TALLINN UNIVERSITY OF TECHNOLOGY
School of Information Technologies

Vladimir Semjonov 211742IAAM

Analysis and Design of Retail Sales Support Infosystem on Example of Datagate OÜ Company

Master's thesis

Supervisor: Nadežda Furs
MBA

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TALLINNA TEHNIKAÜLIKOOL
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Vladimir Semjonov 211742IAAM

Hulgimüügi toetava infosüsteemi analüüs ja kavandamine firma Datagate OÜ näitel

Magistritöö

Juhendaja: Nadežda Furs
MBA

Tallinn 2024

Author’s declaration of originality

I hereby certify that I am the sole author of this thesis. All the used materials, references to the literature and the work of others have been referred to. This thesis has not been presented for examination anywhere else.

Author: Vladimir Semjonov

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Abstract

The objective of the master's thesis is to compose an analysis and provide a design of retail sales support infosystem that will allow the Datagate OÜ company to improve their focus areas of retail sales on basis of statistical information output that is calculated through the system in interactive way for stakeholders. This way, the company will reach for more business opportunities and receives opportunity to convert more sales.

To achieve the goal, the Author composes a business analysis in process of which analyzes the company's environment, main processes and acquires business requirements for the new solution and maps business rules, creates the business data model on basis of which the system analysis is carried out.

The Author carries out the system analysis, composes the functional requirements of the system via use case diagram and its units' description, as well as brings out non–functional requirements and classifies them. In addition to the system analysis, the Author composes his IT architecture vision on the solution being designed, describing it via UML and ER diagrams, together with prototypes, to which collects output from stakeholders.

Despite the solution being designed for Datagate OÜ company needs, it is possible to apply the infosystem being designed for all businesses of sales sectors that own a website infosystem and are looking to acquire better view on the trending client demands.

This thesis is written in English and is 105 pages long, including 7 chapters, 28 figures and 7 tables.

Annotatsioon

Hulgimüügi toetava infosüsteemi analüüs ja kavandamine firma Datagate OÜ näitel

Magistritöö eesmärk on läbi viia analüüs ja kavandada jaemüügi tugiinfosüsteemi, mis võimaldab Datagate OÜ ettevõttel täiustada oma jaemüügi fookusvaldkondi süsteemi kaudu interaktiivsel viisil arvutatava statistilise teabe väljundi alusel. huvirühmade jaoks. Nii jõuab ettevõte rohkemate ärivõimalusteni ja saab võimaluse muuta rohkem müüki.

Eesmärgi saavutamiseks koostab autor ärianalüüsi, mille käigus analüüsitakse ettevõtte keskkonda, põhiprotsesse ja omandatakse ärinõuded uuele lahendusele ning kaardistatakse ärireeglid, luuakse äriandmete mudel, mille alusel tehakse süsteemianalüüs. läbi viidud.

Autor viib läbi süsteemianalüüsi, koostab kasutusjuhtude diagrammi ja selle üksuste kirjelduse kaudu süsteemi funktsionaalsed nõuded, samuti toob välja mittefunktsionaalsed nõuded ja liigitab need. Lisaks süsteemianalüüsile koostab autor oma IT-arhitektuuri visiooni projekteeritavast lahendusest, kirjeldades seda UML-i ja ER-diagrammide kaudu koos prototüüpidega, kuhu kogub huvigruppidelt väljundi.

Vaatamata Datagate OÜ ettevõtte vajadustele kavandatavale lahendusele on projekteeritavat infosüsteemi võimalik rakendada kõikidele müügisektorite ettevõtetele, kes omavad kodulehe infosüsteemi ja soovivad saada paremat ülevaadet trenditavatest klientide nõudmistest.

Lõputöö on kirjutatud Inglise keeles ning sisaldab teksti 105 leheküljel, 7 peatükki, 28 joonist, 7 tabelit.

List of abbreviations and terms

API	Application Programming Interface
AS	*Aktsiaselts* – Joint Stock Company
B2B	Business to Business
BCM	Business Capability Map
CEO	Chief Executing Officer
CPU	Central Processing Unit
CRM	Customer Relationship Management
EAM	Enterprise Asset Management
ER	Entity Relationship
ERD	Entity Relationship Diagram
EUR	Euro
FURPS+	Functionality, Usability, Reliability, Performance, Supportability, plus (Design Constraints, Implementation Requirements, Interface Requirements, Physical Requirements)
HR	Human Resources
IBM	International Business Machines (Company)
ID	Identification
IT	Info Technology
MVP	Minimum Viable Product
OÜ	*Osaühing* - Private Limited Company
PESTLE	Political, Economic, Sociocultural, Technological, Legal , Environmental
SSL	Secure Sockets Layer
SWOT	Strengths, Weaknesses, Opportunities, Threats
TOGAF	The Open Group Architecture Framework
TV	Television
UI	User Interface
UML	Unified Modelling Language
USD	United States Dollar

XML	Extensible Markup Language

Table of contents

List of figures

List of tables

Introduction

The objective of the thesis is to analyze and design a structured and scalable infosystem as a tool, which will assist to solve the problem of declining website retail sales and will enable the company to gain knowledge of the client behavior in periods of time along with more detailed sales data statistics.

In this master's thesis, the following questions are being analyzed:

- What is the root cause of retail sales revenue lowering?
- Which are the current capabilities of the company and which capabilities needing improvement? Which capabilities can be improved by the technology and how?
- Is there any out–of–box solutions that could solve the problem?
- To which business requirements from stakeholders should the designed infosystem meet?
- How does the designed infosystem look like from IT architecture perspective?

The implementation of the proposed infosystem will not only allow to a basis for more effective business decisions but will enable to bring more structure to the offered products on the website, as well as assist to provide most relevant offers and advertisements to the market in the most demanded by the clients' and statistically secured way. This implementation will save the time of the company on planning the sales and advertisements and will avoid extensive investments in less productive advertisement focus points.

The master's thesis contains 7 chapters:

- First chapter gives an overview of the problem and describes focus areas of the master's thesis, such as objective, scope and role of the Author;
- Second chapter gives an overview of the methods used in the master's thesis;

- Third chapter introduces the Datagate OÜ company and an analysis of stakeholders is performed, along with description of company's business strategy in text form and in form of a motivation model. Along with the information, also an AS–IS state of the main processes of retail sales is described;

- Fourth chapter contains business analysis results, where the Author gets to know more about the company's strengths and weaknesses, opportunities and threats, as well as analyzes the environment factors and trends that could influence opportunities and threats of the company. Further on, the Author analyzes competitor website environments to bring out what results can be achieved with implementing the infosystem to the workflow. Therefore, similar solutions are described, evaluated and compared with the solution being designed. Processes to be improved by the designed solution are described in AS-IS and TO–BE forms. Finally, business requirement mapping is done on basis of information from interviewed stakeholders, business rules and business data model are created;

- Fifth chapter contains system analysis results. Functional and non–functional requirements are described;

- Sixth chapter contains IT architecture vision of the Author to the designed solution. The vision is described with help of different UML notations and ER diagram form, along with prototypes;

- Seventh chapter concludes the thesis.

1 Problem Setting and Focus Areas of the Master's Thesis

In following chapter of the master's thesis, the Author defines the problem to be solved, as well as describes the objective and scope of the thesis, along with role of the Author.

1.1 Problem Setting

Datagate OÜ main activity sector is retail sales of personal and mobile computers, servers, entertainment electronics and provides servicing for the offered products. Due to the nature of business, in the last years, the main activity started to take place in B2B sales and governmental tender participation, leaving retail sales activity to second plan. Website retail sales revenue has been historically declining for the last 4 years, because of lowered amount of website visitors and orders.

Despite the company having a wide catalog containing over 500 000 products on the website, customers are not always able to find what they are looking for. The main problem is that the company lacks the knowledge of actual client demand. The current product categorization and advertisement strategy is based solely on observations of the sales and management teams with limited information sources, such as visitor amount on the website and sales statistics. Lack of actual client demand knowledge results in the offered products not always being properly prioritized to focus client attention on the popular products and categories, therefore customer purchasing motivation lowers and less sales are converted on the website.

With use of the freshly designed infosystem, the company will gain a source of precise information in form of statistics tool, which will open possibilities to analyze customer behavior on the website (such as search attributes, viewed products, products added to cart, ordered products) and make effective statistics–based business decisions with use of acquired clearer picture of customer demand. The infosystem will act as a tool, which will enable to prioritize offered products on the website environment relying on information acquired from real customers and subsequently increase the conversion rate of each visit by offering most demanded products. Also, the infosystem will assist to

compile most effective advertisement strategies, focusing on statistically revealed client demand.

1.2 Master's Thesis Objective

The objective of the thesis is to analyze and design a structured and scalable infosystem as a tool, which will assist to solve the problem of declining website retail sales and will enable the company to gain knowledge of the client behavior in periods of time along with more detailed sales data statistics. By introducing the system into the workflow, the gained information will assist the company to create a more advanced product categorization strategy and will provide source of information to implement most effective advertisement strategies.

With taking the designed retail sales infosystem into the workflow, the company will:

- Gain knowledge about the customer behavior on the website and wider understanding of the sales done on the website;
- Gain a dataset, on basis of which it will be possible to produce most customer-oriented advertisement campaigns on the website, as well as to propose effective changes to the website design and possibly new product categories;
- Rise interest to the website, due to better alignment with customer demand;
- Rise shopping cart conversion rate on the website and retail sales revenue.

To achieve the objective of the thesis, the Author will get to know more about the environment of the company with help of business analysis, will perform an analysis required for the design of retail sales support infosystem, along with description and prioritization of the system requirements. Finally, the system architecture vision in form of UML diagrams, ERD and prototypes of the designed system will be described.

1.3 Master's Thesis Scope

The scope and goals of the master's thesis are combined and include the following activities:

- Get acquainted with Datagate OÜ company, its structure, processes, strategy, as well as define the business motivation model, map its current capabilities and bring out the main stakeholders;
- Define the problem and topicality of the solution for the company;
- Bring out analysis of similar software solutions in put them in comparison to the solution that is being designed in the master's thesis;
- Carry out the Business Analysis. Business Analysis should contain:
    - definition of strengths, weaknesses, opportunities and threats of the company;
    - analysis of the competitors of company's activity sector;
    - gathering of business requirements;
    - definition of business rules and composing of information model on basis of the rules;
    - mapping of AS–IS and TO–BE form of the main processes.
- Carry out the System Analysis. System Analysis should contain:
    - description of functional requirements;
    - description of non–functional requirements and their classification.
- Describe IT Architecture Vision of the infosystem being designed. IT Architecture Vision should contain:
    - UML Detail Component Diagram;
    - UML Sequence Diagram;
    - ERD;
    - prototypes.
- Achieve positive feedback from prototype testing by stakeholders.

The scope and goals of the master's thesis do not include:

- An actual technical development of the customer relations information system, nor its implementation in the current Datagate OÜ's system, it's organization and maintenance;
- Testing of the developed solution;
- Security aspect clarification;
- Proposal of development cost, work volume and planning.

1.4 Role of the Author

As a consistent client of Datagate OÜ, the Author has experienced the existing problems on retail sales platform of the company and brought out the issues to the stakeholders. Therefore, with use of business and system analysis methods knowledge that was acquired during Master Studies, the Author stepped in to fulfill responsibilities of solution architect to bring out an infosystem design solution that can be used for further development and realization by the company. Contributed activities were executed solely by the Author with use of external sources of information and input from the stakeholders.

2 Literature Overview

In following chapter of the master's thesis, the Author gives an overview of the methods being used in the thesis to solve the described problem.

2.1 Business Analysis

Business analysis is the practice of enabling change in an enterprise by defining needs and recommending solutions that deliver value to stakeholders. Business analysis enables an enterprise to articulate needs and the rationale for change and to design and describe solutions that can deliver value. [1] Business analysis is an initial action towards resolving the defined problem.

Business analysis is performed on a variety of initiatives within an enterprise. Initiatives may be strategic, tactical, or operational. Business analysis may be performed within the boundaries of a project or throughout enterprise evolution and continuous improvement. It can be used to understand the current state, to define the future state and to determine the activities required to move from the current to the future state. [1] By performing a business analysis on the current activities being executed during company's operation, it is possible to improve both time and financial expenses to achieve same or if not better results with given business processes.

