

THE MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF
KAZAKHSTAN

Kazakh National Research Technical University named after K. I. Satbayev

Institute of Information and Telecommunication Technologies

Department of Cybersecurity, Data Storage and Processing

Sekenkyzy Uldana

Building business architecture of the enterprise

DIPLOMA WORK

specialty 5B070300 – «Information systems»

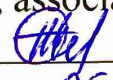
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Department of Cybersecurity, Data Storage and Processing

ADMITTED TO DEFENSE
Head of Department Cybersecurity
Data Storage and Processing,
PhD, associate professor
 N.A. Seilova
« 13 » 05 2019.

DIPLOMA WORK

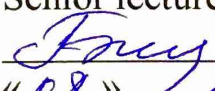
Theme: «Building business architecture of the enterprise»

specialty 5B070300 – Information systems

Performed

Sekenkyzy Uldana

Reviewer,
Deputy Head of the National Scientific
Laboratories for Sharing Information and
Space Technologies

Scientific advisor,
Senior lecture, Ph. D.
 Sh. M. Baymataeva
« 08 » 05 2019.

 Bostanbekov

2019.

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Department of Cybersecurity, Data Storage and Processing

5B070300 – Information system

AFFIRM

Head of Department Cybersecurity
Data Storage and Processing,
PhD, associate professor

 N.A. Seilova
« 13 » 05 2019.

TASK

to perform the Diploma work

Student Sekenkyzy Uldana

Theme: Building business architecture of the enterprise

Approved by the order of the University № 162-B from « 16 » 10 2019

Deadline for completion of work « 13 » 05 2019

Source data to diploma work: Domestic and foreign scientific works and articles, the results of pre-diploma practical work and the literature review, based on theoretical data.

The list of subject to the development of the thesis or a summary of its content:

- a) consider the basic concepts of business;
- b) learning the basics of business activity;
- c) development of a web application for the enterprise.

The list of graphic material presented 15 slides presentation work



Recommended main literature: 20 sources

SCHEDULE
of preparation of the Diploma work

The name of the sections, a list of issues	Deadline for submission to supervisor and consultants	Notice
Overview and analysis of existing IS on the market	10.01.2019 - 08.03.2019.	
Writing the functional structure of IS	05.02.2019-10.03.2019.	
Writing program part	11.03.2019-28.04.2019.	

Signature

Consultants and normocontrol to complete a thesis indicating the related sections of the Diploma work

Section titles	Consultants, Full name (academic degree, rank)	Data of signing	Signature
Program software	M. B. Bauyrzhan Master of Technical Sciences, tutor	8.05.19	
Normocontrol	O.V. Kisseleva, PhD, senior-lector	8.05.19	

Scientific adviser

 Baymataeva Sh. M.

Task was accepted for execution by the student

 Sekenkyzy U

Date

« 08 » 05 2019

REVIEW

On Diploma Thesis Work
Of Sekenkyzy Uldana, student of Satbayev University
Information systems, 5B070300

Entitled: **Building business architecture of the enterprise**

This work consist of:

- a) 14 chapters;
- b) 9 tables;
- c) 7 figures;

COMMENTS AND EVALUATION

The first chapters are focused on general principles of the architectural approach, the basic concepts of business architecture of the enterprise are considered, the basics of business-architecture are examined by researches. In the second and third chapters introduces physical structure of the database, data processing and organization of the organizational structure. For processing author used SQL with PHP programming language. The experimental results are summarized in other chapters consists of conclusions and recommendations for future work. On my mind the work belong to more difficult work, needs to complete knowledge of student. The given task was completely fulfilled; methods of solution were correctly chosen.

Conclusion

I appreciate that the author successfully integrated tools and knowledge from several areas connected. I do recommend this diploma work for presentation with the aim to receiving the Bachelors Degree.

I propose to classify the work with grade A (excellent). *85%*

Reviewer

Deputy Head of the National Scientific Laboratories for Sharing Information and
Space Technologies

K.A.Bostanbekov

2019 г.



THE OPINION OF THE SUPERVISOR

for thesis

Sekenkyzy Uldana

5B070300-Information systems

Subject: Development of business architecture of the enterprise

The purpose of the thesis is the development of business architecture of the enterprise. To achieve this goal the following tasks were solved:

- the basic concept of business was studied;
- the basics of business activity was studied;
- a web application for the enterprise was developed.

In the course of the thesis, an overview of the concept of enterprise business architecture was made, the system development tools and the web-server were chosen. The interface and software of the system are developed on the basis of the chosen development tools.

HTML, PHP tools were used to develop the business architecture of the enterprise.

During the execution of the thesis Sekenkyzy Uldana showed good theoretical preparation. Good knowledge of the subject area allowed to develop a complete interface and a graduate student showed the ability to solve tasks.

The developed application has a user-friendly interface, the development took into account the functions that are not available in the existing system. The developed software can be used to build business processes of an enterprise.

Taking into account the above mentioned, the thesis meets the requirements for graduation papers of specialty 5B070300 – "Information systems" and Sekenkyzy Uldana worthy of awarding the academic title of bachelor of engineering and technology.

Scientific adviser

senior lecturer, Ph. D.

 Baimatayeva Sh.

" 8 " 05 2019.

Протокол анализа Отчета подобия

заведующего кафедрой / начальника структурного подразделения

Заведующий кафедрой / начальник структурного подразделения заявляет, что ознакомился(-ась) с Полным отчетом подобия, который был сгенерирован Системой выявления и предотвращения плагиата в отношении работы:

Автор: Sekenkizi Uldana

Название: Building business architecture of the enterprise

Координатор: Шолпан Байматаева

Коэффициент подобия 1:6,7

Коэффициент подобия 2:4,4

Тревога:0

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Обоснование:

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Шолпан Байматаева

Окончательное решение в отношении допуска к защите, включая обоснование:

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Дата 13.05.1972

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Автор: Sekenkizi Uldana

Название: Building business architecture of the enterprise

Координатор: Шолпан Байматаева

Коэффициент подобия 1: 6,7

Коэффициент подобия 2: 4,4

Тревога: 0

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- ☐ обнаруженные в работе заимствования являются недобросовестными и обладают признаками плагиата, или в ней содержатся преднамеренные искажения текста, указывающие на попытки сокрытия недобросовестных заимствований. В связи с чем, не допускаю работу к защите.

Обоснование:

результаты планов соответствуют
превосхождениям, предъявляемым
для досрочного роста и защиты

13.05.19

Дата

Г. В. В.

Подпись Научного руководителя

Краткий отчет



Университет:	Satbayev University
Название:	Building business architecture of the enterprise
Автор:	Sekenkizi Uldana
Координатор:	Шолпан Байматаева
Дата отчета:	2019-05-08 06:21:01
Коэффициент подобию № 1:	6,7%
Коэффициент подобию № 2:	4,4%
Длина фразы для коэффициента подобию № 2:	25
Количество слов:	4 210
Число знаков:	26 591
Адреса пропущенные при проверке:	
Количество завершённых проверок:	48

Самые длинные фрагменты, определенные, как подобные

№	Название, имя автора или адрес гиперссылки (Название базы данных)	Автор	Количество одинаковых слов
1	URL_ https://en.wikipedia.org/wiki/PHP_script		104
2	URL_ https://en.wikipedia.org/wiki/PHP_script		82

3	URL_ https://en.wikipedia.org/wiki/PHP_script		20
4	URL_ https://en.wikipedia.org/wiki/PHP_script		19
5	ZHANA55.docx Satbayev University (ИИУТТ)	Сыдыкова К	19
6	URL_ https://en.wikipedia.org/wiki/PHP_script		11
7	Budegeting as a main instrument in a company management_Bur.is_2017_ZUProgram.doc Azerbaijan State University of Oil and Industry (ASUOI) (BA (ZU, BBA, MBA) programı)	Mammadzade Laig S.	7
8	SOFTWARE ENGINEERING BOOK_cor.docx Satbayev University (ИИУТТ)	Атымтаева Ляззат	5
9	Budegeting as a main instrument in a company management_Bur.is_2017_ZUProgram.doc Azerbaijan State University of Oil and Industry (ASUOI) (BA (ZU, BBA, MBA) programı)	Mammadzade Laig S.	5
10	SOFTWARE ENGINEERING BOOK_cor.docx Satbayev University (ИИУТТ)	Атымтаева Ляззат	5

Документы, в которых найдено подобные фрагменты: из RefBooks He
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Документы, содержащие подобные фрагменты: Из домашней базы данных

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№	Название (Название базы данных)	Автор	Количество одинаковых слов (количество фрагментов)
1	ZHANA55.docx Satbayev University (ИИУТТ)	Сыдыкова К	19 (1)
2	SOFTWARE ENGINEERING BOOK_cor.docx Satbayev University (ИИУТТ)	Атымтаева Ляззат	15 (3)

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№	Название (Название базы данных)	Автор	Количество одинаковых
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		слов (количество фрагментов)
1	Budegeting as a main instrument in a company management_Bur.is_2017_ZUProgram.doc Azerbaijan State University of Oil and Industry (ASUOI) (BA (ZU, BBA, MBA) programi)	Mammadzade Laig S. 12 (2)

Документы, содержащие подобные фрагменты: Из интернета

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№	Источник гиперссылки	Количество одинаковых слов (количество фрагментов)
1	URL_ <u>https://en.wikipedia.org/wiki/PHP_script</u>	236 (5)

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АНДАТПА

Дипломдық жобаның тақырыбы: «кәсіпорынның бизнес архитектурасын құру».

Кәсіпорынның бизнес архитектурасы бизнес процестер архитектурасынан, ақпарат архитектурасынан, қосымша архитектурасынан және инфрақұрылымнан тұрады. Ең алдымен, ұйымның миссиясы, даму стратегиясы және ұзақ мерзімді бизнес мақсаттарына негізделе отырып, қажетті ұйымдастырушылық құрылымды, сату арналарының құрылымын және кәсіпорынның функционалдық моделін, өнімдерді әзірлеу және енгізу процесінде қолданылатын құжаттар жасалады. Сондықтан, бизнес архитектура ең маңызды бизнес процестерді құрудан тұрады. Бизнес процесті құру үшін ұйымдық құрылым құрылады.

АННОТАЦИЯ

Название дипломного проекта: «построение бизнес архитектуры предприятия».

Бизнес-архитектура предприятия состоит из бизнес архитектуры, архитектуры информации, архитектуры приложения и инфраструктуры. Вначале определяется миссия, стратегии развития и долгосрочные бизнес-цели, необходимая организационная структура, структура каналов продаж и функциональная модель предприятия, документы, используемые при разработке и внедрении продуктов. Поэтому, бизнес архитектура содержит в себе ключевые бизнес процессы предприятия. Составление бизнес процесса начинается с организационной структуры.

ANNOTATION

The name of the graduation project: "building business architecture of the enterprise."

An enterprise business architecture consists of business architecture, information architecture, application architecture, and infrastructure. Initially, the mission, development strategies and long-term business goals, the necessary organizational structure, the structure of sales channels and the functional model of the enterprise, the documents used in the development and implementation of products are determined. Therefore, the business architecture contains the key business processes of the enterprise. Drawing up a business process begins with an organizational structure.

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INTRODUCTION

Modern enterprises need to constantly adapt to rapidly changing conditions. If a problem situation arises, it is important for companies to choose the right solution. Company executives in most cases believe that the introduction of an information system or the opening of a department can solve any problem, which is a delusion.

This is confirmed by the situation that is often encountered in business practice, in which the top management of the company tries to solve the problems that have arisen in the organization by introducing a software product. A company hires a franchisee-firm, which, for example, implements for a short time, the standard equipment of the corporate information system and includes in the service package ongoing system support. After the introduction of the system, the situation often only worsens. The company implements the information system as a solution to any problems, without determining which task to be solved.

There are many such examples in modern business practice. The volume of information with which the company needs to work is constantly growing. For successful management, company managers need a tool that will allow you to look at your enterprise in a systematic way, analyze its work, identify the main problems and find effective solutions to solve them.

