A MODEL OF DATABASE PLATFORM FOR E-COMMERCE APPLICATIONS IN E-SOCIETY

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Abstract. *This paper aims to present a database model for the development of an e-commerce application, a food-ordering/cake shop. Our application is meant to facilitate online ordering of food dishes from suppliers who provide home delivery.*

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1. Introduction

The online environment is developing at an astonishing rate, most of the commerce is carried out in parallel on the Internet and in physical stores. Nowadays we can order almost anything from the Internet, often at lower prices than usual.

First there were electronic good stores, then clothes and accessories stores, and now even food can be found in electronic stores. All of this involves certain logistics costs such as: transport (import or export), packaging, warehousing, delivery, customer relations via email/chat/telephone but also others.

Data is a very powerful organizational resource and it must be managed as such because it reflects on the company's assets, the external environment and the internal environment. The volume of data is constantly increasing and therefore it becomes imminent to organize them into data structures and then databases that can be easily used on the web.

2. Background

The technologies associated with e-commerce are used by clients and companies in different ways, which is why companies use them to ease their work.

In what follows we propose an online business model that brings changes in the relationships between partners and customers. It involves innovative technologies and facilitates the ease of online activity.

Minimally, it contains the product catalog or services with technical and commercial descriptions for each position in the catalog. These descriptions are managed by a database management system, which will deal with the storage and manipulation of data and the provision of data access possibilities. The average version contains facilities for taking orders (by e-mail or interactive forms that customers will complete), and the extended version will include the possibility of making the payment online (by credit cards or other electronic versions).

3. Prototype

The proposed database is implemented on a pastry/cake shop trading company. The structure of the tables and relationships between them is presented below (see *Figure 1*). When designing it, we must ensure the flow from producers to consumers. The database is intended to be properly designed, and the programmer can subsequently add new facilities by adding new tables and relating them to existing ones.

Figure 1. Database relationship

The basic categories and suppliers are shown in the following figures (see Figure 2 and 3).

ClassID	ClassName
1	Oven
2	Wholesale Bakery Ingredients
3	Measuring and mixing Supplies
4	Boxes and Containers
5	Baking Tools and Ustensiles
6	Cake decorating Supplies
7	Pans and Cake Molds

Figure 2. The categories of products

Supplier	Type	Amount	Ranking
Ateco	Decorating Supplies	567	2
Baker's Mark	Pans and Cake Molds	787	7
Cambro	Measuring and Mixing Supplies	632	6
Empire products	Baking machines	58	3
Ernesto	Baking Tools	987	1
Monin	Wholesale Ingredients	986	4
Polar Pack	Boxes and Containers	3434	8
Torani	Wholesale Ingredient	675	5

Figure 3. The Manufacturer table

Purchases are recorded in the *Purchase* table, the invoice is prepared after the *PurchaseID* primary key field.

PurchaseID	Date	Username	IP Address
200901	3/8/2018	kissdia2	122.12.125.12
200902	3/24/2018	corujanela	156.56.456.36
200903	2/7/2018	brbviv22	459.54.459.45
200904	12/14/2017	nagyr3	125.36.963.35
200905	4/20/2018	petra23	126.85.495.59
200906	3/16/2018	noemi10	124.35.565.35
200907	2/5/2018	reka99	854.36.459.85
200908	1/10/2018	liptai67	456.23.458.99
200909	4/29/2018	gabo2000	123.52.981.11

Figure 3. Purchase Table, the structure and a few orders.

The *Selection* table is used to select products from a particular IP. We present the structure and some recordings (see Figure 4).

Field Name	Data Type
Ip Adress	Short Text
ProductID	Number
Amount	Number

Ip Adress	ProductID	Amount
122.12.125.12	1001	1
122.12.125.12	1006	15
122.12.125.12	1021	12
123.52.981.11	1005	5
123.52.981.11	1006	4
123.52.981.11	1009	10

Figure 4. The structure and a few records of Selection table

4. Data retrieval

In a well-designed database, queries help us extract information from various tables and assemble them to display in the form or report. Thus, the user will focus much better only on the information he needs. A database management system requires a query language to allow the user to access the data. SQL is the language used by most relational database systems, so we will also exemplify the queries proposed in this language.

