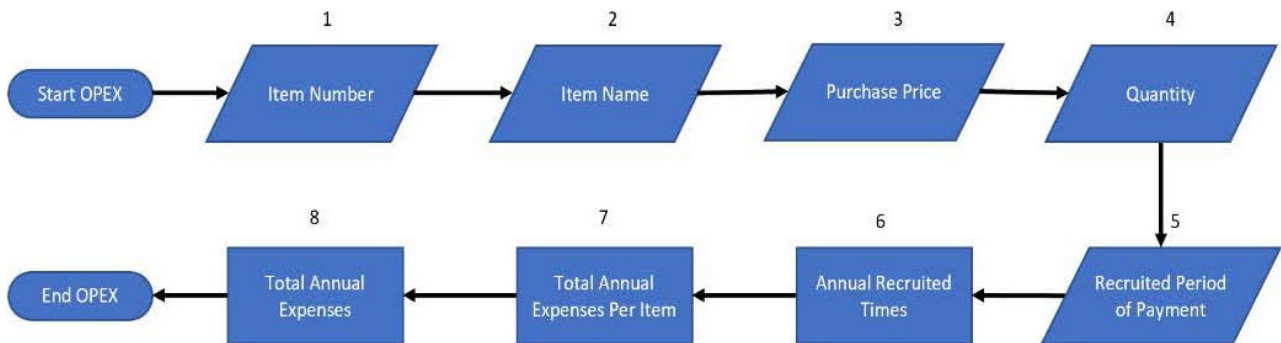
Fig. 4 Calculating the operational expenses

Table 4 The detailed retailer's CAPEXs.

Task number						
1	2	3	4	5	6	7
Status	M	M	M	M	C	C
No.	Item	Price	Quantity	Months to Return	Total Cost	Projected Annual CAPEX to Return
1	Physical building purchase and upgrade	0	0	0	0	0
2	Computer hardware and software	5000	2	24	10000	5000
3	Furniture	50000	1	120	50000	5000
4	Stationary	1000	1	12	1000	1000
5	Legal documents	5000	1	12	5000	5000
6	Machines	5000	4	60	20000	4000
7	Transportation facilities	4000	3	60	12000	2400

Table 5 The summarized retailer's CAPEX.

Task number
8
C
Total CAPEX
98000
Projected Annual CAPEX
22400

As mentioned in the system development's section, the last tasks of the CAPEX stage calculate the total CAPEX and the required annual CAPEXs returned from the business, as in Table 5.

7.2 The Operational Expenses

After completing all the capital expenses to establish the organization, it is time to collect all the ongoing operational expenses, which is the second phase of the proposed system. The OPEX phase should include all the required expenses to run and operate the business, which can be repeated over time. The following figure summarizes the process of the OPEX phase.

The tasks mentioned in Fig. 4 above could be summarized as the following:

- Steps 1 to 5 will be filled manually. The user enters the item sequence number, item name, item purchase price, the quantity, and the recruited period of payment, which could be daily, weekly, fortnightly, monthly, quarterly, semiannually, or annually.

price, the quantity, and the desired month duration to return the value of the item from the revenue.
- Based on the used formulas, the system calculates the projected annual CAPEX to return per item, total expenses and the total annual expenses to return for all items.

After filling the required fields, the information is represented in Table 4. Note that the table contains the first seven tasks. This is because the last task shows accumulated values of all CAPEXs combined together, as shown in Table 5. Note that the business did not buy the premises. Therefore, the price is assigned to zero.

Table 6 The detailed retailer's OPEXs

Task number						
1	2	3	4	5	6	7
Status	M	M	M	M	C	C
No.	Item	Price	Quantity	Period of Payment	Annual recruited times	Total Annual Expenses
1	Legal and Government	10000	1	Annually	1	10000
2	Premises taxes	1500	1	Annually	1	1500
3	Office suppliers	500	1	Monthly	12	6000
4	Salaries	4500	2	Monthly	12	108000
5	Pension	420	3	Monthly	12	15120
6	Rental	10000	1	Semiannually	2	20000
7	Web hosting	50	1	Monthly	12	600
8	Maintenance	250	1	Monthly	12	3000
9	Utilities	500	1	Monthly	12	6000
10	Advertisement	1000	1	Quarterly	4	4000
11	Travel and delivery	30	3	Daily	365	32850

Table 7 The summarized retailer's OPEX.