2.2 PESTLE and SWOT Analyses

SWOT (Strengths, Weaknesses, Opportunities and Threats) and PESTLE (Political, Economic, Sociocultural, Technological, Environmental and Legal) analyses are widely used strategic planning tools that help organizations assess internal and external factors influencing their operations and decision-making [2], [3] The purpose of SWOT (Strengths, Weaknesses, Opportunities and Threats) and PESTLE (Political, Economic, Sociocultural, Technological, Environmental and Legal) analyses is to assess the internal and external factors that can influence the success, viability and strategic decision-making of an organization or initiative [4], [5].

SWOT and PESTLE analyses are required in this thesis to understand the environment of Datagate OÜ in a better way, therefore analyze the environment using the chosen tools to acquire wide picture of it.

SWOT Analysis

- Strengths: Identify and evaluate the internal factors that give an organization or initiative a competitive advantage or distinctive capabilities.
- Weaknesses: Identify and assess the internal factors that may hinder or limit the success of an organization or initiative.
- Opportunities: Identify and evaluate the external factors that present favorable circumstances or potential avenues for growth and improvement.
- Threats: Identify and assess the external factors that pose challenges, risks, or obstacles to an organization or initiative. [6]

PESTLE Analysis

- Political: Assess the political factors and government policies that can impact the industry or organization, including regulations, funding initiatives and geopolitical influences.
- Economic: Evaluate the economic factors such as market conditions, inflation rates, exchange rates and economic policies that can affect the organization's financial performance and decision-making.
- Sociocultural: Examine the societal and cultural factors that can influence customer behavior, preferences and acceptance of products or services, as well as workforce dynamics and social trends.
- Technological: Assess the technological factors that can impact the organization, including advancements in technology, disruptive innovations and the availability of infrastructure.

- Environmental: Consider the environmental factors such as sustainability practices, environmental regulations and the organization's impact on the environment.

- Legal: Evaluate the legal factors and regulatory environment that can affect the organization's operations, compliance requirements and potential legal risks. [6]

Both SWOT and PESTLE analyses provide a structured framework for understanding the internal and external factors that can shape an organization's strategic direction, allowing stakeholders to make informed decisions, capitalize on strengths, mitigate weaknesses, leverage opportunities and navigate potential threats. [6] The analyses help the Author and the stakeholders to acquire fresh understanding of the environment, thus, to generate clearer requirements for the infosystem being designed.

2.2.1 ArchiMate Specification

The ArchiMate® Specification, a standard of The Open Group, is an open and independent modeling language for Enterprise Architecture that is supported by different tool vendors and consulting firms. The ArchiMate Specification provides instruments to enable Enterprise Architects to describe, analyze and visualize the relationships among business domains in an unambiguous way. Just as an architectural drawing in classical building architecture describes the various aspects of the construction and use of a building, the ArchiMate Specification defines a common language for describing the construction and operation of business processes, organizational structures, information flows, IT systems and technical infrastructure. This insight helps stakeholders to design, assess and communicate the consequences of decisions and changes within and between these business domains. [7] The given language was chosen in the thesis, as it gives an opportunity to describe the architecture in a way that is consistent across all architecture models. In addition to that, ArchiMate language provides a framework and other materials that enables the stakeholders to develop and sustain the architecture in a more accessible way.

2.3 Requirement gathering, description and prioritization

Requirement gathering, description and prioritization is a core activity in requirement specification for the future infosystem on basis of feedback from stakeholders.

Requirement gathering

To gather the requirements, the Author used unstructured interview method. The interview is a common technique for eliciting requirements. It involves direct communication with individuals or groups of people who are part of an initiative. In an interview, the interviewer directs questions to stakeholders to obtain information. One–on–one interviews are the most common. In a group interview (with more than one interviewee in attendance), the interviewer is careful to elicit responses from each participant.

There are two basic types of interviews used to elicit business analysis information:

- Structured Interview: in which the interviewer has a predefined set of questions.
- Unstructured Interview: in which the interviewer does not have a predetermined format or order of questions. Questions may vary based on interviewee responses and interactions.

In practice, business analysts may use a combination of the two types by adding, dropping and varying the order of questions as needed.

Successful interviewing depends on factors such as:

- level of understanding of the domain by the interviewer,
- experience of the interviewer in conducting interviews,
- skill of the interviewer in documenting discussions,
- readiness of the interviewee to provide the relevant information and the interviewer to conduct the interview,
- degree of clarity in the interviewee's mind about the goal of the interview and
- rapport of the interviewer with the interviewee. [1]

Combing the unstructured interview method with the knowledge of successful interviewing factors is a solid base for gathering the requirements for future infosystem.

Requirement description

In the early stages of a project implementation, the way a system responds to an actor's commands can be described simply in words, while in the longer term it can be formalized using the UML that allows a clear record of the "use case" in graphic form, the so called "use case diagrams". They provide a universal record that, in addition to fulfilling its primary function of recording how the system behaves in the case under analysis, allows easy presentation of how the system works, during project work, to groups of stakeholders and experts. [8], [9] The requirement description is performed via pointing out functional and non–functional requirements. In given thesis, functional requirements are described through use case diagram.

We can describe individual use cases using the following characteristics [8], [9]:

- identifier/tag – a string of characters identifying the requirement being described,
- name – the name of the use case, e.g., start of toll parking, granting of passage priority,
- actor – a role (a system user belonging to a group with defined permissions), an external system or a device using a use case,
- initial conditions – required conditions, the fulfilment of which enables the implementation of the use case, such as the passage of a vehicle at a red light, the appearance of a queue of waiting vehicles, etc.
- initiating event – an event initiated by an actor, which is the reason for starting the procedure described within the defined use case; The event can be initiated from outside the system, by its user, or because of a trigger by another system or event (e.g., generation of a periodic report, after the end of a calendar month),
- description of the interaction process – the stages of data exchange between the actor and the system occurring during the implementation of the use case, e.g., selection of the type of printout by the actor, display of the correct form, selection of the printout option by the actor, confirmation of the printout, etc.
- main procedure – a list of standard actions performed within the use case,

- result – a description of the effects of the implementation of the use case,
- alternative procedures – which represent a different course of handling an event in the system (use case) than the standard one, the execution of which, however, results in the achievement of the originally intended purpose,
- exceptional events – situations in which the execution of the use case is not possible, for which, at the same time, the way of handling the event is specified in the form of, for example, a message about the need and manner of completion of the data form by the user, an error message, the implementation of an emergency procedure, etc.
- final conditions – the consequences of the correct implementation of the procedure provided for under the use case, such as the correct implementation of calculations and their storage in the database.

Non–functional requirements define how the system works. Non–functional requirements describe the overall behavior of the system like robustness scalability and maintainability of the system. A simple definition of a non–functional requirement is any requirement that specifies the overall behavior of the system is called a non–functional requirement. Non–functional requirements are significant because they have the power to make or break the success of a software system or a product. Even if a system satisfies all expected functional requirements, users will not hesitate to outright reject it if it fails to produce the desired quality results. Many functional needs that are extremely important and need to be expressed in the proper amount of detail in the requirements papers are derived from non–functional requirements. Additionally, they play a crucial role in several important architectural decisions and ensure that important design considerations are made early on rather than when costs and the risk of modification are higher. [10]

The non–functional requirements are categorized using FURPS+ method. The FURPS model was originally presented by Robert Grady at Hewlett Packard (and extended by Rational Software – now IBM Rational Software – into FURPS+).

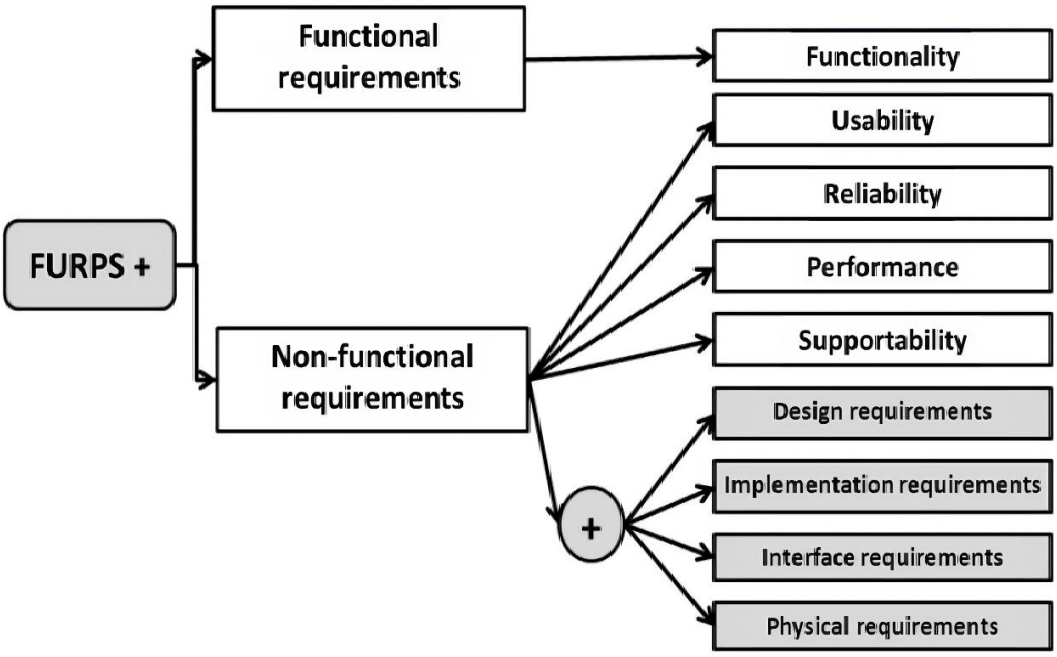

Figure 1. FURPS+ Model [12]

This model categorized characteristics into two different requirements such as Functional Requirements (F) which is defined by expected input & output and Non Functional Requirements in which U stands for Usability (includes human factors, aesthetic, documentation of user and material of training), R stands for Reliability (includes frequency and severity of failure, recovery to failure, time among failure), P stands for Performance (includes functional requirements) and S stands for Supportability (includes backup, requisite of design, implementation, interface and physios). The "+" in FURPS+ stands for: Design requirements, Implementation requirements, Interface requirements and Physical requirements. [11] In given thesis, the Author used FURPS+ method to categorize the gathered requirements in a structured way.

2.3.1 Requirement prioritization

Prioritization of requirements in this thesis is done using MoSCoW method. The acronym stands for must have, should have, could have and won't have. The importance or priority of a certain feature within a project is represented by each category. The core project scope is made up of must–haves, which are important and non–negotiable components necessary for project success. Should–haves are crucial characteristics that greatly enhance the value of the project and ought to be applied whenever practical. Could–haves offer flexibility for prospective improvements because they are desired but not necessary. To manage scope and avoid feature creep, won't–haves are expressly left out of the current

phase or project. MoSCoW supports resource allocation and project planning by assisting project teams and stakeholders in prioritizing requirements, ensuring that critical components are addressed first while providing clarity on what may be postponed or excluded. [12] In order to determine the priority of defined requirements for MVP solution, the Authors decision went towards MoSCoW method, as it is a straight-forward and simple method to divide the requirements that are in the scope.

2.4 IT Architecture Vision

To describe the IT architecture vision, author used a combination of UML diagrams, ERD and prototypes.

2.4.1 UML

The Unified Modeling Language (UML) is a multipurpose modelling language that comprises texts and graphics. Generally, it is employed in modelling systems that utilize object-oriented technologies. UML diagrams contain hieroglyphics that provide different contexts of the system under analysis. In addition, they dispatch both the dynamic and static assessments of a software configuration. The sequence diagram, also known as an event diagram, illustrates how messages flow in a system. It aids in visualizing a variety of dynamic cases. It depicts the interaction between any two lifelines as a time–ordered series of events in which these lifelines participated during the run time. The sequence diagram is one of UML's fundamental diagrams for modeling a system's dynamic characteristics. A sequence diagram, in more detail, depicts the interaction between participants in a two–dimensional chart by showing information delivered and received between them. [13]

The language is a combination of defined concepts and graphical diagrams (notations). They make it possible to create models of the analyzed problem, to describe the assumptions of the designed information system in a systematic way and the detailed solutions contained therein. Unlike object–oriented programming methods, it does not contain an element of description of how to proceed in each phase of the project but is only a set of defined concepts and notations. UML makes it easier to write down the concepts of how information systems work in a human–legible way, while leaving aside the use of programming languages and the programmed code written using them. This facilitates the creation of clear, easy to analyze and develop concepts and descriptions,

during the design and development stages of the application. At the same time, the descriptions are legible due to the notation used which is adapted to human perception. Also, UML is not used exclusively for software development work but it also allows for the creation of system–wide models. [8]

2.4.2 ERD

Entity–relationship diagramming (ERD) is a technique used to model the data requirements of an organization, typically by systems analysts in the requirements analysis phase of a systems development project. While ostensibly a diagramming technique or visual aid it provides the basis for the design of the relational database underlying the information system being developed. The entity–relationship diagram together with supporting detail constitute the data model which in turn is used as a specification for the database. The main elements of an entity relationship model are entities, relationships and attributes. Entities are objects of interest in the area of the organization being modelled. [14] This model is the result for systematic data analysis of system. It is usually drawn in a graphical form named ER diagrams including entities, their attributes and relationships between entities. This model is typically implemented as a database. Software developers and database designers can easily discuss the design of database and software over the ER diagram. Therefore, this subject is the basis of the database courses. ER design can be created very quickly with our library introduced in this study. [15] In the scope of the thesis, the ERD gives a representation of how the initial data model looks on MVP level of the solution. The ERD has ability to be expanded according to the needs in the future during solution development.