When the architect needs to evaluate the concept of his project, he creates a model of the future building: draws a drawing, constructs a layout, takes all the necessary measurements and records their results. Thus, he gradually designs the architecture of the building, which he uses in the next stage for construction.

Similarly, you can do in business: describe all of its elements, combine them into a single model that can be used as a basis for doing business. In other words, the head of the company needs to design and implement the enterprise architecture.

Modern science offers a lot of definitions of the concept of "Enterprise Architecture", but the meaning of this term in all cases remains approximately the same. For example, M. Lankhorst writes that "The architecture of an enterprise is an interconnected integral complex of principles, methods and models that are used in the design and formation of an organizational structure, business processes, information systems and infrastructure". We emphasize that the enterprise architecture gives a holistic view of the enterprise, allows not only to look at the overall picture of what is happening, but also to disassemble it into separate elements.

In general, an enterprise architecture can be represented as a system of several elements: business architecture, data and application architecture, technological architecture, and information services.

Business architecture is usually described as a set of key business processes of an organization. The design of enterprise architecture begins with it, it is the basis.

The data and application architecture determines which data is necessary to support business processes and which applications are used and should be used to manage this data.

1 THE CONCEPT OF ENTERPRISE BUSINESS ARCHITECTURE

The concept of "business architecture" was first introduced by the developers of the TOGAF (The Open Group Architecture Framework) methodology. This methodology is devoted to the development of enterprise architecture. According to TOGAF, the enterprise architecture consists of the following parts:

- business architecture - describes the processes used to achieve business goals;
- application architecture - describes the structure of specific applications and their interaction with each other;
- data architecture - describes the structure of corporate data warehouses and procedures for accessing them;
- technological architecture - describes the infrastructure of the equipment and software in which applications are launched and interact

in addition, in some scientific works, information services are referred to as components of the enterprise business architecture.

The idea embodied in the TOGAF methodology was continued by Lankhorst M. in his book "Enterprise Architecture in Work" [5, p.32]. He defines the enterprise architecture as an interconnected holistic complex of principles, methods and models that are used in the design and formation of the organizational structure, business processes, information systems and infrastructure.

In this paper, of interest is, above all, the description of the business model as the basis for building the enterprise architecture. Indeed, there is no point in creating an architecture of applications or databases without an understanding of what processes, by whom and for what they will be used. Based on the described business model, it is possible to form the structure of the data used, applications and information systems, that is, to fully describe the architecture of the enterprise. Without a business architecture, the entire process of describing an enterprise architecture becomes meaningless. The development and implementation of an information system that is not based on real business processes of a company will not have the desired effect, a situation will occur in the company that can be briefly described as "automation for the sake of automation".

In his book, Lankhorst describes the business architecture as a set of business processes, organizational structure and enterprise document management system, created in accordance with the mission, vision and strategy of the enterprise.

Other followers of the TOGAF methodology are representatives of the company Modern Control Technologies. According to their point of view, the business architecture of an enterprise includes the business strategy of the enterprise, the organizational structure, the system of objects of the enterprise's activity, the system of business processes and the system of indicators that allow evaluating both the efficiency of business processes and the degree of achievement of goals set in the framework of the strategy .

Based on these works, we define the business architecture of an enterprise as a description of its activities in terms of key business processes aimed at achieving strategic goals. The standard elements of the business architecture will include:

- Strategy and balanced scorecard;
 - Organizational structure;
 - The system of business processes and their performance indicators.
- Consider these concepts in more detail.

1.1 Strategy and balanced scorecard

Development of an enterprise strategy begins with a preparatory stage - defining the mission, vision and values of a company.

Mission - the goal of the company or the place of the business unit in the corporate architecture.

Values - a system of internal corporate priorities, social and cultural rules of the company.

Vision is a driver for the development of an organization and a company's vision of its future within medium or long-term goals. Based on the selected mission, vision and values, an enterprise strategy is formed - the choice of such activities in which the organization achieves perfection by creating a sustainable competitive advantage in the market. The main tool for combining and visualizing strategy is the strategic map, an example of which is presented in Appendix A. The strategic map is a set of interrelated goals, broken down by perspective. The idea of forming such maps belongs to R. Kaplan and D. Norton, who first mentioned the strategic map in one of their articles [4, p.54]. Over time, they developed this idea by complementing the strategic map with a balanced scorecard — a tool for translating strategic map objectives into indicators and specific objectives. To each goal within the strategic map

Attached are indicators that measure the degree of achievement of the goal, and activities that allow these goals to be achieved.

1.2 Business process system

A business process is a regularly recurring sequence of interrelated activities (operations, procedures, actions) in which resources are used and the value available for use by the consumer or another process is created [15].

The system of business processes is an interrelated set of business processes, described in accordance with established rules, reflecting the activities of the enterprise. When forming a business process system, three approaches are possible:

- verbal description;
- creating a hierarchy of business processes;
- visual display of the business process system.

The most obvious and convenient for analysis is the latest version of the description of the business process system. The company selects a notation (list of graphical elements) according to which the business process system will be described, as well as other design rules are established: team members, degree of detail of business processes, and so on.

Organizational structure

The organizational structure is one of the forms of work organization, in which an enterprise is divided into divisions, and divisions into positions, each of which is created to perform certain functions. Posts and divisions are collectively called the term "subjects".

Each subject of the organizational structure has connections with one or several subjects, that is, it can be a leader, and can be subordinate to another subject. At the same time distinguish direct and functional subordination.

Direct subordination is the direct subordination of one subject to the nearest other subject. With such submission, the head has the right to give orders to the subject subordinate to him and to demand the execution of these orders on functional and administrative issues.

Functional subordination is the subordination of one subject to another subject within the implementation of certain functions. With such submission, the head has the right to give orders to the subject subordinate to him only on the functional issues of the subordinate subject's activities.

The formation of the organizational structure takes place according to various principles of the formation of divisions, delegation of authority and conferring responsibility. These principles are also called "organizational models".

The basis of building the business architecture of an enterprise is a process approach to enterprise management, therefore, when designing a business architecture, it is customary to rely on a process organizational model.

Also in practice, there are often mixed organizational models. For example, within the framework of different business processes, various organizational models are used, which makes it possible to overcome the drawbacks of using only one of the described models. For example, for production processes, you can use a process model with a focus on the counterparty, and for financial processes it is more convenient to use a rigorous functional organizational model.

The process approach is becoming increasingly popular in modern business practice, however, a number of companies introducing this approach encounter certain difficulties in applying process management at early stages of implementation, which makes it questionable whether its use is appropriate. This is due to the fact that many modern companies are project-oriented, using a project-based approach to enterprise management. The process and project approaches to managing an organization impose different requirements on elements of a company's management system, such as an organizational structure, strategy, personnel, and a motivation system, which makes it difficult to either implement projects or manage the organization as a whole. In this regard, it is necessary to determine the possibility of combining these two approaches.

1.3 Project and process management approaches

In science, it is customary to oppose project and process approaches to enterprise management. Indeed, the process and project approaches to managing an organization impose different, often opposing requirements on various aspects of a company's management system, such as organizational structure, accounting policies, personnel, and so on. Consider each of these approaches in more detail.

The process approach to management is an approach that determines the consideration of the activities of any company as a system of business processes aimed at implementing the strategy of an enterprise.

According to ISO 9001: 2011, a process is any activity or set of activities in which resources are used to transform inputs into outputs. Systematic identification and management of the processes used by the organization and, above all, ensuring their interaction can be considered a "process approach".

Already from the very definition it follows that a business process is a set of repetitive verified actions that allow one to achieve a given conditionally permanent result.

When choosing a process approach to management, an enterprise describes all its activities as a system of business processes aimed at transforming incoming resources into outgoing results. As part of the description of the business process system, the owners of the processes, their performers and other participants are indicated. To correctly describe the organization's business processes, it is necessary in parallel to form a hierarchical organizational structure of the company in accordance with the process organizational model, as well as to form lists of all objects of activity that are used during the transformation of inputs

outputs: documents, goods and materials, software products and so on. Only a description of all the objects and subjects of the organization, or at least the key ones of them, makes it possible to create a model of business processes, the analysis of which will help identify the problem areas of the enterprise and correct them.

Highlight a number of advantages of this approach:

- the opportunity to acquire and use a system of indicators and criteria for evaluating management performance at each stage of the management chain;
- management focus on strategic processes;
- the ability to realize the quality of products in accordance with the requirements of ISO 9000 and obtain the appropriate certificate;
- formation of a clearly established procedure in the development,
- coordination, approval and maintenance of documentation;
- the results of one process will contribute to the improvement of the results of another;
- the emergence of a single language describing the activities of the enterprise;
- simplify automation.

One of the results of the process approach is to create a map of the organization's business processes, which gives managers a holistic view of the

business and makes its structure transparent. Thanks to this, the manager clearly knows what is going on at his enterprise, but in practice this is not enough for the effective management of the company.

In modern business practice, there are often enterprises whose main activities are streamlined and unified, the revenues for its implementation are stable and predictable. The management of the company belongs to the category of highly qualified specialists in their field.

However, when confronted with the need to master new directions or new technologies, such companies encounter difficulties due to a lack of understanding of the management how exactly the process of obtaining unique results should be organized

So, for successful business, it is necessary not only to debug business processes, but also the ability to manage temporary processes aimed at obtaining a unique result. For this purpose, suitable design approach.

A project is a temporary enterprise designed to produce unique results. If the set of resources for the implementation process is conditionally constant, then for each project within the organization a unique set of resources is formed.

When choosing a project approach to management, the enterprise's activity is divided into separate projects, each of which has its own organizational structure, its own list of resources. In addition, for each project, a time frame is set during which the project team needs to achieve unique results. After this time frame expires, the project as a temporary organization ceases to exist.

At first glance, the approaches described are incompatible. The first requires regulation, typing actions, aimed at obtaining a stable result during the conversion of the predicted conditionally constant set of resources. The second approach requires the formation of a new set of actions to achieve each unique result, and the composition of the resources used is always different.

However, in practice it turns out that these approaches are not only not opposed to each other, they must be used together for the successful development of a modern enterprise. The boundary between the two approaches is rather arbitrary, since trying to increase the efficiency of its activities, the company comes to replacing standard business processes with projects. Conversely, trying to improve the results of projects, the company begins to perceive the project as a typical, regularly repeated process that can be standardized.

Project and process approach to enterprise management

The project-process approach is based on the following provisions:

1. The activity of any enterprise can be represented as a set of interrelated business processes. The result of this presentation is a business process map that makes the company's operations transparent and understandable;

2. For the implementation of changes within the company or the development of new directions of the company should organize a project. Project organization should be based on a corporate project management standard. The results of the execution of any project bring the company closer to one of its strategic goals. For

each project, a team of highly qualified specialists is formed who are able to participate in project activities and bring results;

3. Project management is presented in the form of a business process system based on the corporate project management standard.

Thus, the essence of the project-process approach is that the enterprise processes are managed using the process approach, and the project approach is used for unique tasks. In addition, project management is presented as a system of processes, which makes it possible to standardize project work, to make it simpler, more understandable, and the project results are measurable, regardless of what kind of unique result they are aimed at.

Hence we can conclude which companies should pay attention to the project-process approach:

1. Enterprises whose main activity is projects. We are talking about consulting, construction companies, companies for organizing events, etc. As a rule, such companies think only about project management, they are trying to improve the effectiveness of the project. However, it often turns out that the project does not bring the expected results due to the fact that a certain enterprise process is organized incorrectly. For example, a construction project arises due to the fact that the process of negotiating a contract in the financial department is unreasonably expensive, it is signed by five people, and this process is not regulated in any way;

2. Medium and large enterprises of any fields of activity. As you know, the larger the company, the harder it is to manage. If the management has about ten thousand people under its control, there is a problem with a comprehensive analysis of the entire business. If a manager identifies a problem, he needs a tool to assess what is happening. The built business architecture or its part can help in this. As soon as the model allows finding the problem, the enterprise needs to launch a project to introduce change, where a project approach is already needed;

3. Young enterprises seeking growth. If the company already in the first years of its life begins to describe the architecture of an enterprise, adopts a certain standard for project management, then the stages of growth and development will go faster and at lower cost: new people will be easy to train, the business process model will increase along with the business, therefore top management there will always be a current model of business processes.