A first query would be required to display the cost of the products ordered by a particular person. We can write a query with the code below.

```
SELECT Costumers.Name, Purchase.Date, BakingProduct.Name,
Selection.Amount, BakingProduct.Price,
[Selection].[Amount]*[BakingProduct].[Price] AS [Must Pay]
FROM Costumers INNER JOIN (BakingProduct INNER JOIN ([Shopping
Cart] INNER JOIN Purchase ON [Shopping Cart].IPAddress = Purchase.[IP
Adress]) INNER JOIN Selection ON [Shopping Cart].IPAddress =
Selection.[Ip Adress]) ON BakingProduct.ProductID =
Selection.ProductID) ON Costumers.Username = Purchase.Username;
```

The result of the code is shown in Figure 5.

Categories	Manufacturer	Relationships	Orderes product costs			
Costumers.↑	Date	BakingProduct.Name	Amount	Price	Must Pay	
Kiss Dia	3/8/2018	Baking and Icing Spatula	1	\$34.00	\$34.00	
Kiss Dia	3/8/2018	32-Tray Diesel Rotary Oven	15	\$508.50	\$7,627.50	
Kiss Dia	3/8/2018	Baking Molds	12	\$34.00	\$408.00	
Corujan Elena	3/24/2018	Disposable Paper	10	\$10.00	\$100.00	
Corujan Elena	3/24/2018	Cupcake Packing	7	\$12.00	\$84.00	
Barbos Vivien	2/7/2018	32-Tray Diesel Rotary Oven	9	\$508.50	\$4,576.50	
Barbos Vivien	2/7/2018	Fondant Smoothing Tools	5	\$22.00	\$110.00	
Nagy Robert	12/14/2017	Chocolate Spread	8	\$25.00	\$200.00	
Babos Petra	4/20/2018	Quiche Tart Pans and Molds	10	\$55.00	\$550.00	
Teglas Noemi	3/16/2018	Baking Toppings	5	\$12.00	\$60.00	
Benk Reka	2/5/2018	Hinged PET Container	10	\$25.00	\$250.00	
Benk Reka	2/5/2018	Chocolate Spread	55	\$25.00	\$1,375.00	
Benk Reka	2/5/2018	Cake Boxes	13	\$3.00	\$39.00	
Benk Reka	2/5/2018	Disposable Paper	40	\$10.00	\$400.00	
Benk Reka	2/5/2018	Cupcake Pan	49	\$34.00	\$1,666.00	
Liptai Claudia	1/10/2018	Cake Extender	4	\$34.00	\$136.00	
Liptai Claudia	1/10/2018	Cake Take Out Container	22	\$4.00	\$88.00	
Kicsi Gabor	4/29/2018	Pastry Bag	5	\$10.00	\$50.00	
Kicsi Gabor	4/29/2018	32-Tray Diesel Rotary Oven	4	\$508.50	\$2,034.00	
Kicsi Gabor	4/29/2018	Dry Ingredients	10	\$111.00	\$1,110.00	

Figure 5. An important query : Orderes Products costs

We can use arithmetic operators to create our own expressions in queries. For example to apply a discount of 9% we can write the query with the code below.

```
UPDATE BakingProduct SET BakingProduct.Price = Price*0.9 WHERE
(((BakingProduct.[ClassID])="1") AND BakingProduct.[Price])>=100));
```

To generate a report showing us the buyers' products we can write the query below.

```
SELECT Costumers.Name AS Costumers_Name, Purchase.Date, Selection.[Ip
Adress], Selection.ProductID, Selection.Amount, BakingProduct.Name AS
BakingProduct_Name
FROM ([Shopping Cart] INNER JOIN (BakingProduct INNER JOIN Selection ON
BakingProduct.[ProductID] = Selection.[ProductID]) ON [Shopping
Cart].[IPAdress] = Selection.[Ip Adress]) INNER JOIN (Costumers INNER JOIN
Purchase ON Costumers.[Username] = Purchase.[Username]) ON [Shopping
Cart].[IPAdress] = Purchase.[IP Adress];
```

Then the report can be generated, as shown in Figure 6.

SQL being a powerful language for relational databases used in querying, updating and managing data, will also help to write a query that provides us with product information. We will first write the query in SQL code, then we will build the report based on the query (as shown in Figure 7).