Task number
8
C
Total OPEX
207070

- The 6th, 7th, and 8th tasks are calculated by the system.
- The sixth task converts the user selection of task 5 to countable numbers to be used in the following calculations. For example, if the payment was recruited on a daily basis, the system will consider it 365 times per the whole year. If the user selected a monthly payment, the system will consider it 12 times annually, and so on.
- The seventh task calculates the total annual cost per item, while the last task adds the expenses of all items to show the sum of the total OPEXs annually.

Table 6 shows the filled values and the calculated values, while the total OPEX per annum (task 8) is presented in Table 7.

The participated retailer was asked regards considering bank loan and other debts when using this proposed model. They answered that briefly *"obviously, we will put them as operational expenses. We can assign the duration of those expenses to be either monthly or annually. This would help us to deal with the variable interest rate, but luckily, we did not apply for a bank loan"*.

After preparing the business to buy and sell goods and services, it is time now to move to the third phase to fill those products.

7.3 Product Prices

Filling the price and the approximate number of sales of each product consumes extra time. However, once this process is completed, the vision is mostly clear to assign the selling price or COGS for each product, which increases the likelihood of profit and reduces the risk of loss. The associated tasks of this phase are represented in Fig. 5.

Unlike the previous two phases, the product pricing phase process is more sophisticated, containing 21 tasks, which are described as the following:

- The first five tasks are implemented manually. The user enters the sequence number – or the item number – that is followed by selecting a product category and name in tasks 2 and 3. The fourth task determines the purchasing price per item. Then, the monthly purchased quantity of the item will be stated.
- The sixth task is calculated by the system to find the monthly cost of each item, which is required for the upcoming calculations.
- Tasks 7, 8, and 9 are manual. In the seventh task, the user enters the number of months per year to sell each item. The reason for this step is to consider the sessional products that are on the shelves for few weeks or months per annum. Note that the eighth task is combined of three subtasks, as all their numbers are a percentage. The user will assign the percentage rate – if available – of tax, commission and zakat, while the ninth task is dedicated to the shipping cost, which was requested by retailers to consider if they have an online store.
- The system calculates six values per item in tasks 10 to 15. The annual quantity and annual product cost are calculated in steps 10 and 11 respectively. After that, the ratio of the total cost of a single product to the total cost of all products combined is shown in task 12.
- The process of calculating the minimum recommended price for each item starts from task 13. In this task, the annual CAPEX and OPEX costs will be distributed as added costs on top of the cost of each product. Each product will get the additional cost based on the contribution ratio from task 12.
- Task 14 depends on the result of task 13. It will add the extra costs from the tax, commission and zakat. Task 15 will add the shipping cost first to the total of task 14, and then divide the result by the number of items of each product to find the minimum recommended selling price per item.
- The 16th task is implemented manually. After the business see the minimum recommended price, they can now assign their preferred COGS. However, it is highly recommended to leave this task until all products in the table are filled, because the calculated minimum recommended price will change after adding products to the table. This is because the associated costs of CAPEXs and OPEXs are distributed among more products, resulting in reducing the MRSP per item.
- The total COGS of all items of each product are calculated in task 17, which helps in task 18 to find out the profit or loss of each product. Additionally, the net profit per each product is calculated after deducting the tax, commission, and zakat in task 19.