2.4.3 Prototyping

The prototyping is achieved using a wireframe method. A wireframe is a narrative prototype, usually created in the beginning of the design process. The narration is usually derived from a use case or scenario, often the same scenario used in a storyboard. This prototype shows high–level sketches, visualizing conceptual assumptions about the product structure and general interaction. The primary goal of this method is to get a design team in agreement with basic concepts and design directions that guide the conceptual design in addition to more detailed design decisions. [14] A wireframe starts as a raw sketch of how the software could look. This could be anything from a rudimentary sketched interface on a dinner napkin to more thoroughly sketched out

software screens schematics using a graphics tool. Wireframes usually have no visual design associated with them, because they are meant to be used early in the design process to determine the interaction flow and navigation model. As consensus forms around the wireframe concept, detailed designs are usually built from it. Wireframes usually stop being a central focus when a conceptual design is finalized and detailed concrete prototyping (either paper or digital) can begin. [16] The wireframe prototyping method was chosen to be most suiting by the Authors opinion, as the objective in prototyping was to show high-level vision of the designed solution. The more detailed prototypes are a subject for creation during the development process, where exact vision and final UI design are required.

3 Introduction to Datagate OÜ Company

In following chapter of the master's thesis, the Author introduces Datagate OÜ company by giving an overview of the company's background, as well as composes stakeholder analysis, describes business strategy and brings out business capabilities and motivation in form of models.

3.1 Datagate OÜ Company Overview

Datagate OÜ company has been established in 1997 and since establishment has focused its activity in providing honest and relatable IT solutions for private and business customers. In the 4th quarter of 2023, the company has a total of 15 employees.

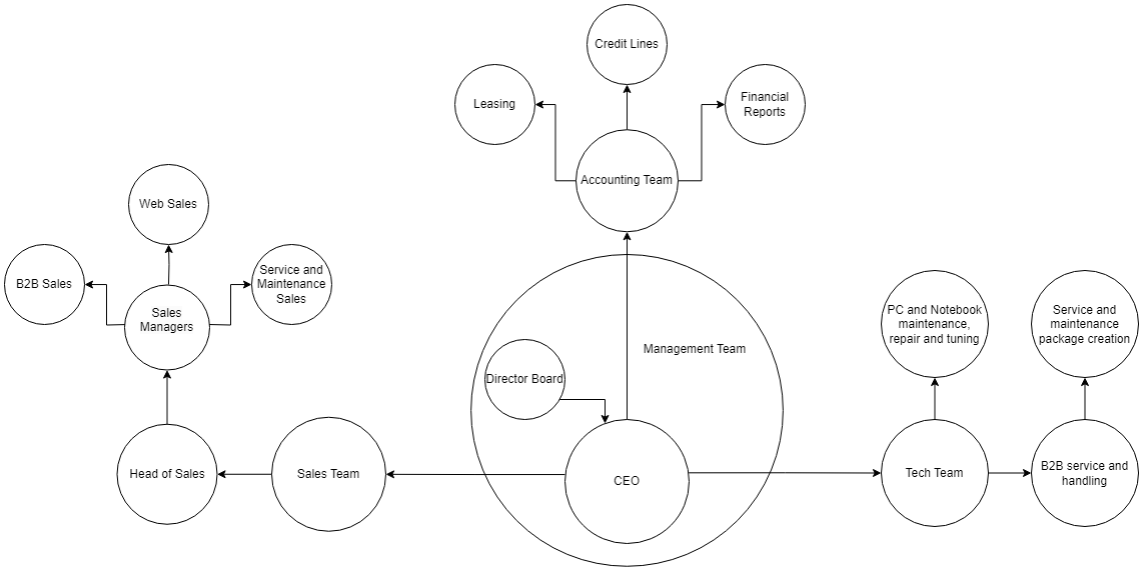

Figure 2. Structure of Datagate OÜ company. Source: composed by the Author.

The current structure of Datagate OÜ consists of Management Team in form of CEO and Director Board, to whom are related three main teams: Sales Team, Accounting Team, Tech Team. Each team and their members have their own responsibilities, which are defined by the Management Team. There is no HR department in the company, as the company size does not require its existence.

In scope of solutions that company provides is:

- retail sales of personal and mobile computers, servers, entertainment electronics (TV, video– and photo cameras, audio systems), home appliances (washing and drying machines, refrigerators), as well as accessories for the products listed above;

- technological solutions for businesses and administrative clients (such as educational sector and governmental procurement);

- in–house and outsourced repair services, consultancy for the offered products.

Datagate OÜ is ranked in Top 7 of Estonian companies that provide retail sale of computers, peripheral units and software in specialized stores with a turnover of 5 842 144 € as of December 2023.

Table 1. Turnover of Datagate OÜ by Year. Source: composed by the Author.

Year	2020	2021	2022	2023 (December)
Turnover (EUR)	5 452 358	8 583 793	7 902 396	5 842 144

The turnover of the company has experienced a positive spike in 2021 – 2022 in comparison to 2020 due to COVID lockdown and cryptocurrency mining popularity rise, which has mirrored on the turnover of the company. In 2023, the prognosis turnover of the company shows that the sales activity went down to statistically average number.

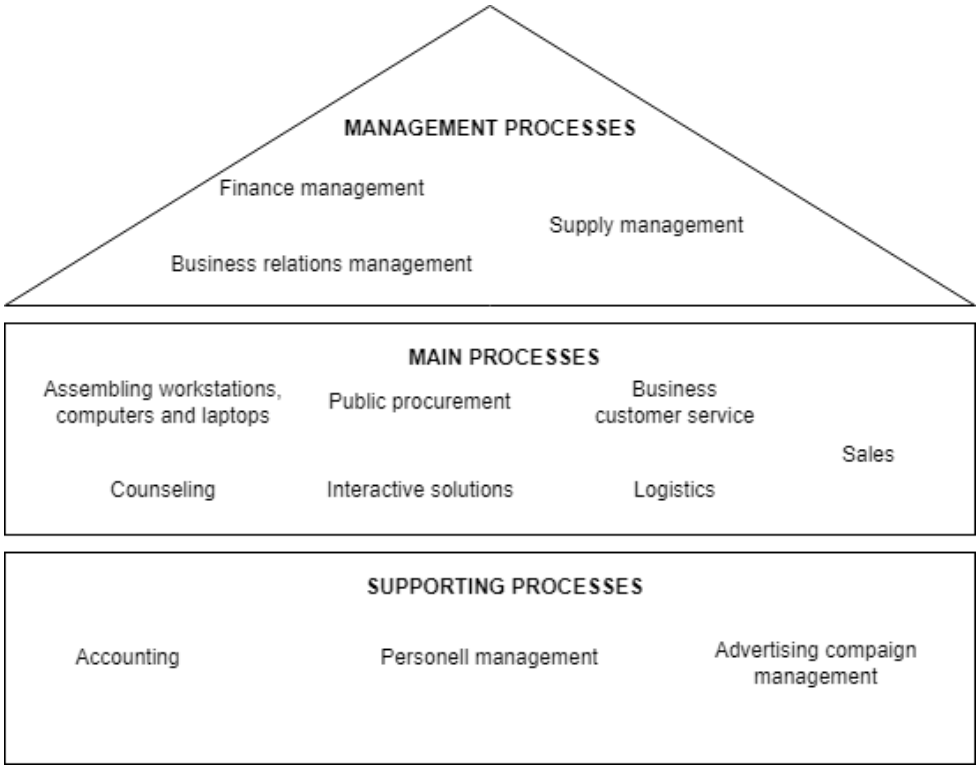

Figure 3. Business Process Framework of Datagate OÜ. Source: composed by the Author.

The process framework consists of three layers – management, main and supporting processes. Each layer represents key processes that are being executed by the company's employees.

3.2 Stakeholder Analysis

The term *stakeholder* is used as a general term to describe individuals, groups, or organizations that have an interest in the project and can mobilize resources to affect its outcome in some way. A formal definition of a stakeholder is: "individuals and organizations who are actively involved in the project, or whose interests may be positively or negatively affected as a result of project execution or successful project completion". Analysis of stakeholders gives an idea of who are the main stakeholders of the company and which demands are being brought out to and from the company in the business relationships. [17] Definition of the company's stakeholders has been achieved through process framework and structure analysis, as well as unstructured interview with the stakeholders directly.

The analysis is brought out in form of stakeholder diagram. Stakeholder diagram is presented in Figure 4. Diagram pictures the main stakeholders and their main interests or expectations towards Datagate OÜ, as well as Datagate OÜ's interests towards the parties.

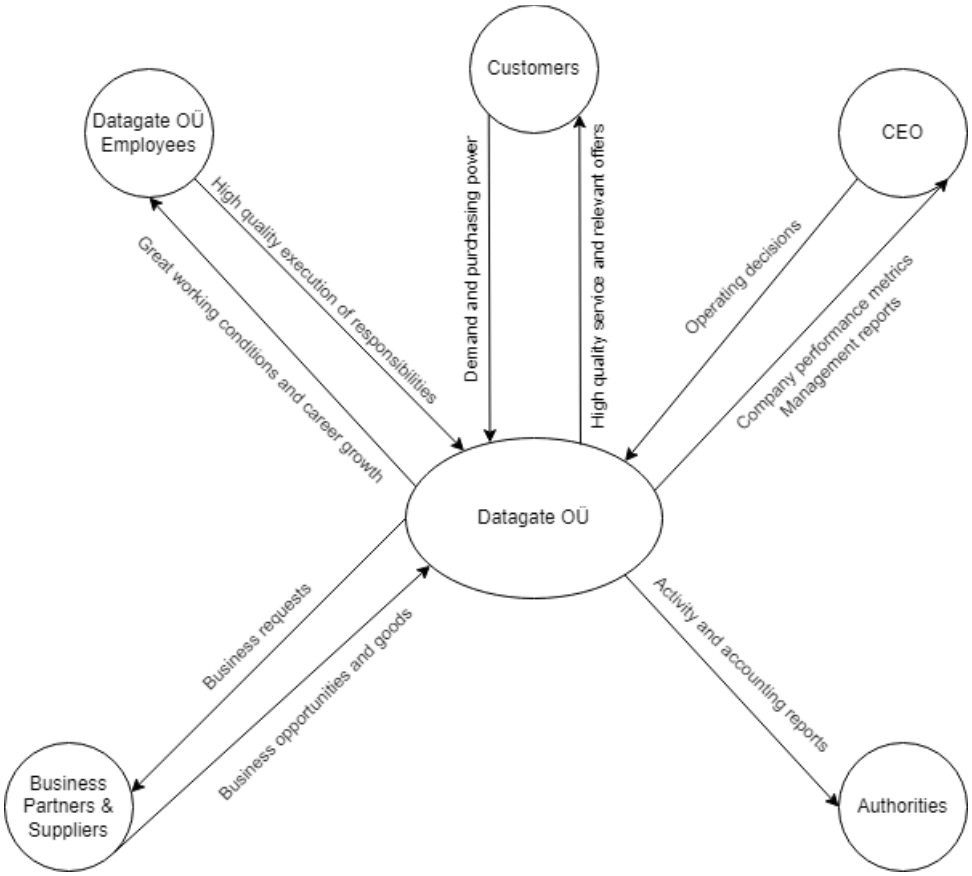

Figure 4. Diagram of interested parties. Source: composed by the Author.

As it can be seen from the diagram of interested parties, main stakeholders of the company are: CEO, Customers, company's employees, business partners & suppliers and authorities. Each party has their own interests, as well as the company is interested in results of their cooperation. For stable operation and growth, it is important to keep the interests of stakeholders and demands of the company to them on required level.