For example, typical processes of a manufacturing enterprise include accounting, equipment maintenance, production of standard components, quality control of manufactured products, and so on. To effectively manage these areas of activity, they should be described in the form of a business process map, linking all the stages of production activities together.

If it becomes necessary to master a new production or improve the organizational structure, business processes will not be able to help in achieving the goals. Therefore, in such cases, the company must run the project. For example, the deputy director for development may be appointed to be responsible for the execution of a project for mastering a new production. He will determine the composition of the team he needs, conduct planning and launch a project in accordance with the

description of the project launch process, which is set out in the corporate project management standard.

Thus, the project-process approach has the following advantages:

- allows you to describe the existing business structure;
- streamlines the company's activities and makes it more transparent and easily

manageable;

- simplifies the automation of the company;
- allows you to develop a single standard for the implementation of innovations

and changes within the company;

– provides the ability to manage change and focus on particularly important innovative developments;

- it focuses simultaneously on the present and the future of the enterprise.

However, this approach has a very significant drawback.

The use of the project-process method in the management of an enterprise requires that the company's managers know the relevant theory and terminology, which requires time and effort. This approach requires managers to change their thinking, to adopt a new systemic view of their company, which takes time.

In addition, all the results of the application of the approach, such as a map of business processes, project documentation and so on, should be stored in a convenient and accessible format, be linked.

That is why in modern conditions it is very important to create a software solution that supports this approach. We will deal with it in the third chapter. Before developing a solution, it is necessary to describe the methodology according to which the business architecture of the enterprise will be designed.

Description of the methodology.

The project-process approach allows to make all kinds of enterprise activities manageable. The most difficult stage in the implementation of this approach is the first, when project participants overcome internal resistance, their thinking changes, an understanding comes that will bring a new approach to enterprise management. To simplify the passage of this stage, it is necessary to develop a methodology that will allow enterprises to clearly understand how and why to implement a project-process approach, what architecture their enterprise should have. The core of enterprise architecture, as mentioned earlier, is business architecture. It is a description of the business, its goals, results, items of activity. It is on the basis of the business architecture that all other parts of the enterprise architecture are built. This means that, first of all, enterprises need to design their business architecture, aligned with the project-process approach.

The following composition of the enterprise business architecture, focused on the project-process approach, is proposed.

Strategic component. At this stage, it is customary to form an enterprise strategy: to determine goals, their influence on each other, to identify indicators that

assess the degree of achievement of these goals. Strategies are being developed for the entire enterprise, as well as for individual business units and departments, which helps all employees to move in a single course. From the point of view of the project-process approach, at this stage there is not enough formation of the list of goals and indicators for each project, the connection between the projects of the enterprise and the strategy. This component must be added;

Designing a business process enterprise.

The activity of the whole enterprise is understood as a process that is decomposed down to the operational level. The problem is that this system does not affect project management. Employees of an enterprise, as a rule, have a rough understanding of how to conduct a project, but each has its own, there is no single standard. In addition, if, for example, a new project manager comes to the company, the entire knowledge base disappears with the departure of the previous employee. The new manager does things the way he used to at his previous job, which often does not fit the processes of the company, for example, accounting or budgeting, which causes serious deviations from the project plan. There will be no such problem if the company has a clear project management standard, which will include a description of the project management process. This element must also be added to the methodology for constructing the business architecture of the specified type of enterprises.

Formation of the organizational structure. As a rule, we are talking about a strict hierarchical structure, which, on the one hand, helps to identify the owners and performers of processes, on the other hand, it undergoes changes after optimizing business processes. Most enterprises use a functional or process organizational model, none of which takes into account the construction of project teams, their structure, which also needs to be regulated.

Therefore, at this stage, it is necessary to pay attention to the project team and the formation of such an organizational model that will allow to share both project and process approaches to management. Moreover, it is necessary to think about creating a system of motivation for the project team so that the projects give the expected result.

So, in the framework of this work, it is proposed to add to the business architecture of an enterprise a design component, which will consist of:

- strategic level: strategic maps of projects corresponding to the general strategy of the company;
- the level of business processes: modeling the system of project management processes, linking this model with the process map of the entire enterprise;
- the level of formation of the organizational structure: the formation of the structure of the project team, the regulation of the rights and duties of roles, the creation of a motivation system for the project team.

Let us consider each of the levels in more detail and give the main recommendations on the description of the business architecture of the enterprise, focused on project and process approaches to management.

Strategic level of enterprise business architecture.

The first stage that an organization needs to go through when designing a business architecture is the choice of a strategy, the direction of business movement. According to the developments of Norton and Kaplan, it is necessary to begin developing a strategy with the mission, vision and values of the company, which were discussed in the previous chapter. They set the vector of development of the enterprise. Very much in the development of a company may depend on a properly and clearly formulated strategy. It is important to understand that a well-developed strategy does not guarantee the successful implementation of a company's plans. The company should be able to implement the developed strategy.

Formal ideas of different companies about the strategy vary. Presentation options range from one slide with five keywords to an impressive document, complete with various tables and entitled “Long-Term Planning”.

Strategies can be successfully implemented only when they are understood by company employees. As a result of the description of the strategy in an ordered form, the probability of its successful implementation increases. That is why it is extremely important that the developers of the enterprise strategy describe it in a language that every employee can understand.

At present, there are not so many examples of successful application of the balanced scorecard in practice, since the implementation of the MTP has to face various problems. The most serious problems often concern people's misunderstanding how to use this tool to form a company strategy.

Let's try to clarify this point.

The development of a strategy and the construction of an appropriate strategic map can be divided into the following stages:

Highlighting the main objectives of the company. To highlight goals, it is most convenient to organize a strategic session, a brainstorming session with the participation of the company's top management and, possibly, the owner. The result of the first stage is a list of long- and medium-term goals of the enterprise;

The next step is to systematize the developed list of goals. For this, a number of perspectives are identified and the identified targets are distributed according to these perspectives. In the classic version of Norton and Kaplan, there are four prospects: finance, customers, internal business processes, training and development;

Prospects and their corresponding goals are transferred to the strategic map. The influence of some goals on others is determined, relations are built;

Define indicators to assess the degree of achievement of goals;

Highlighted projects to achieve goals.

After the strategy of the enterprise as a whole is built, the stage of cascading the strategy to the desired level begins.

Such an approach allows the company to determine the vector of its development, helps employees to understand for what result they are working. It is the understanding of the strategy that makes the development of the enterprise possible. A company without a strategy is like a man in a forest without a compass.

Maybe one day you will be able to achieve a good result, but the probability of its occurrence without a strategy is much lower, you have to spend more resources.

However, once again look at the project-oriented company. Each project has its own goals, usually indirectly related to the overall goals of the enterprise. The objectives of the project - to do everything to produce a product that meets the requirements of the customer, for each project they are unique. The problem is that the project manager understands the overall objectives of the project, but each individual team member sees them in his own way. As a rule, goals for projects are not prescribed; however, this is exactly what will help project participants to check whether they are busy or if they have moved aside from the real needs of the project.

To do this, it is necessary to develop a strategic map for each project before launching it using the same technology as the strategic map of the enterprise. This will allow, firstly, the entire project team to clearly understand their goals and, secondly, to create a motivation system for the project team based on the indicators highlighted on the strategic map. Each person will be assigned the goals to which his work is directed. The employee will see how the goals achieved by him will affect the result of the enterprise as a whole. In addition, if the company has implemented a knowledge base, then when launching new projects, you can get information about how similar goals were implemented in other projects, how they were achieved. Such knowledge can be used in practice.

Formation of a business process model

The next step in building the business architecture of an enterprise is the modeling of a business process system. When designing a business process system, first of all, an approach to describing business processes is chosen. Then this system is designed, implemented, monitored and analyzed.

Recall that to manage a modern organization, it is advisable to use together project and process approaches to management. This means that companies, on the one hand, need to describe their work in the form of business processes and manage them, and, on the other hand, be able to implement projects of high quality. As noted earlier, one of the problems of modern companies is the inability to conduct projects, which entails additional costs when starting any projects. This is due to the fact that in many companies there is no integrated approach to project management - from choosing a goal to getting a result. The project component as part of the business architecture is a comprehensive approach to project management. To manage a project, analyze its results and create an appropriate database, it is necessary to make the project management process transparent and understandable. To do this, it is proposed to consider the project as a set of processes to achieve business goals, which determines the solution of a unique task facing the project management team, which was defined and formalized in the previous section. Such a project presentation provides opportunities for modeling project activities based on the process approach. Presentation of the project in this form will allow you to manage the main characteristics of the project: time, cost, quality, volume, risks and benefits.

1.4 Statement of the problem

Requirements for user interfaces.

The created PointOfSale system for the Trades IN company should have an intuitive user interface and require users to be trained to work with the information system to a minimum.

Provide for the possibility of integrating all existing in the company applications and systems at the data level to obtain statistical reports.

Requirements for the environment.

The PointOfSale system designed for use in «Trades IN» should operate on personal computers running the Microsoft Windows NT operating system.

Data storage should be provided by MySQL, installed on a server accessible to all «Trades IN» personal computers using standard network protocols.

Data access should be carried out using client applications created in PHP.

Development and life cycle requirements

- use of linear software development methodology;
- conducting technical expertise of system requirements and specifications;
- providing the customer with a complete set of technical documentation for the software product;
- conducting trial operation of the system;
- training;
- elimination of possible comments.

Expected Requirements

- delineation of user rights;
- reminding users of the presence of unprocessed tasks;
- the ability to view the full-text version of the document;
- the ability to save the full-text version in the database, as well as a separate file on the hard disk;
- automatic generation of internal registration numbers for incoming documents and internal documents;
- control of the possibility of making changes to the description of registered documents;
- control of the ability to delete a document;
- convenient mechanisms for sorting and searching documents;
- control of the uniqueness of the entered information.

Normal requirements

The program should implement the following functions:

- maintaining the necessary reference system;
- registration of a new customer in the system;
- change of information about the customer;
- obtaining a list of customers from the database of the program used in the department for automation

2 DEVELOPMENT OF DATABASE

2.1 Development of the physical structure of the database

Physical database models determine how data is placed in the storage environment and how it can be accessed by the physical layer. Historically, the first storage and access systems were file structures and file management systems that were actually part of operating systems. The DBMS created an add-on on these file models, which made it possible to organize the entire set of files so that it worked as a whole and received centralized control from the DBMS. However, direct access was made at the level of file commands, which the DBMS used when manipulating all the files that make up the stored data of one or more databases.

However, the mechanisms for buffering and managing file structures are not adapted for solving the problems of the DBMS itself, these mechanisms were developed simply for traditional file processing, and with the growth of the stored data they became ineffective for using the DBMS.