As seen in Fig. 5, the accumulated values of a significant summary are presented in tasks 20 and 21, which shows
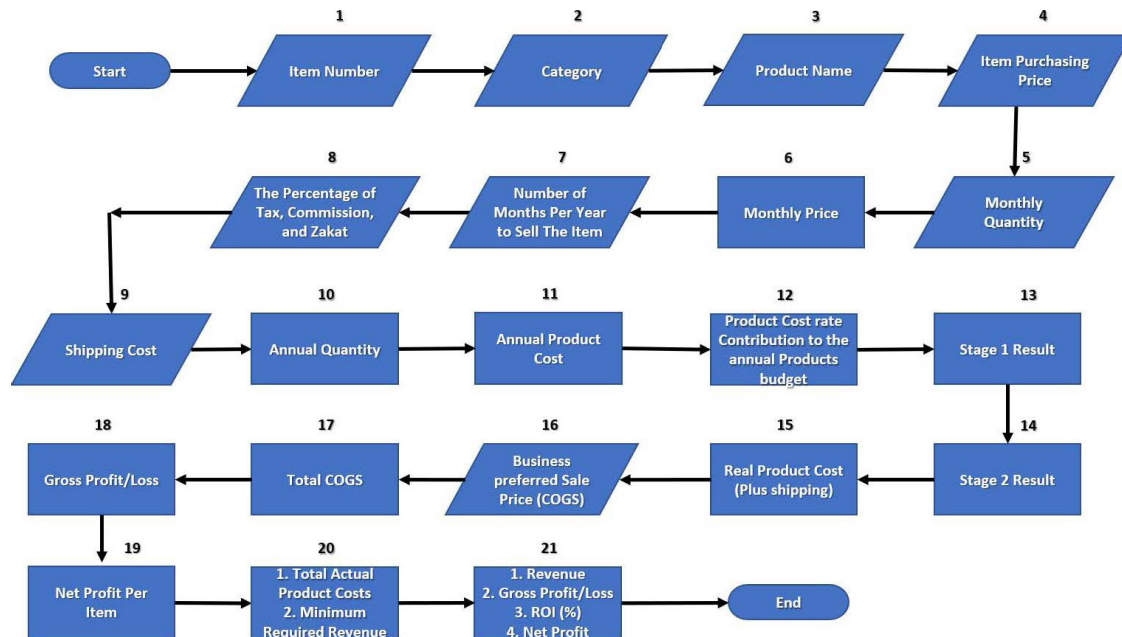
Fig. 5 The workflow of calculating the minimum recommended selling price (MRSP)

the actual product cost of all products after adding the associate costs, the minimum required revenue per annum to avoid loss, the expected revenue based on the preferred COGS, the annual gross profit or loss, the annual ROI, and by the end the expected net profit.

The Tables 8 and 9 represent the detailed scenario of the product pricing process. Task 8 of Table 8 shows a variety of values. All the products are tied with tax and zakat. Some products have commissions, and others do not. The interesting issue to discuss here is related to product numbers 3, 13, and 23. For a stock issue, the retailer had to sell those items below the recommended price. Although the record in Table 8 highlights a loss on those items, the total in Table 9 stands with the business by showing that the profit from the other products exceeded the loss in the three mentioned products, where the net profit is near 98k

8. Discussion

In Table 8, tasks 15 and 16 are significant to lead the business to success. Retailers can obtain the minimum recommended price to sell goods and services by looking at the results of task 15, which gives insight to decide the actual shelf price they would set in task 16. Then, it will see the expected result of the preferred prices immediately in columns – tasks – 18 and 19 as well as seeing the overall effect on the financial statement in Table 9. As discussed in Sect. 8, which is stage 2 of the methodology, the overall result of selling each product depends on understanding the minimum suggested price to generate profit and to avoid loss. It also helps to figure out the prices of the offered products if the retailer has to sell below the real accumulated cost of the product to cover the loss in the financial statement and to reach the desired result.

After obtaining the presented results of Table 8, the same businesses were asked again to explain their strategies in calculating the margin to avoid the unexpected loss, and to encounter any unexpected external forces, such as the variability of the interest rate and the price fluctuation of the products. In summary, four main practices are used as the following:

1. Some new to market businesses tend learn from the experience. Three businesses stated that they are already expecting some loss.
2. About 80% of retailers use their experience and market knowledge to set the margin. Usually, they take extra 30% to 50% profit to cover the unexpected loss or market hits, such as sudden low sales seasons, including COVID19 issue in 2020.
3. Some products' prices were determined by the wholesaler or the manufacturer company. Thus, retailers cannot modify the unified price.
4. The controlled price of some products by the government or the regulator. Again, the price of products in this category is unchangeable, and must remain the same.