3.3 Business Strategy

The survival, continuation and growth of any organization depend upon the nature of strategies adopted. A good business strategy takes into account existing barriers and resources, people, money, power and materials that must be consistent with the vision,

mission and overall goals of the organization's initiative. The initiative often uses various strategies to achieve its goals – providing information, strengthening support, removing barriers and providing resources to how the form of success will be attained when attaining vision and mission. Conversely, strategies suggest ways to be adopted and how to move on the road of success. The strategies help the organization determine how to achieve the vision and goals by working on the basics. [18] For Datagate OÜ, the Business Strategy is a compilation of business principles to pursue annually. The business principles have a set characteristic, which means that they are being pursued annually and have a stable manner, which is a subject to change in case of a better approach to business activities is determined.

The business principles include:

- Maintain stable relationships with the Clients and other Stakeholders;
- Make sure that employee aims and expectations are aligned with the organization;
- Maximize use of Lean Methodology in everyday business activities (continuous improvement, eliminating waste and respect for people);
- Upkeep and improvement in profits;
- Introduce business practices and solutions to minimize time "waste" during regular business activities.

3.4 Business Motivation Model

Business motivation is the first of the four business modeling disciplines. A business motivation model describes what a business is trying to accomplish—the goals and objectives of the business. A motivation model is also concerned with how the business intends to go about accomplishing the goals—the strategy of the business. A motivation model includes what is happening in the world that may represent an opportunity or a threat to the business and what is happening in the business itself that may be a strength or weakness. [19] The Business Motivation Model is displayed in Figure 5.

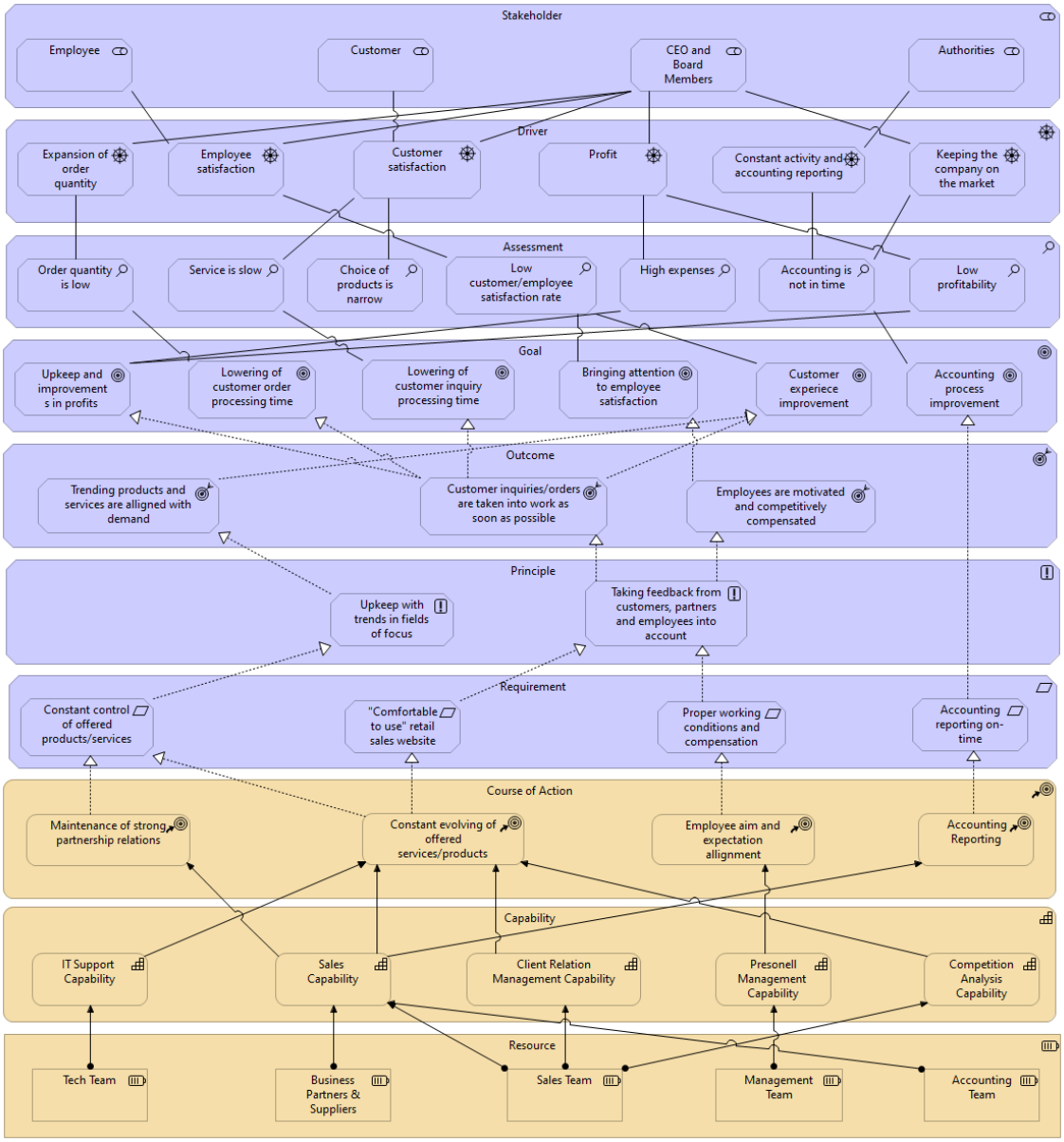

Figure 5. Business Motivation Model. Source: composed by the Author.

Some businesses build motivation models of their strategy and then use those models to communicate their strategy across their organization and to stakeholders outside. [17] On the Business Motivation Model, the main stakeholders and drivers are displayed together with the assessments of the drivers, business goals and their outcomes. The outcomes are related to the principles and requirements, which are defined according to the aims of the company. On basis of the requirements, courses of action by the resources are committed using their capabilities.

3.5 Business Capability Map

Recent studies have shown that business capability maps (BCMs) have gained great attention in EAM [20], [21]. BCMs help to align IT practices and investments with business demands and are essential for communication between business and IT stakeholders [22], [23], [24]. Unlike business processes, business capability does not describe a set of activities that needs to be conducted to achieve a concrete result. The EAM standard TOGAF® from the Open Group describes a capability as "an ability that an organization, person, or system possesses." [25]. For wider understanding of the capabilities the company has, the Author has composed a Business Capability Map diagram on the Figure 6.

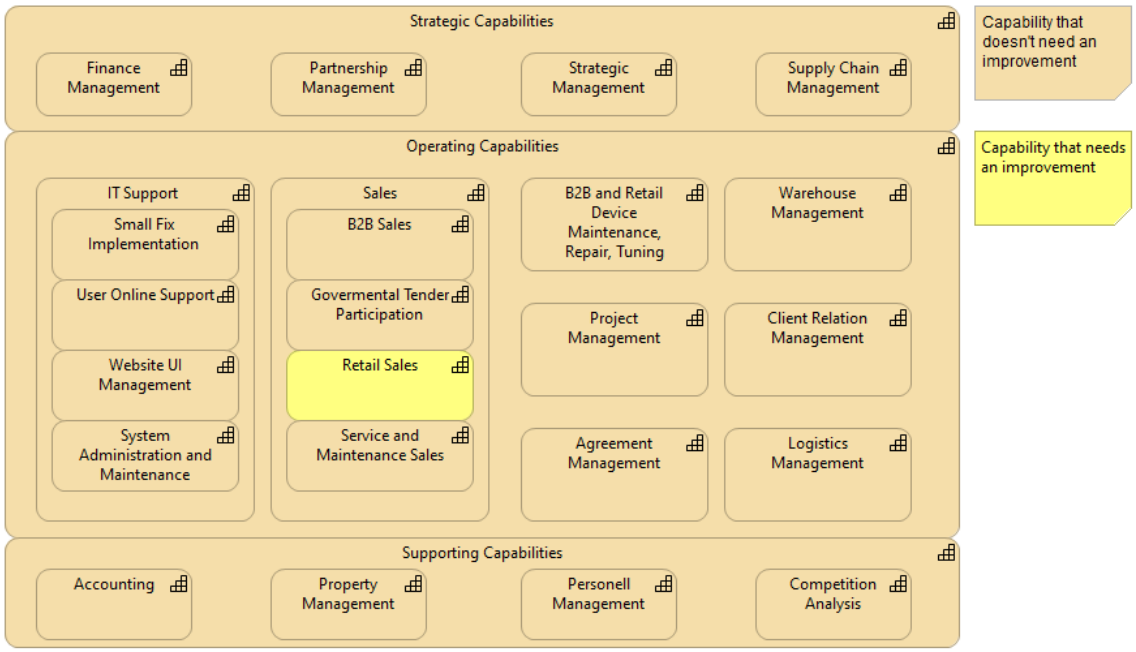

Figure 6. Business Capability Map diagram of Datagate OÜ. Source: composed by the Author.

As it can be seen from the Business Capability Map of the company, most of the capabilities the company has do not require any improvements, as all the processes around the capabilities has been developed to the required level of stable operation. Though, the "Retail Sales" capability needs improvement, which can be achieved with implementation of the infosystem that is being designed. The current issue with determining customer demand in retail sales spectrum is that the observations that are brought out by the company members are limited only by the products that have been ordered. Ordered product list does not equal demand.

4 Business Analysis

In following chapter of the master's thesis, the Author conducts a business analysis, which will open an opportunity to gain better understanding of company's strengths and weaknesses, along with factors and trends that are influencing its opportunities and threats. Subsequently, the Author analyses company's competitors, similar solutions to the one being designed in the thesis, as well as describes topicality of the solution for the company. Finally, the Author conducts stakeholder analysis and interview process with the stakeholders, on basis of which AS-IS and TO-BE process models are created, together with business rules, initial business requirements and business information model.

4.1 SWOT Analysis

Datagate OÜ is a company that has gone from having just one person to growing into a company with 15 employees. Their daily work is spread between departments and each member of the company's teams focuses on their own topics, which is a well put design into employee effective work distribution. Nevertheless, being an IT–sector company, the company faces constant competition from their rivals and always strive for new ways to introduce their company to private customers and businesses. To get a first glance of the company, the Author has composed a SWOT analysis, describing strengths, weaknesses, opportunities and threats with which the company faces during its operation.

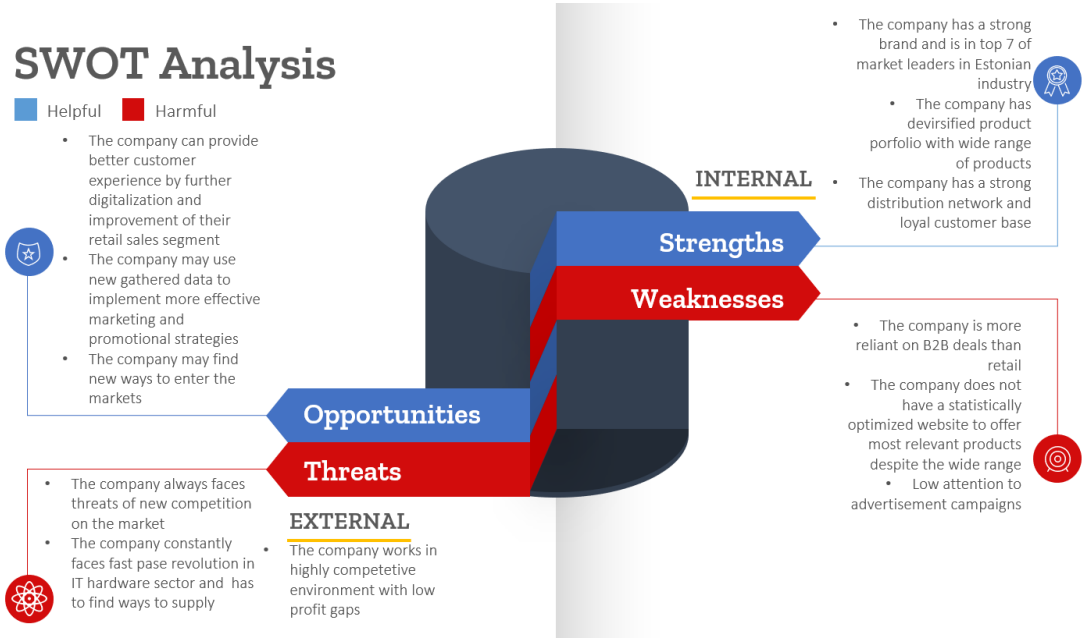

Figure 7. Datagate OÜ SWOT Analysis. Source: composed by the Author.