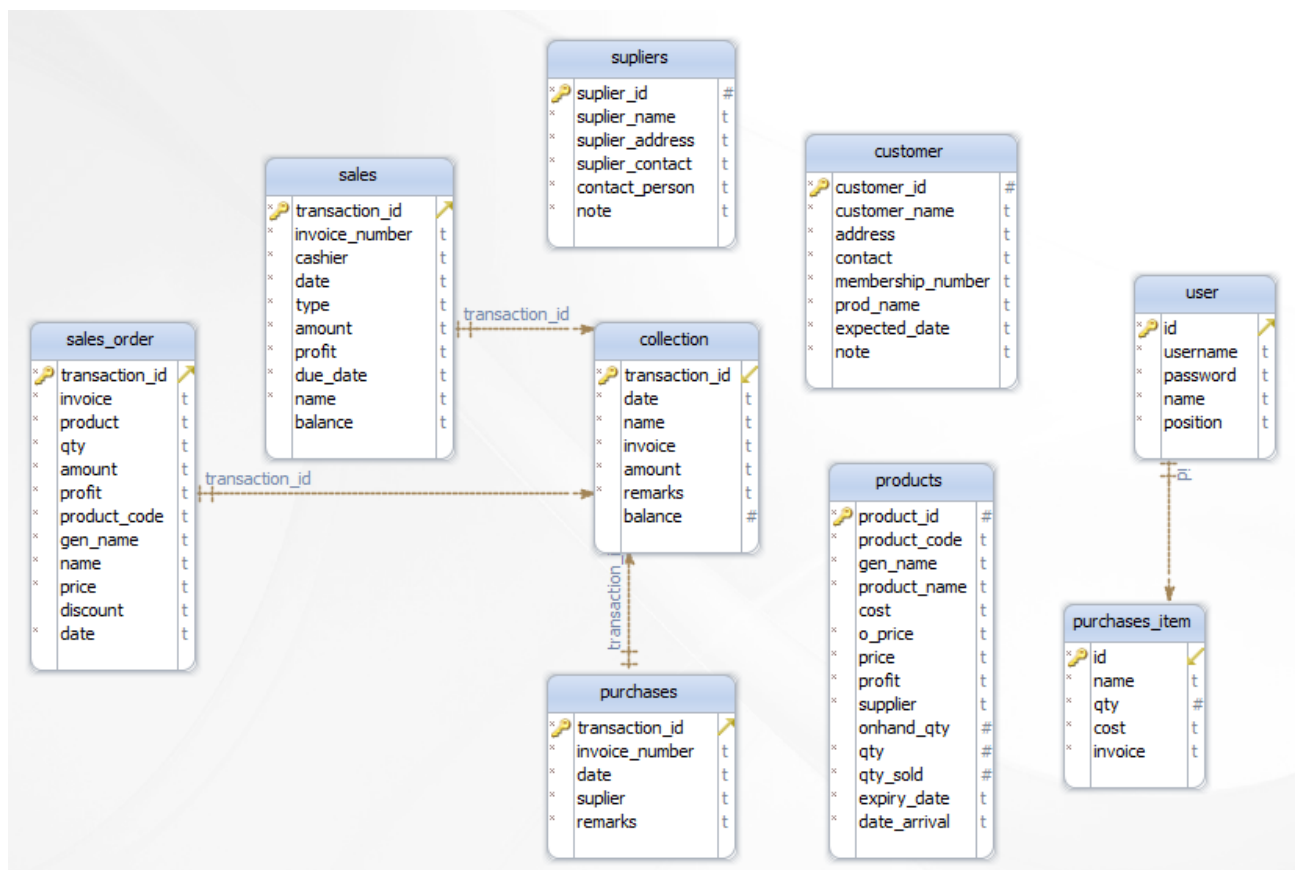


Figure 2.1 - ER database model

The collection table is in the sales database, it stores information about the product name and the date of sale. The structure of the table is given in table 2.1

Table 2.1 - Description of the collection table

Indexes	Field Name	Data Type
*	transaction_id	int AUTOINCREMENT
*	date	varchar(100)
*	name	varchar(100)
*	invoice	varchar(100)
*	amount	varchar(100)
*	remarks	varchar(100)
	balance	
Indexes		
	pk_collection	ON transaction_id

The clients table is in the sale database, it stores information about the client's personal data. The structure of the table is given in table 2.2

Table 2.2 - Description of the customer table

Indexes	Field Name	Data Type
*	customer_id	int AUTOINCREMENT
*	customer_name	varchar(100)
*	address	varchar(100)
*	contact	varchar(100)
*	membership_number	varchar(100)
*	prod_name	varchar(550)
*	expected_date	varchar(500)
*	note	varchar(500)
Indexes		
	pk_customer	ON customer_id

The products table is in the sales database, it stores information about the product identifier, product name, as well as the price, quantity, and supplier of the products. The structure of the table is given in table 2.3

Table 2.3 - Description of the products table

Indexes	Field Name	Data Type
*	product_id	int AUTOINCREMENT
*	product_code	varchar(200)
*	gen_name	varchar(200)
*	product_name	varchar(200)
	cost	varchar(100)
*	o_price	varchar(100)
*	price	varchar(100)
*	profit	varchar(100)

*	supplier	varchar(100)
Indexes	Field Name	Data Type
	onhand_qty	int
*	qty	int
*	qty_sold	int
*	expiry_date	varchar(500)
*	date_arrival	varchar(500)
Indexes		
	pk_products	ON product_id

The purchase table is in the sale database, it stores information about the account number, date, and supplier of products. The structure of the table is given in table 2.4

Table 2.4 - Description of the purchase table

Indexes	Field Name	Data Type	Description
*	transaction_id	int AUTOINCREMENT	
*	invoice_number	varchar(100)	
*	date	varchar(100)	
*	supplier	varchar(100)	
*	remarks	varchar(100)	
Indexes			
	pk_purchases	ON transaction_id	
Foreign Keys			
	fk_purchases_collection	(transaction_id) ref collection (transaction_id)	

The purchase item table is located in the sales database; it stores information about the name of the purchase item, the quantity and the invoice. The structure of the table is given in table 2.5

Table 2.5 - Description of the purchase_item table

Indexes	Field Name	Data Type	Description
*	id	int AUTOINCREMENT	
*	name	varchar(100)	
*	qty	int	
*	cost	varchar(100)	
*	invoice	varchar(100)	
Indexes			
	pk_purchases_item	ON id	

The sales table is in the sales database; it stores information about the invoice number, date, cashier and amount of sales. The structure of the table is given in table 2.6

Table 2.6 - Description of the sales table

Indexes	Field Name	Data Type	Description
*	transaction_id	int AUTOINCREMENT	
*	invoice_number	varchar(100)	
*	cashier	varchar(100)	
*	date	varchar(100)	
*	type	varchar(100)	
*	amount	varchar(100)	
*	profit	varchar(100)	
*	due_date	varchar(100)	
*	name	varchar(100)	
	balance	varchar(100)	
Indexes			
	pk_sales	ON transaction_id	
Foreign Keys			
	fk_sales_collection	(transaction_id) ref collection (transaction_id)	

The sales order table is in the sales database; it stores information about the invoice, quantity, amount, and product code for sale. The structure of the table is given in table 2.7

Table 2.7 - Description of the sales_order table

Indexes	Field Name	Data Type	Description
*	transaction_id	int AUTOINCREMENT	
*	invoice	varchar(100)	
*	product	varchar(100)	
*	qty	varchar(100)	
*	amount	varchar(100)	
*	profit	varchar(100)	
*	product_code	varchar(150)	
*	gen_name	varchar(200)	
*	name	varchar(200)	
*	price	varchar(100)	
	discount	varchar(100)	
*	date	varchar(500)	
Indexes			
	pk_sales_order	ON transaction_id	
Foreign Keys			

Indexes	Field Name	Data Type	Description
	fk_sales_order_collection	(transaction_id) ref collection (transaction_id)	

The suppliers table is in the sale database, it stores information about suppliers of goods. The structure of the table is given in table 2.8

Table 2.8 - Description of the suppliers table

Indexes	Field Name	Data Type	Description
*	supplier_id	int AUTOINCREMENT	
*	supplier_name	varchar(100)	
*	supplier_address	varchar(100)	
*	supplier_contact	varchar(100)	
*	contact_person	varchar(100)	
*	note	varchar(500)	
Indexes			
	pk_suppliers	ON supplier_id	

The users table is located in the sales database, it stores the system user credentials information. The structure of the table is given in table 2.9

Table 2.9 - Description of the suppliers table

Indexes	Field Name	Data Type	Description
*	id	int AUTOINCREMENT	
*	username	varchar(100)	
*	password	varchar(100)	
*	name	varchar(100)	
*	position	varchar(100)	
Indexes			
	pk_user	ON id	
Foreign Keys			
	fk_user_purchases_item	(id) ref purchases_item (id)	

Then gradually there was a transition from basic file structures to direct control over the placement of data on external databases of the DBMS itself. And the space of external memory was already coming out of the sufs ownership and was controlled directly by the DBMS. At the same time, the mechanisms used in file systems have largely shifted to new systems for organizing data in external memory, often referred to as page-based information storage systems. Therefore, we will begin our section on physical data models with an overview of the files and file structures used to organize physical models used in databases, and finally we will look at the mechanisms for organizing data in external memory using the page principle of organization.

2.2 Organizational structure of the company

Organizational structure is a set of organizational units and their interrelations, within which administrative tasks are distributed among the units, the powers and responsibilities of managers and officials are determined. The organizational structure is built, on the one hand, in accordance with the tasks that its strategy sets for the organization. On the other hand, the structure at different levels ensures that economies of scale are used to conserve organization's resources. Thus, the structure links external - strategic, efficiency with internal efficiency - cost-effectiveness. The distribution of tasks between departments and officials, the distribution of powers and responsibilities must remain stable for some time in order to ensure the reproduction and maintenance of the strategy. Therefore, the structure sets the static system management properties of the organization is given in Figure 2.2.

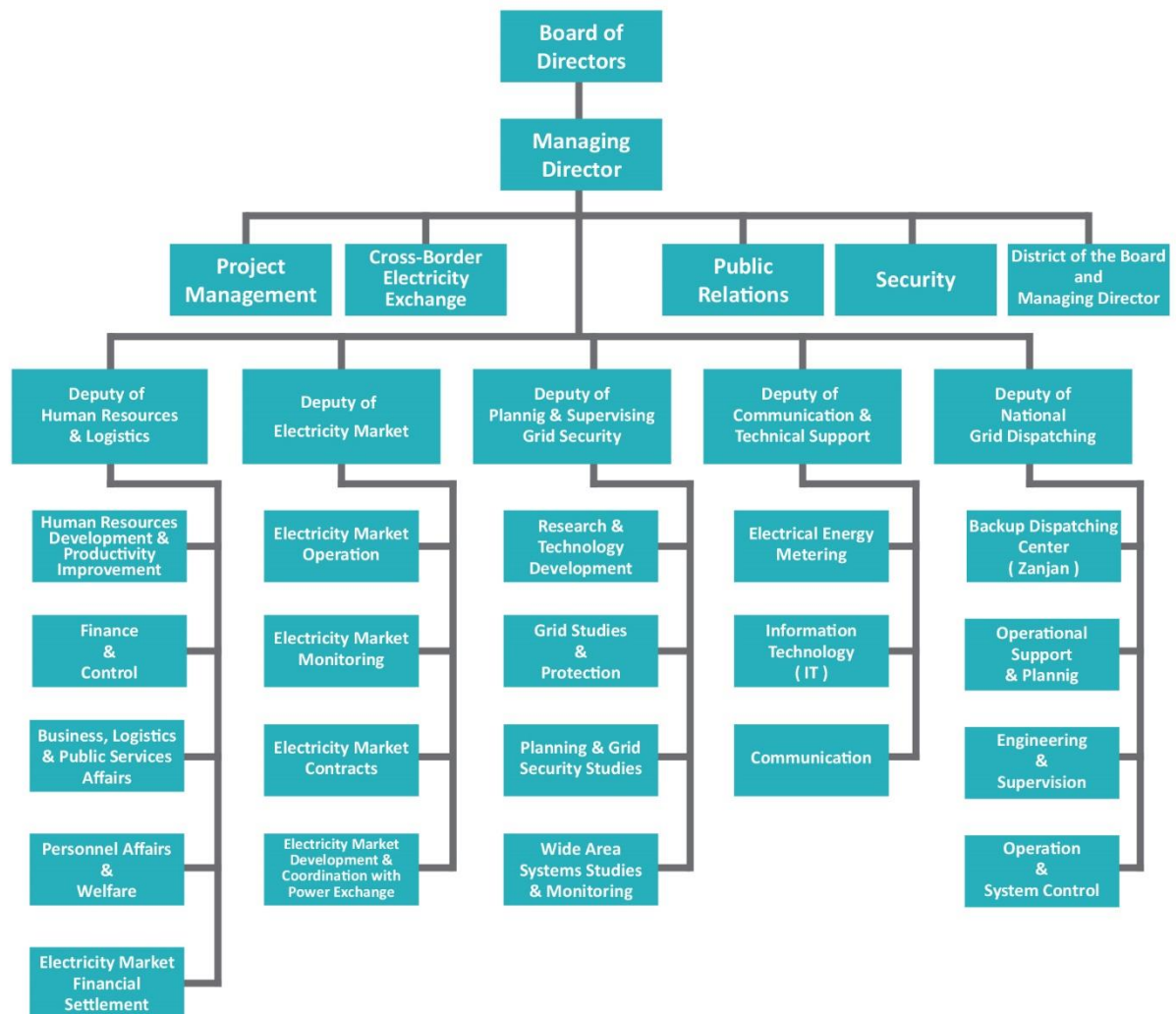


Figure 2.2 - the Organizational structure of the company «Trades IN»

In cases where the strategy changes, or when the structure is recognized as ineffective in terms of the objectives of the strategy or economy, there is a reorganization. Reorganization can have both a global character and change the principle of building a structure, as well as solve local problems of individual units and their interrelations. Any reorganization should help improve the orderliness and efficiency of the structure. That, unfortunately, is not always the case.