The proposed system has the advantage of the adaptability to work with most retailers with different margin calculation strategies. They can add the ratio as example to the preferred sales price. Also, businesses can add, alter, or remove expenses easily to fill the values more precisely. However, this system considers the same products in both inbound and outbound processes. In other words, this system deals with the same products that enter the retailers for a specific price and then are sold for a higher price to generate profit. It does not consider the business-generated products, such as the industry or at least a bakery who creates breads

Table 8   The detailed products' details and MRSP for each product.

1	2	3	4	5	6	7	8	8	8	9	10	11	12	13	14	15	16	17	18	19
Status	M	M	M	M	C	M	M	M	M	M	C	C	C	C	C	C	M	C	C	C
No.	Category	Product	Purchasing Price	Monthly Quantity	Monthly price	# of months per year	tax(%)	Commission (%)	Zakat (%)	Shipping Cost per item	Annual Quantity	Annual cost	Contribution to the annual products budget	Stage 1	Stage 2	MRSP (Plus shipping)	Business preferred Sale Price (COGS)	Total COGS	Gross Profit/Loss	Net Profit
1	Food	Chicken	7.5	200	1500	12	5	0	2.5	1	2400	18000	7%	33840.45	36378.49	16.16	20.00	48000.00	9221.51	8529.90
2	Food	Sugar	10	100	1000	12	5		2.5		1200	12000	5%	22560.30	24252.32	20.21	30.00	36000.00	11747.68	10866.60
3	Food	Milk	26	100	2600	12	5		2.5	0	1200	31200	12%	58656.78	63056.04	52.55	49.99	59988.00	-3068.04	-2837.94
4	Food	Noodles	1	100	100	12	5		2.5		1200	1200	0%	2256.03	2425.23	2.02	5.00	6000.00	3574.77	3306.66
5	Food	Rice	33.5	30	1005	12	5		2.5		360	12060	5%	22673.10	24373.59	67.70	76.00	27360.00	2986.41	2762.43
6	Food	Olives	5	30	150	12	5		2.5		360	1800	1%	3384.05	3637.85	10.11	13.00	4680.00	1042.15	963.99
7	Food	Cheese	8.95	300	2685	12	5		2.5		3600	32220	12%	60574.41	65117.49	18.09	21.00	75600.00	10482.51	9696.32
8	Food	Dates	9	500	4500	1	5		2.5		500	4500	2%	8460.11	9094.62	18.19	22.00	11000.00	1905.38	1762.48
9	Food	Meat	8	100	800	12	5		2.5		1200	9600	4%	18048.24	19401.86	16.17	18.00	21600.00	2198.14	2033.28
10	Food	Eggs	13	400	5200	12	5		2.5		4800	62400	24%	117313.57	126112.09	26.27	29.00	139200.00	13087.91	12106.32
11	Cleaning	Shampoo	8.5	50	425	12	5		2.5		600	5100	2%	9588.13	10307.24	17.18	20.00	12000.00	1692.76	1565.81
12	Cleaning	Tissue	1	1000	1000	12	5		2.5		12000	12000	5%	22560.30	24252.32	2.02	2.02	24252.32	0.00	0.00
13	Food	Juice	0.65	2000	1300	12	5		2.5		24000	15600	6%	29328.39	31528.02	1.31	1.20	28800.00	-2728.02	-2523.42
14	Cleaning	Clothes bleach	7.66	50	383	12	5		2.5		600	4596	2%	8640.60	9288.64	15.48	20.00	12000.00	2711.36	2508.01
15	Electronics	Printers	77.6	2	155.2	12	5	2	2.5		24	1862.4	1%	3501.36	3833.99	159.75	200.00	4800.00	966.01	874.24
16	Electronics	Cell Phone	68	1	68	12	5	2	2.5		12	816	0%	1534.10	1679.84	139.99	160.00	1920.00	240.16	217.34
17	Electronics	Chargers	3	10	30	12	5	2	2.5		120	360	0%	676.81	741.11	6.18	10.00	1200.00	458.89	415.30
18	Electronics	Microwave	27.9	2	55.8	12	5	2	2.5		24	669.6	0%	1258.86	1378.46	57.44	60.00	1440.00	61.54	55.70
19	Food	Water	0.7	3000	2100	12	5		2.5		36000	25200	10%	47376.63	50929.88	1.41	2.00	72000.00	21070.12	19489.86
20	Cleaning	Toilet Papers	0.4	1000	400	12	5		2.5		12000	4800	2%	9024.12	9700.93	0.81	3.00	36000.00	26299.07	24326.64
21	Electronics	Toaster	8.33	2	16.66	12	5	2	2.5		24	199.92	0%	375.85	411.56	17.15	20.00	480.00	68.44	61.94
22	Outdoor	Charcoal	5	10	50	8	5		2.5		80	400	0%	752.01	808.41	10.11	30.00	2400.00	1591.59	1472.22
23	Outdoor	Tent	50	20	1000	3	5		2.5		60	3000	1%	5640.08	6063.08	101.05	100.00	6000.00	-63.08	-58.35
24	Outdoor	Poncho	0.3	300	90	3	5		2.5		900	270	0%	507.61	545.68	0.61	1.00	900.00	354.32	327.75
25	Outdoor	Football	15	20	300	3	5		2.5		60	900	0%	1692.02	1818.92	30.32	31.00	1860.00	41.08	38.00