Starting from the Strengths, as it is discussed above, the company has a strong, well–established brand since 1997 and currently is placed in top 7 of the market leaders in Estonian industry. The product portfolio has one of the widest ranges of offered products in IT hardware retail sales in Estonia, as well as strong distribution network of acquired connections during the years of operation and loyal customer base in form of private and business customers. This is a very solid base, which will only multiply the effect of introducing advanced technological infosystem solution that is being designed for sales and business in general.

Following up, as one of the main weaknesses of the company is that the company is more reliant on B2B and organization deals than retail. This means that the actual retail sales that the website is built for are going on second plan, which brings the sales down, holding up the stock for longer than expected and letting the profits down with administrative costs. As a result of that the retail website of the company has an unoptimized and older design, which works more manually than on the base of statistics secured by the infosystem. Last, but not the least, the company has a low attention to advertisement campaigns, which affect the sales in negative manner. All in all, regarding weaknesses, the company must bring a higher attention to retail sales to gain extra profits.

Speaking of opportunities, the company has a great possibility to provide better customer experience by further digitalization of their processes and improvement of their retail

sales segment. The company may use new gathered data to implement more effective ways of marketing their stock for retail sales and figure out the best promotional strategies with most demanded products on the market – this will open possibilities and new way to enter new markets not only in Estonia.

Finally, the company always faces threats of the new competition on the market. IT market is a very wide and very demanded sector of economics, which brings in a lot of interested parties in acquiring profits – therefore the profit gaps are getting smaller, leaving the company only with more sales work to be done. Additionally, to the threats discussed above, the company constantly faces fast-paced revolution in IT hardware sector and must find ways to supply the newest tech in the fastest manners to gain profits – which is big dependency and threat.

4.2 PESTLE Analysis

To examine, which factors and trends could influence opportunities and threats of Datagate OÜ company, a PESTLE analysis is conducted. The result of analysis of each factor is represented as state of external forces that are driven by the factor.

Table 2. PESTLE Analysis. Source: composed by the Author.

Factor	**Factor state in Datagate OÜ**
Political	Governmental tenders are one of the current main activity sectors of the company, which directly impacts the company in case of tender participation or hosting end. Though, the retail sales customer demand is not affected by the political factor. It is also important to follow up with government situation that affects its stability, as customer demand might focus on other direction in case of political crisis.
Economic	The company being a sales business, the economic factor directly affects the potential interests of the company. It is essential for the company to follow up with economic situation to make prompt business decisions. Current and

	future levels of interest rates, inflation, unemployment and taxation are crucial to be followed up with.
Social	Social factor impacts Datagate OÜ directly, as the society directly drives the retail sales. It is essential to gather knowledge of customer demands to be competitive on the market. As the competition being main threat of the company, it is crucial to gain attention of society on the offered products and services by the company. It is crucial to maintain the image of the brand and company, along with tracking customer purchase patterns and following up with major events, trends and influence that is happening in the industry.
Technological	Technological factor does not directly impact the business processes of Datagate OÜ, but it impacts the actuality of offered products by the company. Technology evolves very rapidly, therefore the technological offered products today might become irrelevant tomorrow. Innovations are constantly being done, therefore innovations inside the company are also a subject to be on the table.
Legal	Legal factor does not directly impact the company, but there are legal requirements from the government that should be complied with to retain the company on the market. Also, it is important to follow up with regulatory bodies and trading policies, together with European law.
Environmental	Environmental factor is one of the least impactful in the company, though it is important to follow up with recycling and global fight against waste. The level of pollution created by the company is a metric to be maintained on low level.

4.3 Analysis of Competitors

As it got clear from the SWOT analysis that the company always faces threats of new competition on the market, the Author compiled an analysis of competitors to bring out their advantages in comparison to Datagate OÜ in terms of retail sales websites. The sector and field of activity of the companies that are taken into focus is the same as Datagate OÜ's – retail sale of computers, peripheral units and software in specialized stores.

The purpose of a competitor analysis is to provide managers with a complete picture of the competitive landscape confronting a firm. The core idea behind a competitor analysis is to use a systematic approach to (1) identify current and future rivals to a firm, (2) assess the strengths and weaknesses of current and future rivals, (3) determine a match between a competitor's strategies and capabilities, (4) analyze the future plans and intentions of rivals(5) predict a competitor's reaction to initiatives launched by a firm. The ability to anticipate the response by rivals provides a firm with a competitive advantage. [26]

4.3.1 Competitor 1: Arvutitark OÜ

Arvutitark OÜ is a company that was established in 2013 and is currently holding top 3 placement in the turnover statistics in the sector.

In Figure 5, a home page of Arvutitark OÜ company is displayed.

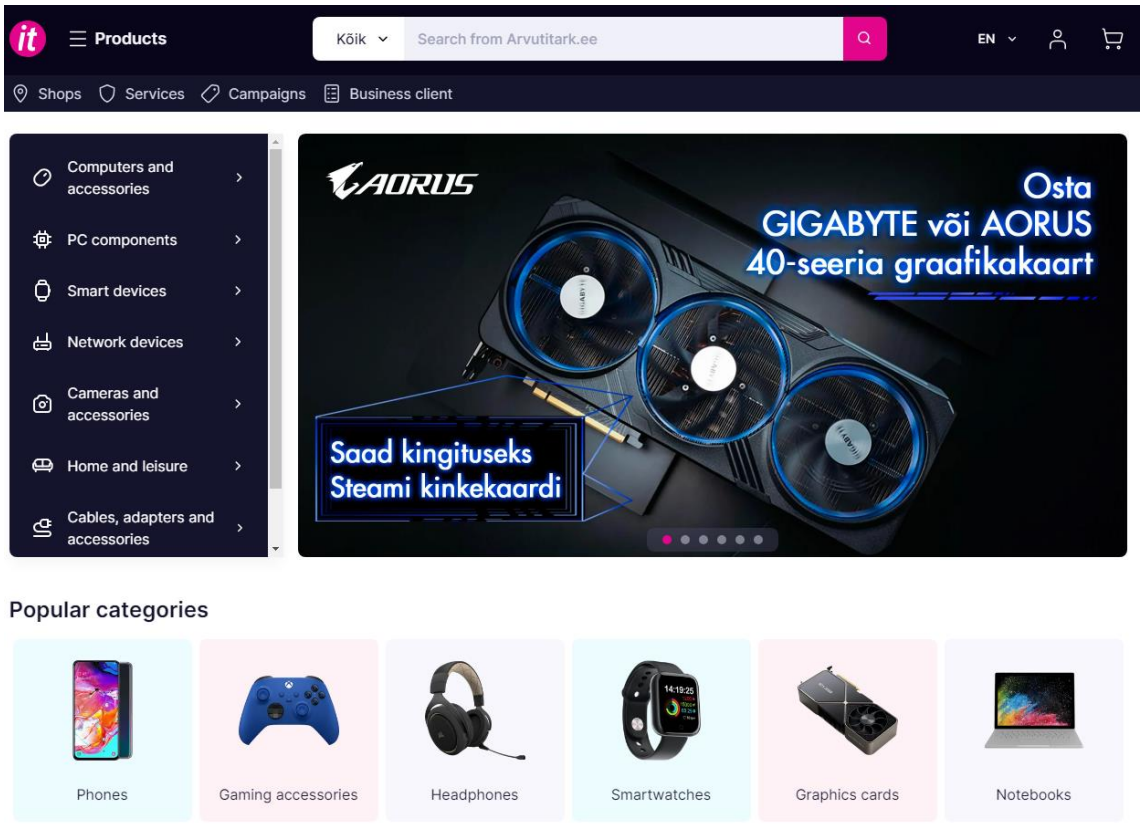

Figure 8. Home Page of Arvutitark OÜ. Source: screenshot taken by Author on 05 November 2023

As it can be seen from the home page of the website, right away, the most demanded product type (video cards) advertisement is shown and the most popular categories are open for choosing right away. This categories' top list and the advertisement focus shows that company has done the research on what exactly the client needs, when visiting company's website for another purchase.

4.3.2 Competitor 2: Klick Eesti AS

Klick Eesti AS is a company that was established in 2006 and is currently holding top 2 placement in the turnover statistics in the sector, above Datagate OÜ.

In Figure 6, a home page of Klick Eesti AS company is displayed.

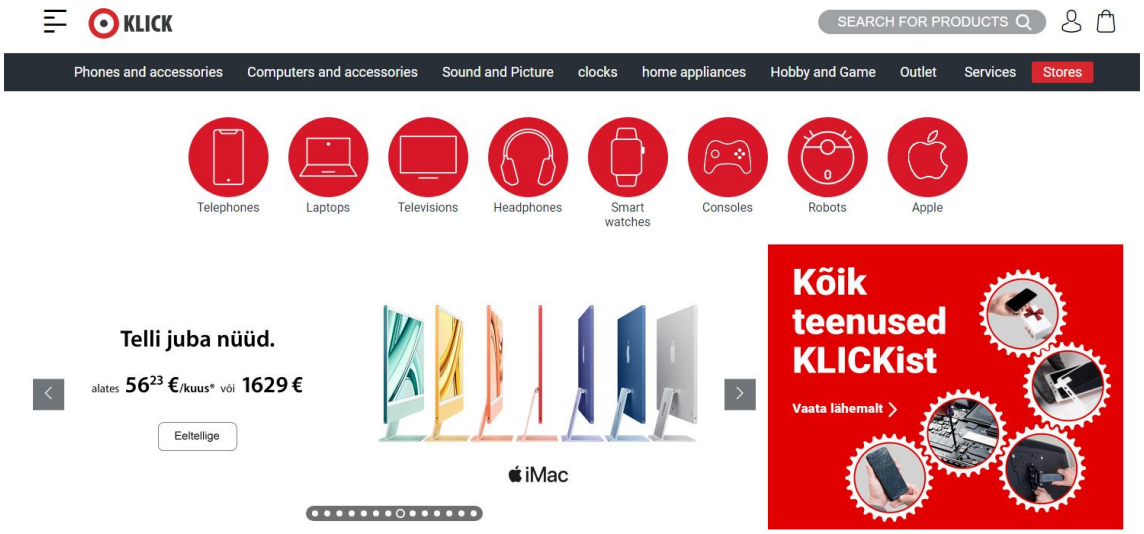

Figure 9. Home Page of Klick Eesti AS. Source: translated, screenshot taken by Author on 05 November 2023

As it can be seen from the home page of the website, same as Arvutitark OÜ, Klick Eesti AS focuses the attention of potential clients on the most demanded categories and products, which is an approach that Author strives to implement for Datagate OÜ.

4.3.3 Competitor 3: Smartech Shop OÜ

Smartech Shop OÜ is a company that was established in 2013 and is currently holding top 12 placement in turnover statistics in the sector.

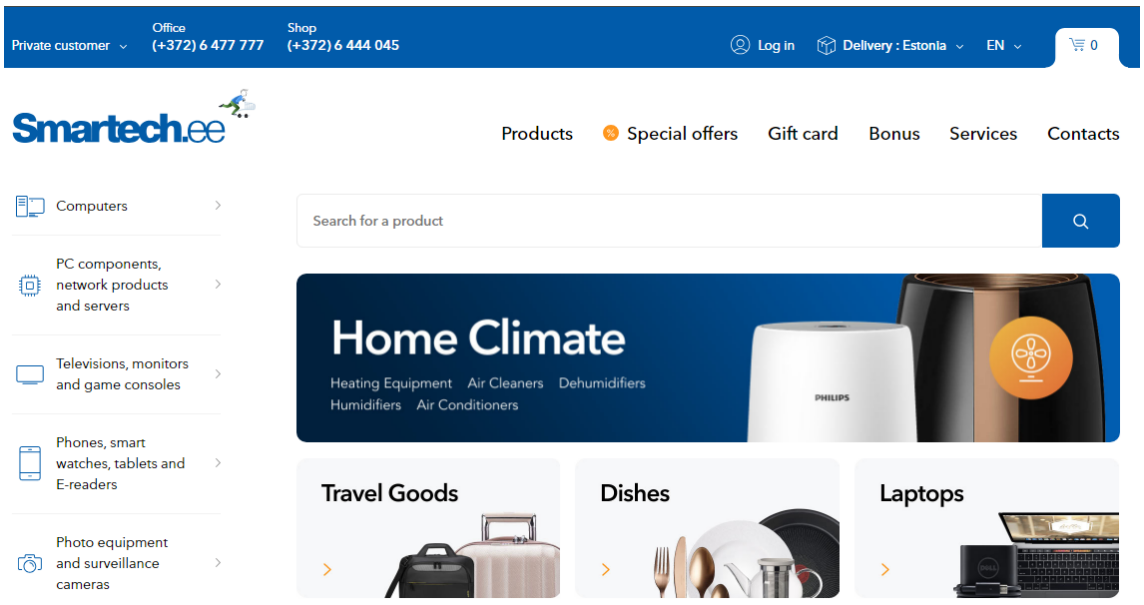

Figure 10. Home Page of Smartech Shop OÜ. Source: screenshot taken by Author on 05 November 2023

The home page of the website greets the customer with most demanded categories in the field of activity of the Smartech Shop OÜ company, which is seen by the differences of the categories in comparison to the competitors. This approach enables the client to inspect the offers right away that the company is most competent on, which results in a more probable purchase from clients' side.