At the same time, the structure constantly undergoes a kind of degradation and corrosion, unjustifiably simplifying and blurring the distribution of tasks, powers and responsibilities. Thus, in parallel with the process of organizing and increasing efficiency, a process of disorganization and destruction occurs in the structure. Therefore, any formal organizational structure is always different from the actual structure. And any reorganization requires an analysis of both formal structure and actual structure, and their comparison.

2.3 Enterprise business process

The business architecture models the enterprise in order to show how the strategic interests of key stakeholders are fulfilled and to support ongoing efforts to change the business.

The business architecture provides architectural descriptions and representations in the form of diagrams in order to provide a general understanding of the organization in order to align strategic objectives with tactical requirements. Business architecture allows you to apply analytical thinking and architectural principles to the level of the entire enterprise. Solutions may include changes in the business model, operating model, organizational structure, or may launch other initiatives.

Business architecture follows some basic architectural principles:

Scope: the scope of business architecture is the whole enterprise. This is not a single project, initiative, process or piece of information. The business architecture places projects, processes, and information in a wider business context to provide insights into interactions, integration capabilities, abbreviations, and conflict resolution.

Differentiation of interests: a business architecture shares interests for reasons. She specifically separates what the business does:

- from the information that the business uses;
- on how the business is run;
- on who is the performer and where in the enterprise it happens;
- on when this happens;
- on why this happens;
- on how well this is done.

Once independent interests are highlighted, they can be grouped into specific combinations or mappings that can be used to analyze targeted business problems.

Scenario dependency: There are many different questions that businesses are trying to answer to provide a problem solving plan. Each of these questions or

business scenarios requires its own set of schemes containing different information and links, with different types of results and measures to determine success.

Justification by knowledge: while the main task of the business architecture is to answer business questions, the second equally important task is to collect and catalog various architectural components (what, how, who, why, etc.) and their links in the database knowledge so that they can be quickly and easily used to answer the next business question. The knowledge base often takes the form of an architectural repository.

Business architecture can be applied:

- to the entire enterprise as a whole;
- to one line of business within the enterprise;
- to one functional unit.

Activities related to business architecture, as a rule, are carried out with an eye to the entire enterprise as a whole, but can also be performed for an independent business unit within the enterprise. A large scale is necessary for correct work with integration at the corporate level. For example, a business architecture can clarify a situation in which the same business opportunities are realized by various other processes in many other organizations using different information models. Given the clarity that can be obtained only from the scale of the entire enterprise, a business is able to determine whether its structure is the best way to align with strategic goals.

Efforts in the area of business architecture can also be focused at the executive level of the enterprise to support strategic decision-making or at the management level to support the implementation of initiatives.

Although the business architecture provides information about the situation in a company, it is usually not applied at the process or operational level; instead, it evaluates the processes at the level of the value stream.

Business architecture, using the principle of differentiation of interests, develops models that decompose business systems, solutions or organizations into separate elements with specific functions, and shows the interaction between them.

Elements of a business architecture model include:

- opportunities;
- values;
- processes;
- information and data;
- organization;
- reporting and management;
- parties concerned;
- security strategies;
- results.

Architecture models allow organizations to see the overall picture of the area being analyzed. They provide an understanding of the important elements of an organization or a software system, and how they fit together, and highlight the most important components or capabilities.

Elements of a business architecture is given in Figure 2.3

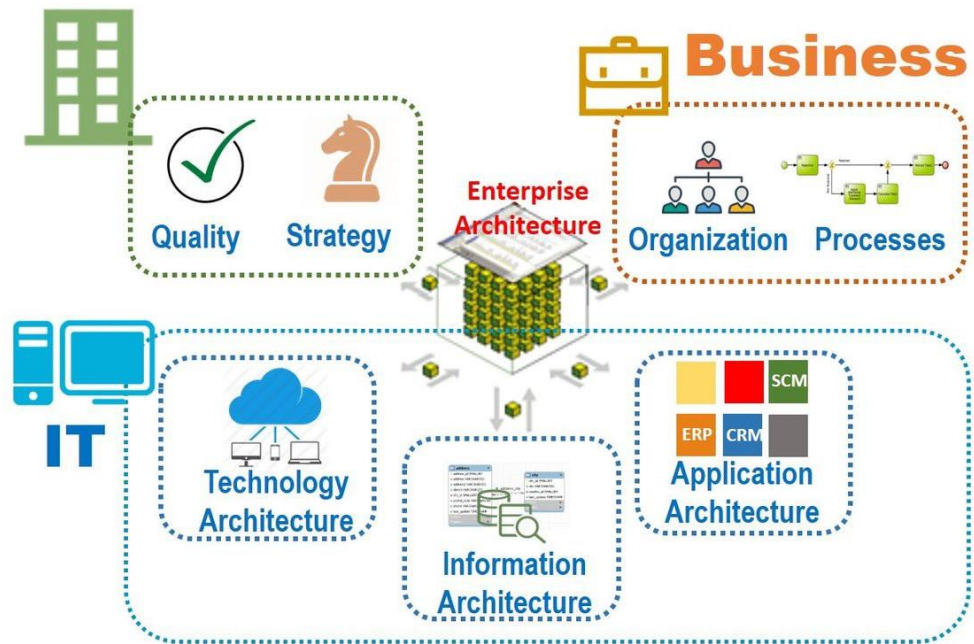


Figure 2.3 - Elements of a business architecture

Business processes of the enterprise is given in Figure 2.4

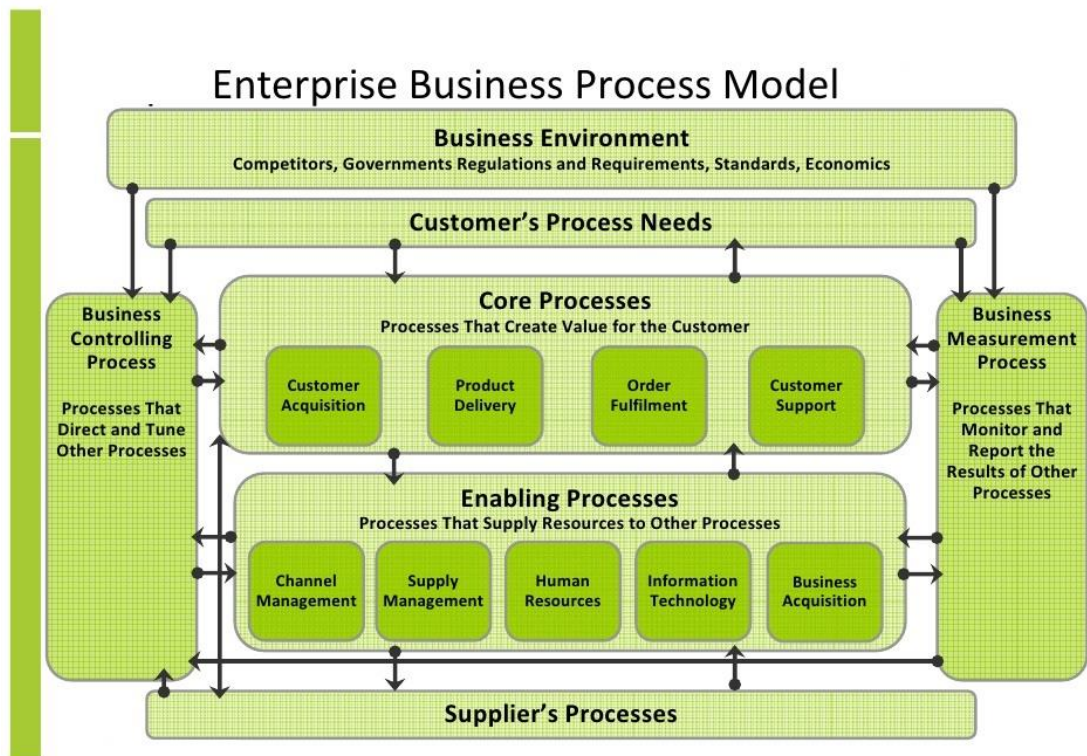


Figure 2.4 - Business processes of the enterprise

3 CREATING SOFTWARE

3.1 Justification of the choice of programming languages

PHP: Hypertext Preprocessor is a general-purpose programming language originally designed for web development. It was originally created by Rasmus Lerdorf in 1994 the PHP reference implementation is now produced by The PHP Group. PHP originally stood for Personal Home Page, but it now stands for the recursive initialism PHP: Hypertext Preprocessor

PHP code may be executed with a command line interface (CLI), embedded into HTML code, or it can be used in combination with various web template systems, web content management systems, and web frameworks. PHP code is usually processed by a PHP interpreter implemented as a module in a web server or as a Common Gateway Interface (CGI) executable. The web server combines the results of the interpreted and executed PHP code, which may be any type of data, including images, with the generated web page. PHP can be used for many programming tasks outside of the web context, such as standalone graphical applications and robotic drone control.

The standard PHP interpreter, powered by the Zend Engine, is free software released under the PHP License. PHP has been widely ported and can be deployed on most web servers on almost every operating system and platform, free of charge.

The PHP language evolved without a written formal specification or standard until 2014, with the original implementation acting as the de facto standard which other implementations aimed to follow. Since 2014, work has gone on to create a formal PHP specification.

3.2 General Information

Programs for accounting for goods in the point of sale are very different. They can differ in all characteristics: functionality, price, specifics of use, etc. A good program for a store or outlet should satisfy all accounting needs, be simple, so that its implementation does not take much time, and its price should not be much reflected in the budget .

Web application was developed using wamp server.

WAMP is short for Windows, Apache, MySQL and PHP. This is a software stack, which means that installing WAMP installs Apache, MySQL and PHP on your operating system. Despite the fact that you can install them separately, they are usually supplied in the kit, and for good reason. We will analyze what WAMP is.

WAMP comes from LAMP (L stands for Linux). The only difference between them is that WAMP is used for Windows, and LAMP is used for Linux-based operating systems.

Let's quickly consider what each letter represents:

“W” stands for Windows, there is also LAMP and MAMP.

“A” means Apache. Apache is server software that is responsible for maintaining web pages. When you request the page you see, Apache satisfies your HTTP request and shows you the site.

“M” means MySQL. MySQL is a database management system for your server. It stores all the necessary information, such as the contents of your site, user profiles, etc.

“P” stands for PHP. This is a programming language that was used to write web applications. It acts as a glue for this whole software stack. PHP works in conjunction with Apache and interacts with MySQL.

WAMP server acts as a virtual server on your computer. It allows you to test all the functions of web applications without any consequences, because it is localized on your computer and is not connected to the Internet.

Firstly, this means that you do not need to wait for the files to be uploaded to your website, and, secondly, this greatly simplifies the creation of backup copies.