Table 9   The final product costs' summary

Task number					
20	20	21	21	21	21
Status	C	C	C	C	C
Total Actual Product Costs	Minimum Required Revenue	Revenue	Gross Profit/Loss	ROI (%)	Net Profit
260753.92	527137.65	635480.32	108342.67	20.55	97961.07

inside the business from a collection of raw materials.

Tables 8 and 9 show the filled products by the selected retailer.

9.   Conclusion

Considering using a business model while establishing and running the business would play a major role in the business success, especially if the business leverages the resources of the information and communication technology. The potential of using automated systems adds a significant value that most likely views several hidden opportunities while conducting tasks manually. Unlike the significant utilization of computing resources by giant enterprises, small retailers still need further steps to empower their businesses by adopting information technology.

This research contributed in offering the retailing industry a simplified algorithm to assist in calculating the minimum recommended selling price for each product. It considers and calculates all possible associate costs during the establishment and the running of the business in order to highlight the breakeven selling price that the retailer should go above to generate profit. One of the advantages of this system is to provide easy-to-understand and visual statistics that allow retailers to see their profit or loss per item and in general. As discussed before, the system also showed that retailers could generate profits even if they sell some products below the MRSP, because they can cover it from the sale of the other products.

The certainty level of the proposed model depends on several factors. The ideal view of the calculation would work accurately with no possibilities of any errors. However, considering other factors would generate different levels of error rate. For instance, the misleading consideration of safety margin might not be sufficient to face the unexpected market situations. This would lead to unexpected loss. Additionally, forgetting to include all expenses and products to CAPEX and OPEX lists would leads later to incorrect calculations with a several levels of severity. If the forgotten items were expensive and essential, the calculated budget would be damaged. One more possible source of risk that should be considered; as it would regularly happen; is the frequent adding and modifying the list. This because the system will always recalculate the minimum recommended retail price. Thus, the safety margin should be well consid-

ered from the early stages of using this model.

The future stages of this work go into several directions. Technically, the project will be converted to a reusable code – or what programming experts call "APIs" – to be usable with any other system. This will boost the benefits of this project by utilizing the potential of big data and web services to enhance business decisions. In addition, the work will be implemented to connect it directly to the inventory systems to avoid data entry duplication.

From a business view, the work will be implemented to mitigate the limitations of the system by considering having raw materials and converting them within the retailer's premises into a ready-to-sell product. Additionally, the dynamic product offering feature is not part of the current proposed model. Thus, it will be well-considered in the future plan to be added and proposed in the new versions of the model.