An overview of the competitors gives a better understanding, which advantages should be worked on Datagate OÜ company's side. This analysis will be used in the interview process to give a better way to introduce the problem to the stakeholders, which will assist in getting more productive and focused input for business requirements and business rules.

4.4 Analysis and Comparison of the Existing Solutions

In this section, the Author will cover and compare existing solutions used in the company to the one being analyzed and designed in the master's thesis. During the analysis, the Author draws attention to the current software being used in Datagate OÜ, as well as looks at two popular web analytics tools that are available on the market.

To decide, what is the wisest way to continue with choice of solution, there are three ways:

1. Continue with working the same way without any changes;
2. Work out and develop company-specific solution;
3. Use „out-of-box" solutions.

It is also crucial to understand the additional aspects that impact the choice:

1. Implementation time;
2. Pricing;
3. Fitment to company needs.

4.4.1 Directo – the software being used in Datagate OÜ

For everyday business activities Datagate OÜ software called “Directo”. “Directo” is a business software that covers business activities, such as: accounting, personnel and salary management, sales management, warehouse management, project management and workflow management. Every activity coverage includes a wide scope of different processes and functionalities to insure best productivity. This software is being used by all employees for their activities. Nevertheless, the company has different processes designed for handling business requests and warranty work/repair workflow management. The software is connected to the retail sales website of the company to track the orders that are being done on the website.

“Directo”-s CRM software makes it possible to cover the clients that are somehow interacted with company via contact channels or by ordering. In the case of acting as source of information of customer behavior on the website, the current CRM software does not bring in enough value.

4.4.2 Web Analytics Tools

Web Analytic Tools are software that is designed to gather information of the website activity in form of user clicks, visitor sources and traffic that can be measured and reported in user interface. The software helps to understand what is happening on the website and acts as a source of information for business decisions. In the scope of the analysis, the Author has chosen two examples of the software that could have been used.

Google Analytics

Google Analytics is a tool that tracks website traffic and provides statistics about website views by users.[27] The Google Analytics is most widely used web analytics service on the web.[28] Google Analytics has free and paid versions. The free version offers quite wide range of functionality, such as real-time data, custom reporting option, social reporting, conversion reporting, heat map and more. Along the way, Google Analytics making it possible to integrate it with other Google products such as “AdSence” and others. The paid version of the Google Analytics starts from 150 000 USD a year, which extraordinarily expensive for the application in the current company.

Despite Google Analytics offering quite wide range of functionality, to apply the tool for business needs of understanding customer behavior it requires website-specific metric configuration, which is not possible through Google Analytics with the free version. Google Analytics may show an overall picture of website activity but does not provide exact metric configuration for business needs and does not have customer support.

Kissmetrics

Kissmetrics is an event-driven web analytics tool for tracking individual users and for other advanced features, such as cohort analysis. It has a wide variety of add-ons and a fully customizable dashboard to improve analysis. Kissmetrics is very easy to integrate with other tools and platforms. Through Kissmetrics, you can observe what is leading website users to perform conversions and, if they are not performing them, remove the obstacles that prevent them from meeting the objectives. It also helps to understand the indicators of commitment and churn, so you can react accordingly and increase your retention. With this tool, it is easier to understand the behavior of customers, something necessary to improve growth and lead the company to its growth.[29]

“Kissmetrics“ is a truly wide-range functionality software that wide spectrum of information to be analyzed by the organization. This tool integrates with the website through API and gathers data from the endpoints that are available.

Nevertheless, despite the tool being able to track individual users and do different sorts of analyses, the tool does not fit the needs of the current company as it is essential to understand, which exact products are being ordered to build proper categorization strategy. Because it's an event driven system, there is no way to modify events in the past. Same as Google Analytics, “Kissmetrics” integrates into a web source and gathers information solely from the events that are happening on the website. Though, along with the events, the solution must have a possibility to use sales data for displaying statistics and to make categorization decisions.

Considering the volume of events that Datagate OÜ website would generate monthly is about 10 million to 15 million – yearly cost of the solution would be in range of 7 712,91 USD up to 11 060,91 USD, considering their yearly billing discount. In 5-year perspective it is from 38 564,55 USD up to 55 304,55 USD in expenses just to determine user

behavior. Indeed, it is cheaper than Google Analytics, but still brings in a big chunk of expenses, which highly affect profits from low marginality of offered products.

4.4.3 Conclusion to Solution Choice

Different web analytics tools that are available "out-of-box" truly offer impeccable number of features that might contribute to rise of company's conversion rates and overall understanding of customer behavior. All the features offered by the "out-of-box" solutions come with a price that is not applicable to the needs of Datagate OÜ company and the features do not fulfill the requirements of Datagate OÜ to the infosystem.

The freshly designed infosystem must not only show website activity statistics, but also conclude the sales data into graphs and metrics. It might require combining few solutions together to achieve the same result that one infosystem could do, if developed as one unit.

To fulfill the needs of Datagate OÜ in gaining knowledge about client demand, a source in form of an infosystem is required. It is wise to invest into own product to include exact features that the company needs for best possible outcome, considering specifics of the business and its data sources. It is always easier to have the solution developed and configured for custom data sources than having to adapt the „out-of-box" solutions to them, presumably missing out on opportunities to gain more knowledge.

4.5 AS–IS Processes

To describe AS–IS processes, the Author takes the main processes related to the retail sales, which is a subject to be directly impacted by infosystem implementation in the workflow: advertisement compilation and product adding to the catalogue.

4.5.1 Discussion Subprocess of Advertisement Compilation Process

Understanding and optimizing business processes is key to the overall performance of any organization. Inefficient processes can cause errors and delays that impact business operations. [31] The advertisement compilation process starts with a sales team meeting. Sales team discusses the possible products and services that can be advertised in free form. As the decision is made, the sales team proceeds preparing the advertisement materials and sends them to the management team for confirmation. As the advertisement

materials are verified by the management team, sales team proceeds with publishing the advertisements to the market.

Process of advertisement compilation is described in Figure 11.

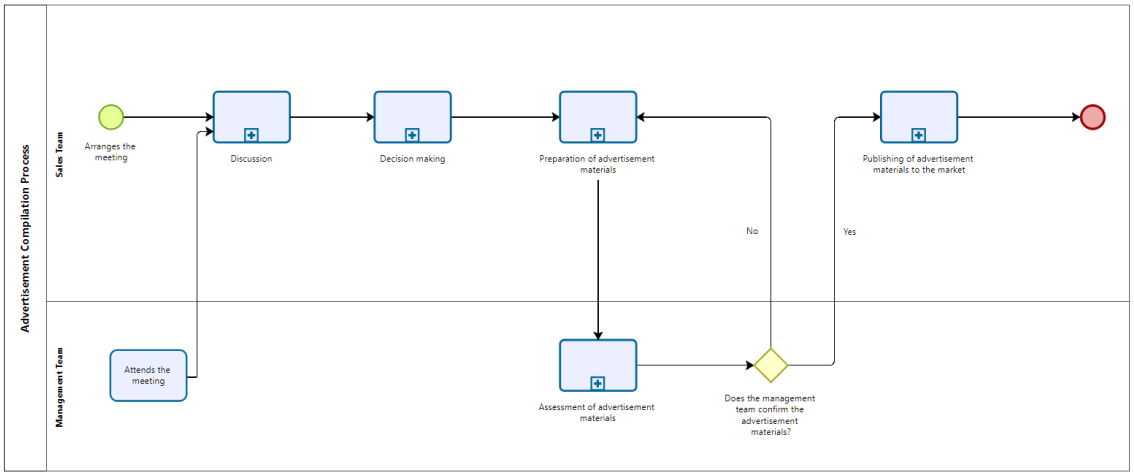

Figure 11. Advertisement Compilation Process. Source: composed by the Author.

The main problem of the AS–IS process is that the Discussion subprocess is highly impacted only by the observation of the sales team members but is not statistically supported. Even though that there is a capability of the sales team to observe ordered products and services, there is no possibility to find out what the customers are looking for and in which niche the main demand is located.

In Figure 12, the Discussion subprocess is described.

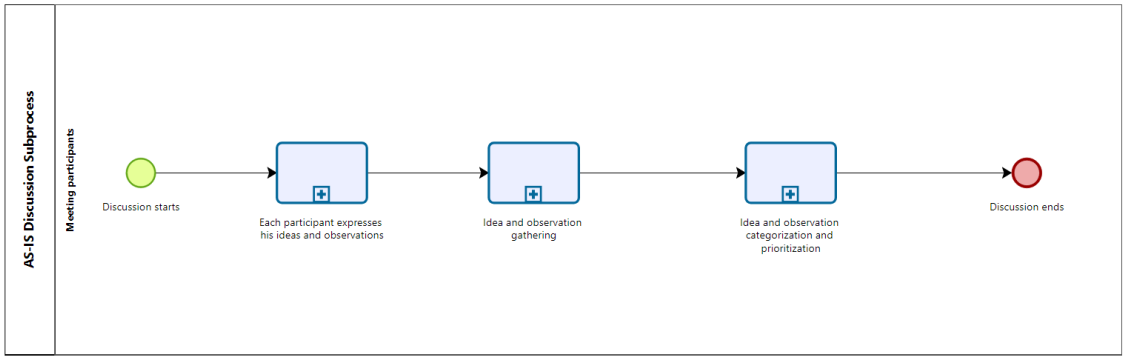

Figure 12. AS–IS Discussion Subprocess. Source: composed by the Author.

As it can be observed from the Discussion subprocess, the ideas and observations being categorized and prioritized are based only on the observations, which is a process that can be improved. This leads to the fact that the advertisements are created based on very

narrow pool of ideas and knowledge, followed up with smaller interaction with the advertisements and lower interest in company's offered products.

4.5.2 New Product Information Correction Subprocess of Adding Products to the Catalogue Process

The second process, which a subject to be impacted with infosystem implementation is product adding to the catalogue. The process starts from the supplier, who acquires new product offering and sends XML data to form the products. The XML data is taken into processing by the web system and it forms a wait list of new products to be added. As notification arrives to the sales team, a new product review subprocess begins. If the product list does not fit the scope of company catalogue, the sales team sends a request to supplier for product list correction request to form a new XML dataset to be processed by the web system. As all products fit the scope of the company catalogue, the sales team goes through new product information correction, if needed. Further on, a product implementation request is sent to tech team and the products are being implemented into the web system.

Process of product adding is described in Figure 13.

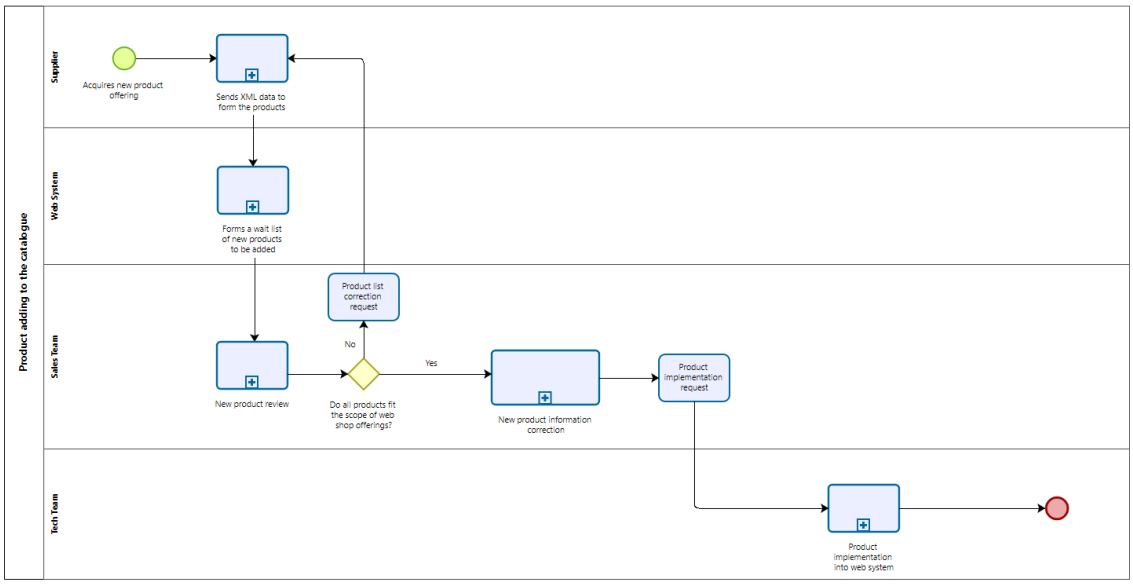

Figure 13. Process of Adding Products to the Catalogue. Source: composed by the Author.