WAMPserver speeds up the workflow for both developers and theme designers. Moreover, you can also play with your site for your pleasure.

WampServer is a Web development platform on Windows that allows you to create dynamic Web applications with Apache2, PHP, MySQL and MariaDB. WampServer automatically installs everything you need to intuitively develop Web applications. You will be able to tune your server without even touching its setting files. Best of all, WampServer is available for free (under GPL license) in both 32 and 64 bit versions. Wampserver is not compatible with Windows XP, SP3, or Windows Server 2003.

Features

- manage your apache, mysql and mariadb services;
- install and switch apache, mysql, mariadb and php releases;
- manage your servers settings;
- access your logs;
- access your settings files;
- create alias;
- use virtualhost as hosters.

The purpose of this chapter is to develop and describe a typical solution for designing a business architecture of an enterprise, focused on project and process approaches to management. This add-on should help the company's management to design, implement and maintain up to date all elements of the enterprise business architecture, including the project component described in the previous chapter.

Two approaches are possible to develop a standard solution:

- creating your own software from scratch;
- completion of the existing software product.

The modern market offers a sufficient number of different solutions for project or process management, so creating a software product from scratch does not make sense. It is necessary to choose the most suitable solution from the existing ones and modify it so that the new product meets the following requirements:

- support of the process approach to management (formulation of the company's goals, development of strategic maps, creation of a map of business processes, their optimization and valuation, development of an organizational structure);
- support of the project management approach (implementation of the project component of the business architecture described in the previous chapter);
- integration of elements necessary for project and process management to meet all the strategic goals of the company;
- ability to customize the product without the intervention of programmers;
- support for extensions and add-ins.

To achieve this goal it is necessary to perform a number of tasks:

- examine the market for software solutions that support process or project management approaches;
- choose the most suitable product;
- determine what opportunities the selected product already has;
- identify missing functions;
- develop missing functions.

First of all, it is necessary to choose a platform for developing a solution - one of the existing software products that support the project or process management approach.

3.3 Functional appointment

Accounting system can automatically generate a variety of reports on any sites. Report on sales, receipts, customers and suppliers, receipts and retirement of money and so on. The program provides visual information with which you can more effectively manage your outlet.

To open a web project point of sale. It is necessary to register in the browser "http: //localhost/erec".

The application "included" invented records corresponding to the subject area and allow to evaluate the functionality of the program. When working with the program, these records must be deleted to enter the real data already. First of all, it is necessary to fill in the tables "products", "suppliers", "customers" - these are the initial data necessary for filling in other tables. Further, when working with a client, you should first enter his data into the "Client" table, and only then issue a request. If the client wants to sell the goods, then the data are entered into the "sales" table, moreover, the data filling form is activated automatically if the application specifies the type of operation "sale" or "exchange". Accounting is carried out for each sale, and there is a sorting by product number. The key moment in the work of the company is sales registration. For the storage of this data, the "sales" table is intended, which contains the date, agent number, customer number, product number

and customer-buyer number. All operations are performed in the present day, so the date, wherever necessary, is set automatically and is not subject to correction.

The point of sale (POS) or point of purchase (POP) is the time and place where a retail transaction is completed. At the point of sale, the merchant calculates the amount owed by the customer, indicates that amount, may prepare an invoice for the customer (which may be a cash register printout), and indicates the options for the customer to make payment. It is also the point at which a customer makes a payment to the merchant in exchange for goods or after provision of a service. After receiving payment, the merchant may issue a receipt for the transaction, which is usually printed but is increasingly being dispensed with or sent electronically.

To calculate the amount owed by a customer, the merchant may use various devices such as weighing scales, barcode scanners, and cash registers. To make a payment, payment terminals, touch screens, and other hardware and software options are available.

The point of sale is often referred to as the point of service because it is not just a point of sale but also a point of return or customer order. POS terminal software may also include features for additional functionality, such as inventory management, CRM, financials, or warehousing.

Businesses are increasingly adopting POS systems, and one of the most obvious and compelling reasons is that a POS system does away with the need for price tags. Selling prices are linked to the product code of an item when adding stock, so the cashier merely needs to scan this code to process a sale. If there is a price change, this can also be easily done through the inventory window. Other advantages include the ability to implement various types of discounts, a loyalty scheme for customers, and more efficient stock control.

A wide range of POS applications have been developed on platforms such as Windows and Unix. The availability of local processing power, local data storage, networking, and graphical user interface made it possible to develop flexible and highly functional POS systems. Cost of such systems has also declined, as all the components can now be purchased off-the-shelf.

In 1993, IBM adopted FlexOS 2.32 as the basis of their IBM 4690 OS in their 469x series of POS terminals. This was developed up to 2014 when it was sold to Toshiba, who continued to support it up to at least 2017.

As far as computers are concerned, off-the-shelf versions are usually newer and hence more powerful than proprietary POS terminals. Custom modifications are added as needed. Other products, like touchscreen tablets and laptops, are readily available in the market, and they are more portable than traditional POS terminals. The only advantage of the latter is that they are typically built to withstand rough handling and spillages; a benefit for food & beverage businesses.

The key requirements that must be met by modern POS systems include high and consistent operating speed, reliability, ease of use, remote supportability, low cost, and rich functionality. Retailers can reasonably expect to acquire such systems (including hardware) for about \$4000 US (as of 2009) per checkout lane.

Reliability depends not wholly on the developer but at times on the compatibility between a database and an OS version. For example, the widely used Microsoft Access database system had a compatibility issue when Windows XP machines were updated to a newer version of Windows. Microsoft immediately offered no solution. Some businesses were severely disrupted in the process, and many downgraded back to Windows XP for a quick resolution. Other companies utilized community support, for a registry tweak solution has been found for this.

POS systems are one of the most complex software systems available because of the features that are required by different end-users. Many POS systems are software suites that include sale, inventory, stock counting, vendor ordering, customer loyalty and reporting modules. Sometimes purchase ordering, stock transferring, quotation issuing, barcode creating, bookkeeping or even accounting capabilities are included. Furthermore, each of these modules is interlinked if they are to serve their practical purpose and maximize their usability.

For instance, the sale window is immediately updated on a new member entry through the membership window because of this interlinking. Similarly, when a sale transaction is made, any purchase by a member is on record for the membership window to report providing information like payment type, goods purchased, date of purchase and points accumulated. Comprehensive analysis performed by a POS machine may need to process several qualities about a single product, like selling price, balance, average cost, quantity sold, description and department. Highly complex programming is involved (and possibly considerable computer resources) to generate such extensive analyses.

POS systems are designed not only to serve the retail, wholesale and hospitality industries as historically is the case. Nowadays POS systems are also used in goods and property leasing businesses, equipment repair shops, healthcare management, ticketing offices such as cinemas and sports facilities and many other operations where capabilities such as the following are required: processing monetary transactions, allocation and scheduling of facilities, keeping record and scheduling services rendered to customers, tracking of goods and processes (repair or manufacture), invoicing and tracking of debts and outstanding payments.

Different customers have different expectations within each trade. The reporting functionality alone is subject to so many demands, especially from those in the retail/wholesale industry. To cite special requirements, some business's goods may include perishables and hence the inventory system must be capable of prompting the admin and cashier on expiring or expired products. Some retail businesses require the system to store credit for their customers, credit which can be used subsequently to pay for goods. A few companies even expect the POS system to behave like a full-fledged inventory management system, including the ability to provide even FIFO (First In First Out) and LIFO (Last In First Out), reports of their goods for accounting and tax purposes.

In the hospitality industry, POS system capabilities can also diverge significantly. For instance, while a restaurant is typically concerned about how the sale window functions, whether it has functionality such as for creating item buttons,

for various discounts, for adding a service charge, for holding of receipts, for queuing, for table service as well as for takeaways, merging and splitting of a receipt, these capabilities may yet be insufficient for a spa or slimming center which would require in addition a scheduling window with historical records of customers' attendance and their special requirements.

It may be said that a POS system can be made to serve different things to different end-users depending on their unique business processes. Quite often an off-the-shelf POS system is inadequate for customers; some customization is required, and this is why a POS system can become very complex. The complexity of a mature POS system even extends to remote networking or interlinking between remote outlets and the HQ such that updating both ways is possible. Some POS systems even offer the linking of web-based orders to their sale window. Even when local networking is only required (as in the case of a high-traffic supermarket), there is the ever-present challenge for the developer to keep most if not all of their POS stations running. This puts high demand not just on software coding but also designing the whole system covering how individual stations and the network work together, and special consideration for the performance capability and usage of databases. Due to such complexity, bugs and errors encountered in POS systems are frequent^[11].

With regards to databases, POS systems are very demanding on their performance because of numerous submissions and retrievals of data - required for correct sequencing the receipt number, checking up on various discounts, membership, calculating subtotal, so forth - just to process a single sale transaction. The immediacy required of the system on the sale window such as may be observed at a checkout counter in a supermarket also cannot be compromised. This places much stress on individual enterprise databases if there are just several tens of thousands of sale records in the database. Enterprise database Ms SQL, for example, has been known to freeze up (including the OS) entirely for many minutes under such conditions showing a "Timeout Expired" error message. Even a lighter database like Microsoft Access will slow to a crawl over time if the problem of database bloating is not foreseen and managed by the system automatically. Therefore, the need to do extensive testing, debugging and improvisation of solutions to preempt failure of a database before commercialization further complicates the development.

POS system accuracy is demanding, given that monetary transactions are involved continuously not only via the sale window but also at the back-end through the receiving and inputting of goods into the inventory. Calculations required are not always straightforward. There may be many discounts and deals that are unique to specific products, and the POS machine must quickly process the differences and the effect on pricing. There is much complexity in the programming of such operations, especially when no error in calculation can be allowed.

Other requirements include that the system must have functionality for membership discount and points accumulation/usage, quantity and promotional discounts, mix and match offers, cash rounding up, invoice/delivery-order issuance with outstanding amount. It should enable a user to adjust the inventory of each product based on physical count, track expiry of perishable goods, change pricing,

provide audit trail when modification of inventory records is performed, be capable of multiple outlet functionality, control of stocks from HQ, doubling as an invoicing system, just to name some.

It is clear that POS system is a term that implies a wide range of capabilities depending on the end-user requirements. POS system review websites cannot be expected to cover most let alone all the features; in fact, unless one is a developer himself, it is unrealistic to expect the reviewer to know all the nuts and bolts of a POS system. For instance, a POS system might work smoothly on a test database during the review but not when the database grows significantly in size over months of usage. And this is only one among many hidden critical functionality issues of a POS system.

3.4 Necessary technical equipment

I used the Intel Core2Duo 2.2 GHz / RAM 1024 Mb / HDD 160 Gb / VideoCard 384 Mb / HP Compaq 6510b notebook to create the "point of sales" program.

3.5 Call and download

To open the information portal on a WAMP server, we open the Start → Software → WAMP Server → <http://localhost/erec> path.

3.6 Input details

By using the program's inputs, we recommend that you use the main functional buttons for the program.

3.7 Output details

Data transmission through the program's output data can be obtained as a result.

CONCLUSION

This work contains theoretical and practical aspects of applying at the enterprise at the same time project and process approaches to enterprise management. Modern companies need to use both of these approaches, since it allows, on the one hand, a comprehensive look at the processes existing in the company and optimizing them and, on the other hand, makes it possible to develop in new directions, to adapt to changing conditions.

Modern management methodologies, as a rule, take into account either a focus on the process approach or a design approach. A number of scientists in their works mention that it is the concentration at the same time on processes and projects that will allow companies to achieve high results. However, for the successful implementation of the project-process approach as a basis, a methodology is needed for constructing the business architecture of an enterprise, focused on both project-based and process-based approaches to management. The development of this methodology was devoted to the second part of the work.