In the end, it is recommended to conduct more research to automate more components of the business model to direct retailers to the best path in their decisions.

Acknowledgements

References

[1] R.M. Abrams, The successful business plan: secrets & strategies, The Planning Shop, 2003.

[2] M. Kajanus, V. Leban, P. Glavonjić, J. Krč, J. Nedeljković, D. Nonić, E. Nybakk, S. Posavec, M. Riedl, M. Teder, E. Wilhelmsson, Z. Zālīte, and T. Eskelinen, "What can we learn from business models in the european forest sector: Exploring the key elements of new business model designs," Forest Policy Econ., vol.99, pp.145–156, 2019.

[3] A. Osterwalder and Y. Pigneur, Business model generation: A handbook for visionaries, game changers, and challengers, John Wiley & Sons, 2010.

[4] B. Fritscher and Y. Pigneur, "Classifying business model canvas usage from novice to master: A dynamic perspective," Business Modeling and Software Design, Lecture Notes in Business Information Processing, vol.257, pp.134–151, Springer International Publishing, Cham, 2016.

[5] J. Frick and M.M. Ali, "Business model canvas as tool for SME," Advances in Production Management Systems. Sustainable Production and Service Supply Chains, IFIP Advances in Information and Communication Technology, vol.415, pp.142–149, Springer Berlin Heidelberg, Berlin, Heidelberg, 2013.

[6] S. Ma and R. Fildes, "A retail store SKU promotions optimization model for category multi-period profit maximization," Eur. J. Oper. Res., vol.260, no.2, pp.680–692, 2017.

[7] A. Greenstein-Messica and L. Rokach, "Personal price aware multi-seller recommender system: Evidence from eBay," Knowl-Based. Syst., vol.150, pp.14–26, 2018.

[8] R. Whittington and P.R. Delaney, Wiley CPA Exam Review, Business Environment and Concepts, Wiley, 2010.

[9] J.J. Weygandt, P.D. Kimmel, and D.E. Kieso, Managerial Accounting: Tools for Business Decision Making, John Wiley & Sons, 2015.

[10] P. Muller, J. Julius, D. Herr, L. Koch, V. Peycheva, and S. McKiernan, "Annual report on european smes 2016/2017: Focus on self-employment," London: European Commission, 2017.

[11] S. Nicholls, D. Orsmond, et al., "The economic trends, challenges and behaviour of small businesses in australia," Proceedings of the Reserve Bank Annual Conference, pp.5–31, 2015.

[12] B. Fakieh, "Smes research: The continuous need to explore the ict potential," pp.1088–1097, Nov. 2018.

[13] USITC, "Small and medium-sized enterprises: Characteristics and performance," pp.332–510, 2010.

[14] N. Arroteia and B. Bhatta, The Secrets to the Profitable Startup, Startup Finance, 2018.

[15] J. Municipality, "About jeddah city," https://www.jeddah.gov.sa/English/JeddahCity/About/index.php, April 2019.

[16] T.Y. Sawyer, Pro Excel financial modeling: Building models for technology Startups, Springer, 2009.

[17] S. Bragg, "Examples of capital expenditures," https://www.accounting tools.com/articles/examples-of-capital-expenditures.html, March 2019.

[18] S. Bragg, "Examples of operating expenses," https://www.accounting tools.com/articles/what-are-examples-of-operating-expenses.html, March 2019.

Bahjat Fakieh is working as assistant professor at King Abdulaziz University in Jeddah - Saudi Arabia. Previously, he was working as a lecturer in Federation University in association with ATMC college campus in Sydney for 1.5 years to teach cloud computing for a postgraduate program. In addition, he was working as an Information Systems tutor in Macquarie University for 4.5 years. His research interest is technology adoption, information systems, electronic business, electronic commerce, IT Project management and cloud computing. Currently, Bahjat is working on technology enabling for small and medium sized enterprises (SMEs) and information systems projects implementations.