The process itself, by its nature, requires a lot of manual work from the sales team. This leaves the sales team to decide how to properly align the products into correct categories and how to properly show the product data for the potential customers on the website.

Speaking about improvements to the process, the product adding procedure has been in action since the time, when Datagate OÜ focused its business approach to offering as wide selection of products as possible. Therefore, there is not a lot of improvement points available, but there is a subprocess that can be impacted with implementation of the infosystem. This subprocess is described in Figure 14.

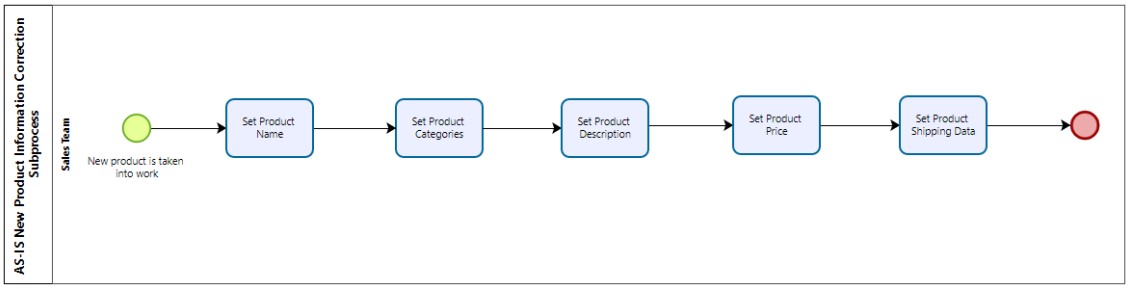

Figure 14. AS–IS New Product Information Correction Subprocess. Source: composed by the Author.

The new product information correction subprocess is a simple process of setting attributes of the product that is being added to the catalogue. It is a crucial part of the main process, as the XML data that is sent by the suppliers does not always fit the expectations of the sales team and requires corrections. With the new solution being implemented in the workflow, it will give a possibility to gain an overview of products in same category from the infosystem and will give an idea for sales team member on which categories can the product be additionally assigned to. This fact may also give an idea of new product subcategory for sales team member to introduce for the tech and management teams if it makes sense to assign the product into a new subcategory. The new category may compile different products into client demand focus and result in better exposure on the website.

4.6 TO–BE Processes

Based on previously described processes, it is possible to compose the TO–BE process model. To describe TO–BE processes, the Author chose subprocesses of two main processes: Discussion subprocess and new product information correction subprocess.

4.6.1 Discussion Subprocess of Advertisement Compilation Process

The main idea behind the retail sales support infosystem is that the system gives an input for the business side to support its members in making business decisions. Therefore, it is crucial that the infosystem output is analyzed and considered.

In Figure 15, a TO–BE Discussion subprocess of advertisement compilation main process is displayed.

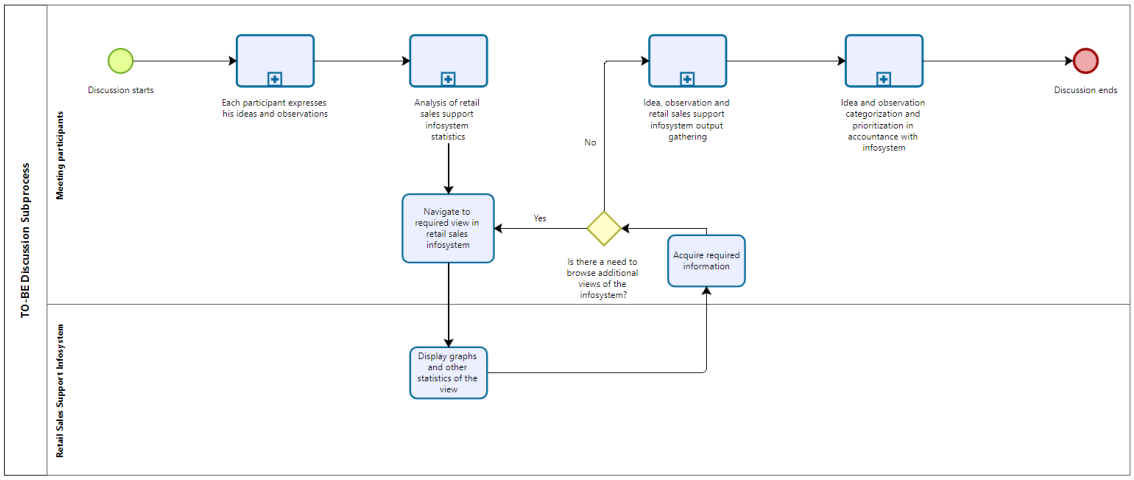

Figure 15. TO–BE Discussion Subprocess. Source: composed by the Author.

As it can be observed from the updated subprocess, despite each participant of the meeting expressing their ideas and observations, an analysis of retail sales support infosystem statistics is followed up. As a part of the discussion, retail sales support infosystem will provide statistics view for the most demanded products in categories, as well as a set of custom statistics that the sales team will consider. This analysis will help the discussion participants to eventually acquire a more statistically confirmed ideas and observations, which will result in a more focused advertisements to client demands. Having advertisements with statistically confirmed client demand is the best way to introduce the company to the market and acquire additional possibilities for business opportunities.

4.6.2 New Product Information Correction Subprocess of Adding Products to the Catalogue Process

In Figure 16, TO–BE new product information correction subprocess of adding products to the catalogue main process.

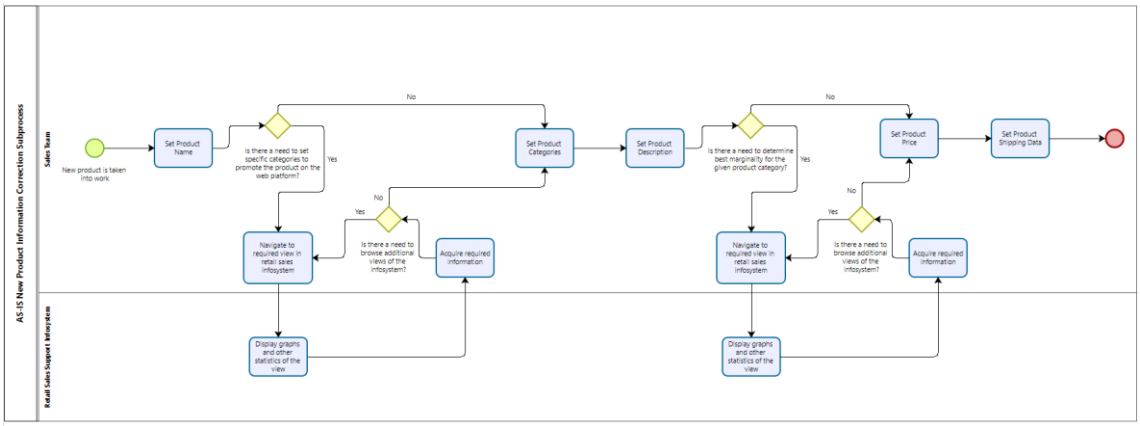

Figure 16. TO–BE New Product Information Correction Subprocess. Source: composed by the Author.

As it can be observed from the updated subprocess, in case of need for promotion of the new product, the sales team visits the retail sales support infosystem to observe the best categories for given product type. This way the sales team has ability to focus the new products into most effective categories, knowledge about which is acquired from retail sales support infosystem. Same way goes around setting the product price. To maintain best possible marginality in favor of the company, it is also possible to gather information from retail sales support infosystem about the marginality with which the products of same main categories have been sold.

4.7 Initial Business Requirement Gathering

To gather business requirements for a solution that is being designed to improve retail sales, the Author chose an unstructured interview type of gathering opinions from parties that are closest to the retail sales process.

The parties were:

- CEO and Management Board;
- Datagate OÜ Employees.

Total amount of participants in the interviews was 17. The interviews were carried out during November 2023. The Author used information collected from the parties during interviews and prioritized them via MoSCoW method.

The described initial business requirements are listed in Table 3.

Table 3. Collected Initial Business Requirements. Source: composed by the Author.

ID	Business requirement	Priority
BR1	For authentication, the system should use internally created encrypted usernames and passwords.	Must have
BR2	The system should be hosted locally and not available to public Internet.	Must have
BR3	The system should give possibility to compile datasets into readable graphs (most searched products, most clicked on products, most ordered products etc.).	Must have
BR4	The system should be in form of web application, so it could be used on both personal computer platforms and mobile devices.	Must have
BR5	The system should contain an admin panel with a possibility of server configuration possibilities and user management.	Must have
BR6	The system should collect user activity data from the main website.	Must have
BR7	The system should support integrations with other technologies that the company uses in internal activities (Website, APIs from suppliers).	Must have
BR8	The system should have its own database, with help of which it stores collected data.	Must have
BR9	The system should bring value to the organization.	Must have
BR10	The system should have role-based view of composed graphs.	Must have
BR11	The system might have possibility to compile accounting–supporting graphs for easier reporting.	Could have

BR12	The system should allow to manually log customer inquiries from secondary contact channels (email, phone) and make it possible to compile the data into statistics.	Could have
BR13	The system should have interface to view raw data from tables in structured form by rows and columns.	Won't have
BR14	The system should have possibility to publicly show trends in form of datasets on the website.	Won't have

Brought out business requirements are a base of direction for the system analysis that is done in the following up section of the master's thesis.

4.8 Business Rule Map and Business Data Model

The following table, Table 4, describes business rules related to the information system that is being designed, which are based on interviews with interested parties. A business application is a source of truth for the business. To be effective at this task, data will need to conform to a structure. This will allow processes and workflows to be built around it. Categorically, the specification of a data's structure, how it is modified and what happens when it is changed are all considered business rules. At a given point in time, they will be specific. As the business changes, so will its rules. [30]

Table 4. Business Rule Map. Source: composed by the Author.

ID	**Business Rule**
BRU1	One search attribute can be included in one or more search requests. Each search request is related with one or more search attributes.
BRU2	One cart contains one or more products. One product is related with none or more carts.
BRU3	Each product can include one or more links. One product link can include only one product.

BRU4	Each search request can include one or more users. One user can include one or more search requests
BRU5	One cart can include only one user. One user can have none or more carts.
BRU6	One order can include only one cart. One cart can include only one order.
BRU7	One order can include only one user. One user can include none or more orders.
BRU8	One product can have one or more categories. One category can have none or more products.
BRU9	One order can have one or more delivery methods. One delivery method can have one or more orders.
BRU10	One order can have one or more payment methods. One payment method can have one or more orders.

The procedure for compiling business rules was based on the business requirements gathered during the interviews. As it was cleared out, which data points would the stakeholders want to see in the solution, the rules were created according to the requirements. The rules were validated separately with the interview participants in a separate session.

Based on brought out business rules, author composed an information model in Figure 17.