The main idea of this methodology is that the standard system of elements of a business architecture must be supplemented with a design component, which consists of the following elements:

1. Strategic level: strategic maps of projects corresponding to the general strategy of the company, general decisions are made concerning the principles of using the architecture, the main directions of its development, reaching agreements in the organization on the appropriateness of these efforts ;
2. The level of business processes: modeling the system of project management processes, linking this model with the process map of the entire enterprise. This information can be presented in a variety of formats, but the most important aspect is to create a context for describing business processes. This part of the architecture is not technical, but it is critically important from the point of view that the architecture of information technologies (information, application systems, technological architecture) is built on its basis and ensures the implementation of key functions of the organization.;
3. The level of formation of the organizational structure:
the formation of the structure of the project team, the regulation of the rights and duties of roles, the creation of a motivation system that allows you to bring projects to a successful conclusion. It also describes the specific processes within each functional area and their operational parameters — for example, the volume of operations, the roles, the implementation of a centralized or decentralized model of operations, etc. This part is the "point of contact" between business architecture and application architecture and provides a view of business and organization functions that are sufficiently detailed to be used in developing strategies and plans for creating applications.

LIST OF USED LITERATURE

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- 11 Fundamentals of computer science: textbook / [G. V. Alekhina et al.]. - Moscow: Moscow Academy of Finance and Industry: Market DS, 2016. - 464 p.
- 12 Fundamentals of computer science: a textbook / V. F. Lyakhovich, S. O. Kramarov

Appendix A

Main scripts of the program

```
<?php
//Start session
session_start();

//Unset the variables stored in session
unset($_SESSION['SESS_MEMBER_ID']);
unset($_SESSION['SESS_FIRST_NAME']);
unset($_SESSION['SESS_LAST_NAME']);
?>
<html>
<head>
<title>
POS
</title>
<link rel="shortcut icon" href="main/images/pos.jpg">
<link href="main/css/bootstrap.css" rel="stylesheet">
<link rel="stylesheet" type="text/css" href="main/css/DT_bootstrap.css">
<link rel="stylesheet" href="main/css/font-awesome.min.css">
<style type="text/css">
body {
padding-top: 60px;
padding-bottom: 40px;
}
.sidebar-nav {
padding: 9px 0;
}
</style>
<link href="main/css/bootstrap-responsive.css" rel="stylesheet">
<link href="style.css" media="screen" rel="stylesheet" type="text/css" />
</head>
<body>
<div class="container-fluid">
<div class="row-fluid">
<div class="span4">
</div>
</div>
<div id="login">
<?php
if(                                     isset($_SESSION['ERRMSG_ARR'])                                &&
is_array($_SESSION['ERRMSG_ARR']) && count($_SESSION['ERRMSG_ARR'])
>0 ) {
```

Continue of appendix A

```
foreach($_SESSION['ERRMSG_ARR'] as $msg) {
echo '<div style="color: red; text-align: center;">',$msg,'</div><br>';
}
unset($_SESSION['ERRMSG_ARR']);
}
?>
<form action="login.php" method="post">
<font style=" font:bold 44px 'Aleo'; text-shadow:1px 1px 15px #000;
color:#fff;"><center>Point of sale</center></font>
<br>
<div class="input-prepend">
<span style="height:30px; width:25px;" class="add-on"><i class="icon-user icon-
2x"></i></span><input style="height:40px;" type="text" name="username"
Placeholder="Username" required/><br>
</div>
<div class="input-prepend">
<span style="height:30px; width:25px;" class="add-on"><i class="icon-lock icon-
2x"></i></span><input type="password" style="height:40px;" name="password"
Placeholder="Password" required/><br>
</div>
<div class="qwe">
<button class="btn btn-large btn-primary btn-block pull-right" href="dashboard.html"
type="submit"><i class="icon-signin icon-large"></i> Login</button>
</div>
</form>
</div>
</div>
</div>
</div>
</div>
</body>
</html>
<?php
//Start session
session_start();
//Array to store validation errors
$errmsg_arr = array();
//Validation error flag
$errorflag = false;
//Connect to mysql server
$link = mysql_connect('localhost','root','root');
if(!$link) {
die('Failed to connect to server: ' . mysql_error());
```

Continue of appendix A

```
//Select database
$db = mysql_select_db('sales', $link);
if(!$db) {
    die("Unable to select database");
}
//Function to sanitize values received from the form. Prevents SQL injection
function clean($str) {
    $str = @trim($str);
    if(get_magic_quotes_gpc()) {
        $str = stripslashes($str);
    }
    return mysql_real_escape_string($str);
}
//Sanitize the POST values
$login = clean($_POST['username']);
$password = clean($_POST['password']);
//Input Validations
if($login == "") {
    $errmsg_arr[] = 'Username missing';
    $errflag = true;
}
if($password == "") {
    $errmsg_arr[] = 'Password missing';
    $errflag = true;
}
//If there are input validations, redirect back to the login form
if($errflag) {
    $_SESSION['ERRMSG_ARR'] = $errmsg_arr;
    session_write_close();
    header("location: index.php");
    exit();
}

//Create query
$qry="SELECT * FROM user WHERE username='$login' AND
password='$password'";
$result=mysql_query($qry);
//Check whether the query was successful or not
if($result) {
    if(mysql_num_rows($result) > 0) {
        //Login Successful
        session_regenerate_id();
    }
}
```

Continue of appendix A

```
$member = mysql_fetch_assoc($result);
$_SESSION['SESS_MEMBER_ID'] = $member['id'];
$_SESSION['SESS_FIRST_NAME'] = $member['name'];
$_SESSION['SESS_LAST_NAME'] = $member['position'];
//$_SESSION['SESS_PRO_PIC'] = $member['profImage'];
session_write_close();
header("location: main/index.php");
exit();
}else {
//Login failed
header("location: index.php");
exit();
}
}else {
die("Query failed");
}
?>
<!DOCTYPE html>
<html>
<head>
<title>
POS
</title>
<link href="css/bootstrap.css" rel="stylesheet">
<link rel="stylesheet" type="text/css" href="css/DT_bootstrap.css">
<link rel="stylesheet" href="css/font-awesome.min.css">
<style type="text/css">
.sidebar-nav {
padding: 9px 0;
}
</style>
<link href="css/bootstrap-responsive.css" rel="stylesheet">
<link href="../style.css" media="screen" rel="stylesheet" type="text/css" />
<link href="src/facebox.css" media="screen" rel="stylesheet" type="text/css" />
<script src="lib/jquery.js" type="text/javascript"></script>
<script src="src/facebox.js" type="text/javascript"></script>
<script type="text/javascript">
jQuery(document).ready(function($) {
$(a[rel*=facebox]).facebox({
loadingImage : 'src/loading.gif',
closeImage : 'src/closetlabel.png'
})
})
```

Continue of appendix A

```
})
</script>
<?php
require_once('auth.php');
?>
<?php
function createRandomPassword() {
    $chars = "003232303232023232023456789";
    srand((double)microtime()*1000000);
    $i = 0;
    $pass = " ";
    while ($i <= 7) {
        $num = rand() % 33;
        $tmp = substr($chars, $num, 1);
        $pass = $pass . $tmp;
        $i++;
    }
    return $pass;
}
$finalcode='RS-'.createRandomPassword();
?>
<script language="javascript" type="text/javascript">
/* Visit http://www.yaldex.com/ for full source code
and get more free JavaScript, CSS and DHTML scripts! */
<!-- Begin
var timerID = null;
var timerRunning = false;
function stopclock (){
    if(timerRunning)
        clearTimeout(timerID);
    timerRunning = false;
}
function showtime () {
    var now = new Date();
    var hours = now.getHours();
    var minutes = now.getMinutes();
    var seconds = now.getSeconds()
    var timeValue = "" + ((hours >12) ? hours -12 :hours)
    if (timeValue == "0") timeValue = 12;
    timeValue += ((minutes < 10) ? ":0" : ":") + minutes
    timeValue += ((seconds < 10) ? ":0" : ":") + seconds
    timeValue += (hours >= 12) ? " P.M." : " A.M."
```


Continue of appendix A

```
document.clock.face.value = timeValue;
timerID = setTimeout("showtime()",1000);
timerRunning = true;
}
function startclock() {
stopclock();
showtime();
}
window.onload=startclock;
// End -->
</SCRIPT>
</head>
<body>
<?php include('navfixed.php');?>
<?php
$position=$_SESSION['SESS_LAST_NAME'];
if($position=='cashier') {
?>
<a href="../index.php">Logout</a>
<?php
}
if($position=='admin') {
?>
<div class="container-fluid">
<div class="row-fluid">
<div class="span2">
<div class="well sidebar-nav">
<ul class="nav nav-list">
<li class="active"><a href="#"><i class="icon-dashboard icon-2x"></i> Dashboard
</a></li>
<li><a href="sales.php?id=cash&invoice=?php echo $finalcode ?"><i
class="icon-shopping-cart icon-2x"></i> Sales</a></li>
<li><a href="products.php"><i class="icon-list-alt icon-2x"></i> Products</a></li>
<li><a href="customer.php"><i class="icon-group icon-2x"></i>
Customers</a></li>
<li><a href="supplier.php"><i class="icon-group icon-2x"></i> Suppliers</a></li>
<li><a href="salesreport.php?d1=0&d2=0"><i class="icon-bar-chart icon-2x"></i>
Sales Report</a></li>
<br><br><br><br><br>
<li>
<div class="hero-unit-clock">
<form name="clock">
```

Continue of appendix A

```
<font color="white">Time: <br></font>&nbsp;<input style="width:150px;"
type="submit" class="trans" name="face" value="">
</form>
</div>
</li>
</ul>
</div><!--/.well -->
</div><!--/span-->
<div class="span10">
<div class="contentheader">
<i class="icon-dashboard"></i> Dashboard
</div>
<ul class="breadcrumb">
<li class="active">Dashboard</li>
</ul>
<font style=" font:bold 44px 'Aleo'; text-shadow:1px 1px 25px #000;
color:#fff;"><center>Point of sale</center></font>
<div id="mainmain">
<a href="sales.php?id=cash&invoice=?php echo $finalcode ?"><i class="icon-
shopping-cart icon-2x"></i><br> Sales</a>
<a href="products.php"><i class="icon-list-alt icon-2x"></i><br> Products</a>
<a href="customer.php"><i class="icon-group icon-2x"></i><br> Customers</a>
<a href="supplier.php"><i class="icon-group icon-2x"></i><br> Suppliers</a>
<a href="salesreport.php?d1=0&d2=0"><i class="icon-bar-chart icon-2x"></i><br>
Sales Report</a>
<a href=" ../index.php"><font color="red"><i class="icon-off icon-
2x"></i></font><br> Logout</a>
<?php
}
?>
<div class="clearfix"></div>
</div>
</div>
</div>
</div>
</body>
<?php include('footer.php'); ?>
</html>
```

Appendix B

To open a web project point of sale. It is necessary to register in the browser "http: //localhost/erec".