Costumers					
Costumers_Name	Date	Ip Adress	ProductID	Amount	BakingProduct_Name
Babos Petra	4/20/2018	126.85.495.59	1018	10	Quiche Tart Pans and Molds
	2/7/2018	459.54.459.45	1006	9	32-Tray Diesel Rotary Oven
Barbos Vivien	2/7/2018	459.54.459.45	1003	5	Fondant Smoothing Tools
	2/5/2018	854.36.459.85	1028	10	Hinged PET Container
Benk Reka	2/5/2018	854.36.459.85	1012	55	Chocolate Spread
	2/5/2018	854.36.459.85	1022	13	Cake Boxes
	2/5/2018	854.36.459.85	1025	40	Disposable Paper
	2/5/2018	854.36.459.85	1029	49	Cupcake Pan
Corujan Elena	3/24/2018	156.56.456.36	1024	7	Cupcake Packing
	3/24/2018	156.56.456.36	1025	10	Disposable Paper
Kicsi Gabor	4/29/2018	123.52.981.11	1009	10	Dry Ingredients
	4/29/2018	123.52.981.11	1005	5	Pastry Bag
Kiss Dia	4/29/2018	123.52.981.11	1006	4	32-Tray Diesel Rotary Oven
	3/8/2018	122.12.125.12	1001	1	Baking and Icing Spatula
	3/8/2018	122.12.125.12	1021	12	Baking Molds
	3/8/2018	122.12.125.12	1006	15	32-Tray Diesel Rotary Oven
Liptai Claudia	1/10/2018	456.23.458.99	1020	4	Cake Extender
	1/10/2018	456.23.458.99	1023	22	Cake Take Out Container
Nagy Robert	12/14/2017	125.36.963.35	1012	8	Chocolate Spread
Teglas Noemi					

Figure 6. Buyers products (report and query builder)

```
SELECT Manufacturer.Supplier, BakingProduct.Name,
BakingProduct.Price, BakingProduct.Amount,
BakingProduct.[Warranty(Months)]FROM Manufacturer INNER JOIN
BakingProduct ON Manufacturer.[Supplier] = BakingProduct.[Supplier];
```

Product Information					
Supplier	Name	Price	Amount	Warranty(Months)	
Ateco	Baking and Icing Spatula	\$34.00	43	6	
	Fondant Smoothing Tools	\$22.00	34	12	
	Individual Piping Tips	\$14.00	23	6	
		Total value	7000		
Baker's Mark	Quiche Tart Pans and Molds	\$55.00	77	12	
	Baking Molds	\$34.00	23	12	
	Cake Extender	\$34.00	34	12	
	Cake Pan	\$66.00	45	6	
	Cupcake Pan	\$34.00	98	6	
		Total value	61771		
Cambro	Measuring Spoons	\$23.00	54	6	
	Measuring Cups	\$55.00	46	6	
	Mixing Bowl	\$11.00	34	6	
	Ingredient Bows	\$34.00	34	6	
		Total value	20664		
Empire products	32-Tray Diesel Rotary Oven	\$457.65	56	36	
		Total value	25628.4		
Ernesto	Butane Cooking Torch	\$30.00	75	12	
	Pastry Bag	\$10.00	55	3	
		Total value	5200		
Monin	Fondant	\$24.00	47	18	

Figure 7. Product information (report and query builder)

After the basic tables are created, it is necessary to create a table to manage the shopping cart. The usual operations in such situations are: adding products, removing a product or a piece of a product, emptying the shopping cart.

The table structure is made in accordance with the application requirements and includes the following fields with the corresponding properties (see Table 1).

Table 1. The structure of Shipping Cart table

Field Name	Field Type	Properties
IPAddress	Short Text	Indexed, Primary key, No Duplicates
Payment	Short Text	Lookup Wizard, Cash / Card
Number of Product	Number	Whole number
Shipping	Short Text	Free / Costs

Some examples from the table that manages the shopping cart data are shown in figure 8.

Sort & Filter	Records
Categories	Manufacturer
Relationships	Orderes prod
IPAddress	Payment
Number of p	Shipping
122.12.125.12	Card
123.52.981.11	Card
124.35.565.35	Cash
125.36.963.35	Card
126.85.495.59	Card
156.56.456.36	Cash
456.23.458.99	Card
459.54.459.45	Cash
854.36.459.85	Cash

Figure 8. Shipping Cart

5. Conclusions

Nowadays, even a very small e-commerce store on a custom platform already uses a database. There is so much information that a store processes, that it is impossible not to use a database. This is the reason why for our online store business we have chosen to design the database and build the application ourselves. We considered that our application would provide some of the following features: easy to make changes, cakes detail pages, online support, contact forms, animation on pages, e-commerce features, easy making changes to the site.

With regard to databases, the present work aims to be an example of several branches in this field: database description, SQL programming and VBA programming. Through this combination we tried to integrate information, centralize it and extract results to be processed. The current technologies existing in both electronic commerce and in the field of databases promote decentralized, web-based work, managing to achieve the most profitable compromise.

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