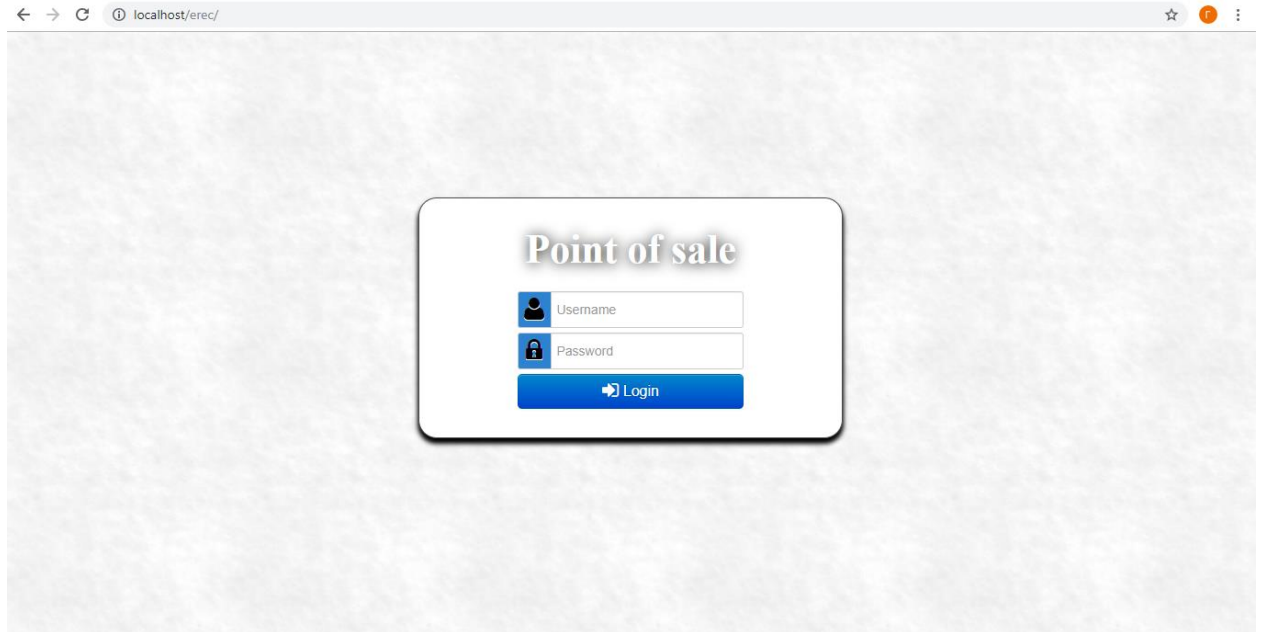


Figure B.1 - Login Page

After logging in, the user will exit the main menu of the system. In the system you can view a list of products, customers, suppliers, sales and get a sales report.

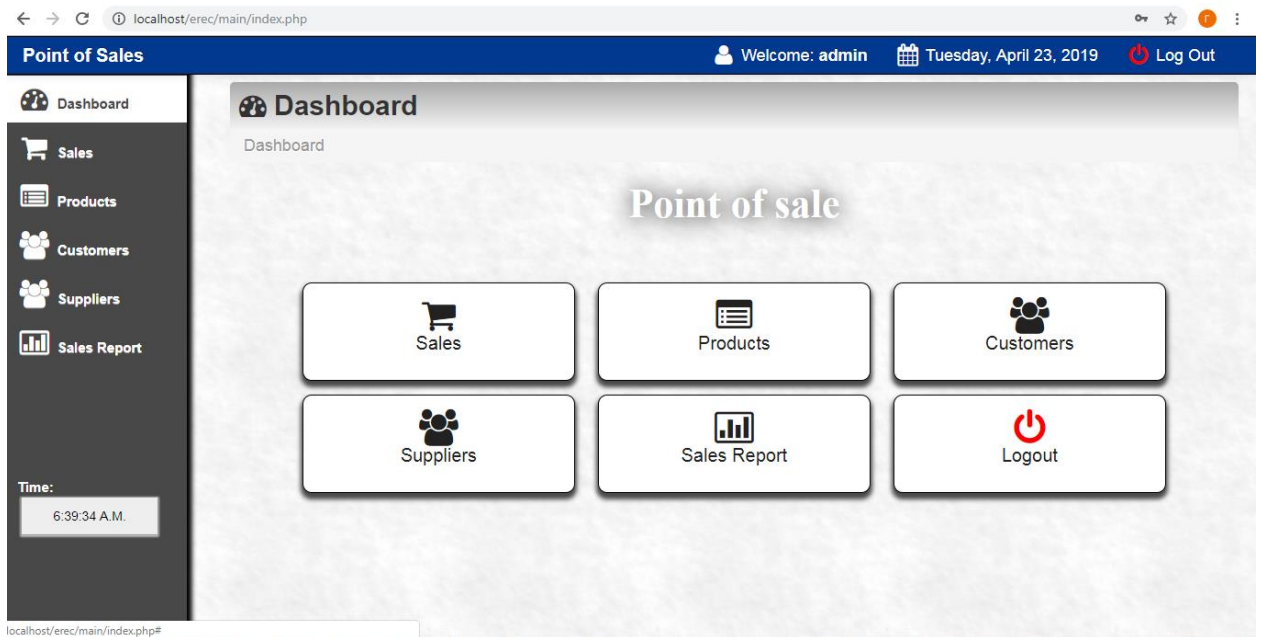


Figure B.2 - Main Page

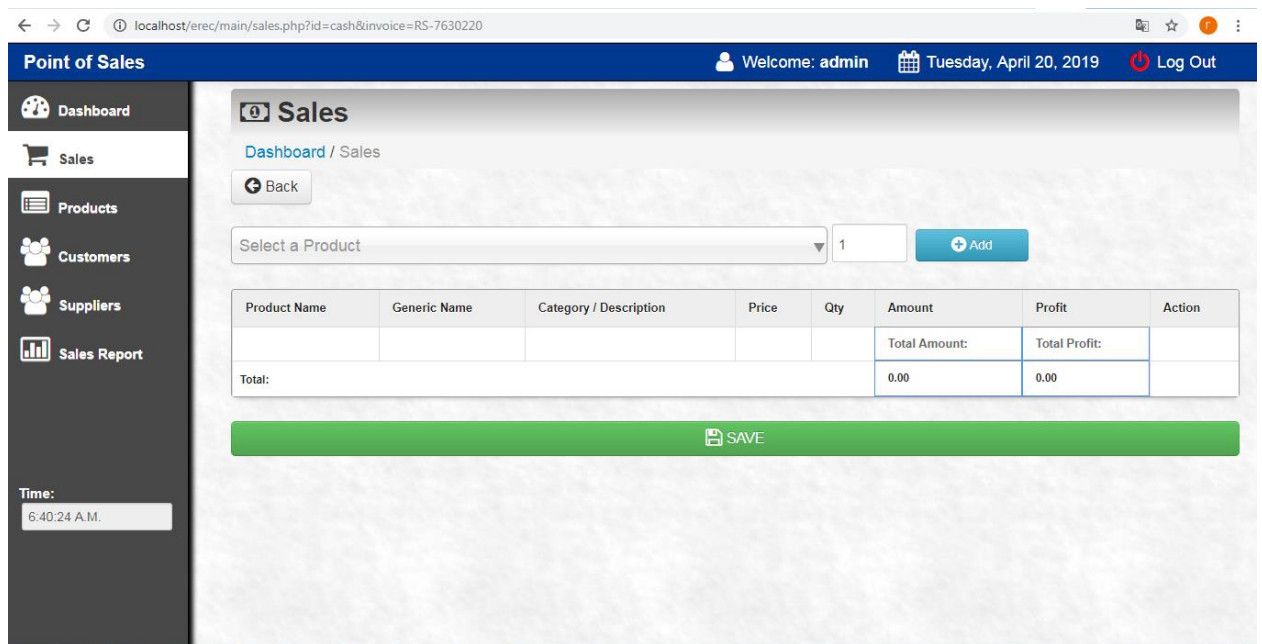


Figure B.3 - Sales Section

In the section of sale, you can select a product for sale, the system will automatically calculate the cost of this product.

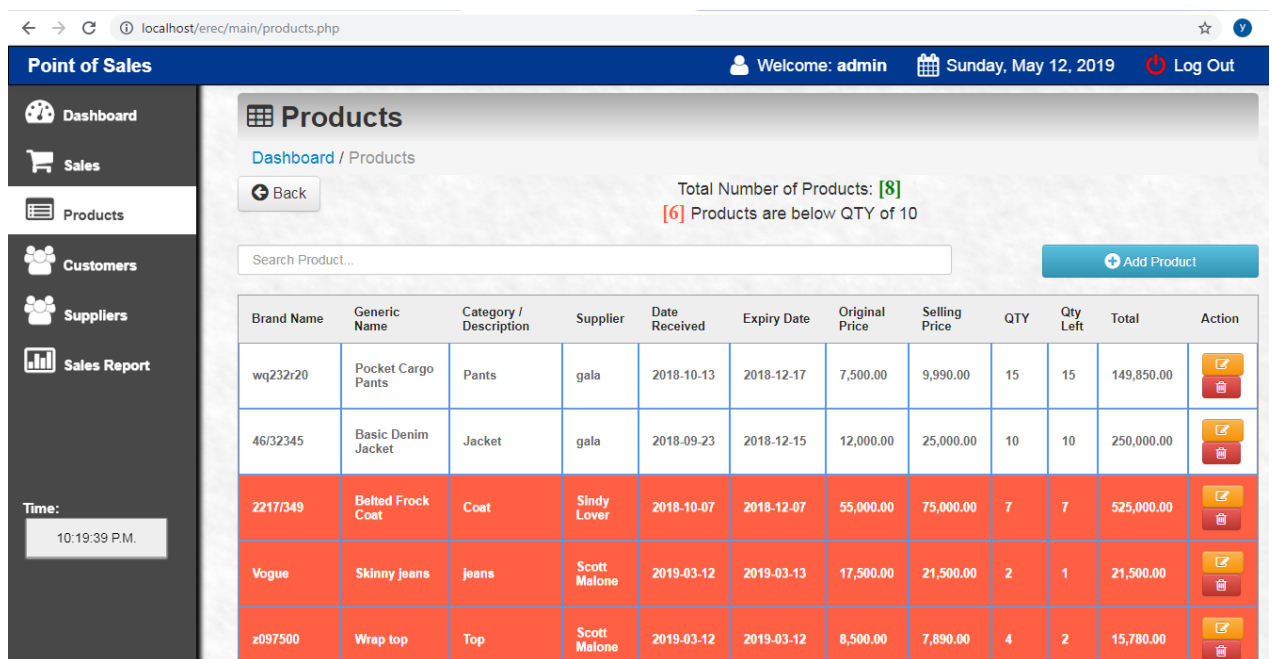


Figure B.4 - products section

← → ↻ localhost/erec/main/customer.php

Point of Sales Welcome: admin Sunday, May 12, 2019 Log Out

Customers

Dashboard / Customers

Back Total Number of Customers: 5

Search Customer...

Add Customer

Full Name	Address	Contact Number	Product Name	Total	Note	Due Date	Action
Janina Sanders	22 Avenue	+3103314787	top	P 13500.00	-----	2019-05-03	Edit Delete
Katty Cardosa	Harbor 1N	+300345452	jeans	P 1.00	-----	2018-12-23	Edit Delete
Billy Crisp	Microragion 8,22/17	+77783008500	skinny jeans	P 2.00	-----	2018-10-13	Edit Delete
Isa Nodra	Microragion 3,23/15	+77782428559	Dress	P 17500.00	----	2019-02-11	Edit Delete

localhost/erec/main/addcustomer.php

Figure B.5 - Customers section

← → ↻ localhost/erec/main/supplier.php

Point of Sales Welcome: admin Sunday, May 12, 2019 Log Out

Suppliers

Dashboard / Suppliers

Back Total Number of Suppliers: 6

Search Supplier...

Add Supplier

Supplier	Contact Person	Address	Contact No.	Note	Action
Pamela Devlin	736811200	37 Street	+1030345452	code number 0z167000071	Edit Delete
Nick Mills	786112	Tzlina Street 132	+106315252	-----	Edit Delete
Cynthia Eskilida	76547	Street Copper 55	+3033142187	product code 0z8957657911	Edit Delete
Sindy Lover	971	Marsa Street,66	+303314787	-----	Edit Delete
Scott Malone	7876	10N BayLake	+306315252	-----	Edit Delete
V-neck	66	5 Avenue	1353	test	Edit Delete

Figure B.6 - Suppliers section

← → ↻ localhost/erec/main/salesreport.php?d1=01%2F12%2F2019&d2=04%2F19%2F2019 ☆ ⓘ ⋮

Point of Sales Welcome: admin Tuesday, April 20, 2019 Log Out

Sales Report
Dashboard / Sales Report
Back Print

From : To: Search

Sales Report from 01/12/2019 to 04/19/2019

Transaction ID	Transaction Date	Customer Name	Invoice Number	Amount	Profit
STI-00142	03/12/19	gala	RS-323222	2,000.00	1,800.00
Total:				2,000.00	1,800.00

Time:
6:43:25 A.M.

Figure B.7 – Sales report section