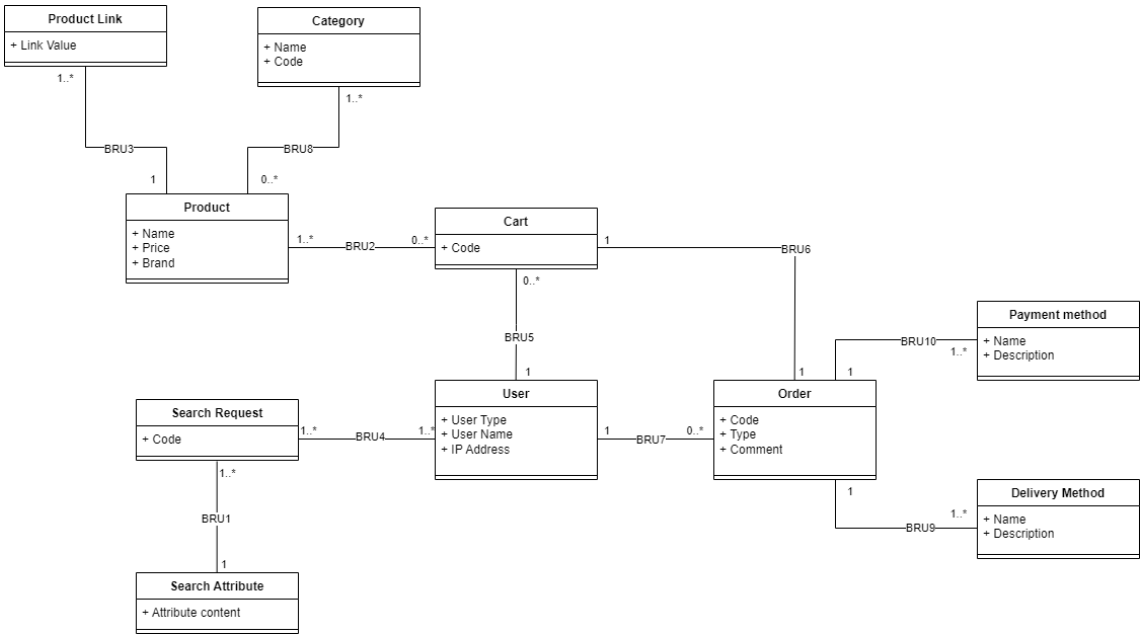

Figure 17. Business Data Model. Source: composed by the Author.

This model gives a clear picture of the potential data used and how the main business rules interact with one another. The most crucial elements for developing a primary information system are shown in the business data model. This data will be used to determine ones of the following:

- Products being searched for and sold;
- Categories of products being searched and sold;
- Search attributes that are being input by users;
- Payment and delivery methods that are being used for orders.

5 System Analysis Results

In following chapter of the master's thesis, the Author composes a system analysis on basis of business analysis to ensure proper alignment with business requirements. System Analysis results contain a use case model with brought out use cases as a part of functional requirements for the system, as well as non–functional requirements. The requirements are classified using FURPS+ method.

5.1 Functional Requirements

Within this master's thesis, the functional requirements are described in a form of Use Case Model and in text form of the use cases. Use–Case Model give an overview of how the actors will perform actions in the system that is being designed.

In Figure 18, the use case model of Retail Sales Support Infosystem is displayed.

Figure 18. Use Case Model of Retail Sales Support Infosystem. Source: composed by the Author.

Two main figures in the system are: User and System Administrator. System Administrator is responsible for managing different parts of the system along with managing to support the users via tickets and chats. Users, on other hand, share a few use cases with the system administrator, as well as have their own use cases of the system. The Use Cases are:

- UC1: User Registration;
- UC2: Authorization;
- UC3: Accessing System Endpoints (Pages);
- UC4: Creation of Statistical Graphs;
- UC5: Managing Permissions;
- UC6: Managing Users;
- UC7: Submitting Support Ticket;
- UC8: Managing Tickets;
- UC9: Using Online Chat;
- UC10: Managing Chats;
- UC11: Gathering Data.

The Use Cases are described more widely in form of tables. Two most important use cases are described below.

UC4: Creation of Statistical Graphs

Table 5. Use Case 4: Creation of Statistical Graphs. Source: composed by the Author.

ID and name	UC4: Creation of Statistical Graphs
Main actor	User, System Administrator

Description	Statistical graphs are main source of information from the system and to organize the datasets, User or System Administrator should create statistical graphs.
Prerequisite terms	Data is available to compile a statistical graph. System has a dashboard, on which graphs can be viewed by user groups defined by the graph creator. User has enough permissions to create a graph.
Subsequent terms	Statistical graph is created on assigned page.
Standard pattern	1. User accesses a dashboard view; 2. User accesses “New Graph” menu; 3. User defines graph style and chooses data, on basis of which the graph is made; 4. User submits the graph to the system; 5. Statistical graph draft is created; 6. User defines graph visibility to user groups; 7. Statistical graph draft is being assigned status “ACTIVE”.
Exceptional events	**User attempts to access “New Graph” menu, but receives exception** 1. User accesses a dashboard; 2. User attempts to access “New Graph” menu; 3. User receives output from system in form of exception; 4. User contacts System Administrator to resolve the issue. **User does not have access to data he wants to display**

	1. User accesses a dashboard view; 2. User accesses “New graph” menu; 3. User does not see data points, which he wants to display; 4. User contacts System Administrator to resolve the access problem.
Usage Frequency	Every time when a new statistical graph is being created.
Business Requirements	• Statistical graph creating permissions should be assigned to trusted users.

Creating the graphs is a main use case on MVP level of the solution. The graphs act as sources of information, which can be used to gather knowledge about different metric combinations. For example, it could be possible to track how many visitors searched for something on the website. This and a lot more metrics can be tracked with this use case.

UC11: Gathering Data

Table 6. Use Case 11: Gathering Data. Source: composed by the Author.

ID and name	UC11: Gathering Data
Main actor	System
Description	Gathering Data is a crucial part in an input for the infosystem to compile statistics on basis of the results of the use case.
Prerequisite terms	API / Secured Gateway endpoints are available.
Subsequent terms	Data is gathered.
Standard pattern	1. System sends requests to sources;

	2. Sources return data; 3. System sends request to save data to the database; 4. Database compares the data to current snapshot, updates current data and saves required data to the database.
Exceptional events	**API / Secured Gateway endpoint is not available.** 1. System sends requests to sources; 2. One of the endpoints is not available; 3. System sends request containing exception details to log system; 4. System continues sending requests; 5. Subsystems return data; 6. System sends request to save data to the database; 7. Database compares the data to current snapshot, updates current data and saves required data to the database.
Usage Frequency	Every time the System sends a request to gather data from sources.
Business Requirements	• Data gathering should be a pre–planned process.

Another very crucial use case of the system is to gather the data that will be used in compiling the graphs. The system uses API to request data from the sources, which in case of positive response send the data towards the system, where the data is being compared with the one in the database. Finally, data is saved.

5.2 Non–functional requirements

In the process of the interviews, the Author has collected business requirements, which acted as a basis for non–functional requirements. In the contents of Table 16, a description of non–functional requirements is performed.

Table 7. Non–functional Requirement Mapping. Source: composed by the Author.

ID	Description	Distribution
U1	System notifications should be understandable for users, including exceptions.	Usability
U2	System design should use unified template.	
U3	System theme should be configurable.	
U4	System should display name of the logged user.	
U5	System should have log subsystem.	
U6	System should have admin–panel for easier user and permission handling on system administrator side.	
U7	System should allow for the user to logout.	
U8	On certain events, system should ask for confirmation.	
U8	System should allow user to log in using username and password and log out.	
U9	User session must be ended after 10 minutes without activity.	
U10	System load should be possible to be monitored through admin–panel.	
R1	System should have connectivity with database and get its data only from this data source.	Reliability
R2	System should have its own backup subsystem.	

R3	All data should be held in encrypted source.	
R4	Access to the system should be protected with SSL Certificate.	
P1	System reaction time should be below 1 second.	Performance
P2	System should handle up to 15 sessions without loss in performance.	
P3	System should be available 90.00 percent of the time of every month.	
S1	System should have ticket subsystem for user feedback.	Supportability
S2	System is scalable for further implementations.	
S3	System should have proper documentation.	
S4	System must be compatible with different browsers.	
S5	System should be accessible from both desktop and portable devices.	

The requirements are initial, which means that they are a subject to change and to be improved during system development and realization.

6 IT Architecture Vision

In following chapter of the master's thesis, the Author describes IT architecture vision on the solution that is being designed. Chapter consists of a set of diagrams and models that assist in gaining understanding of the solution from architectural point of view.

6.1 UML Detail Component Diagram

In Figure 19, a UML Detail Component Diagram is displayed.

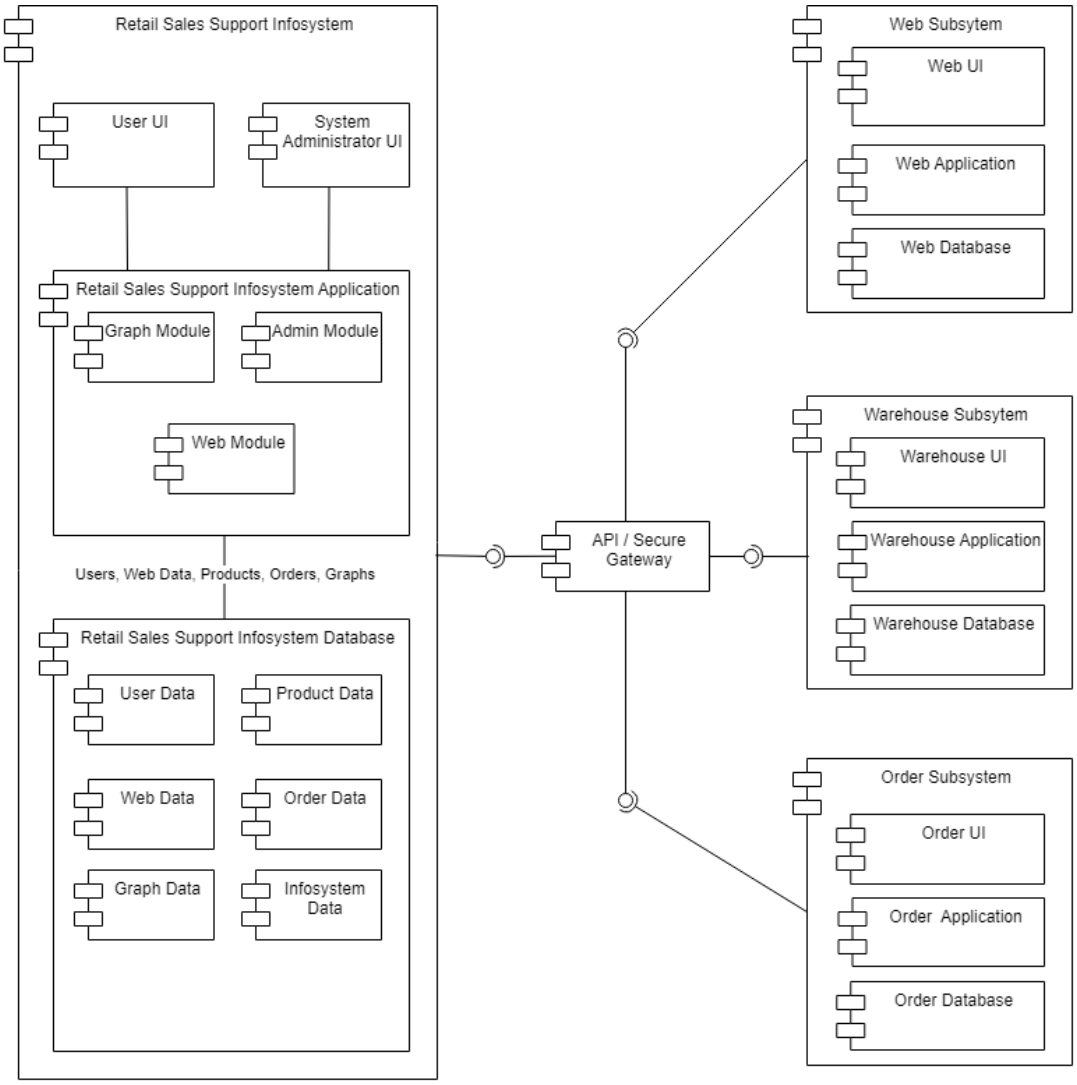

Figure 19. UML Detail Component Diagram. Source: composed by the Author.

The Retail Sales Support Infosystem UI consists of User and System Administrator UI's. As System Administrator has a wider access through Admin–Panel, information about Users is brought to the UI for chat and ticket handling. The application contains graph, admin and user modules. The infosystem gathers, compares and saves/updates its data from product, order and web subsystems via API / Secure Gateway to compile it into statistics later in form of graphs. Gathered data is also compared to current state of the data in the database, therefore, for example, if a product gets unlisted from the website, the database updates the product active status. This approach is also used for orders, which have a feature to be either deleted or updated to be dismissed.

6.2 UML Sequence Diagram

The UML Sequence Diagram is displayed in Figure 20. This diagram is created based on use case number 11: „Gathering Data", which is one of most important use cases in the infosystem for successful graph creation.

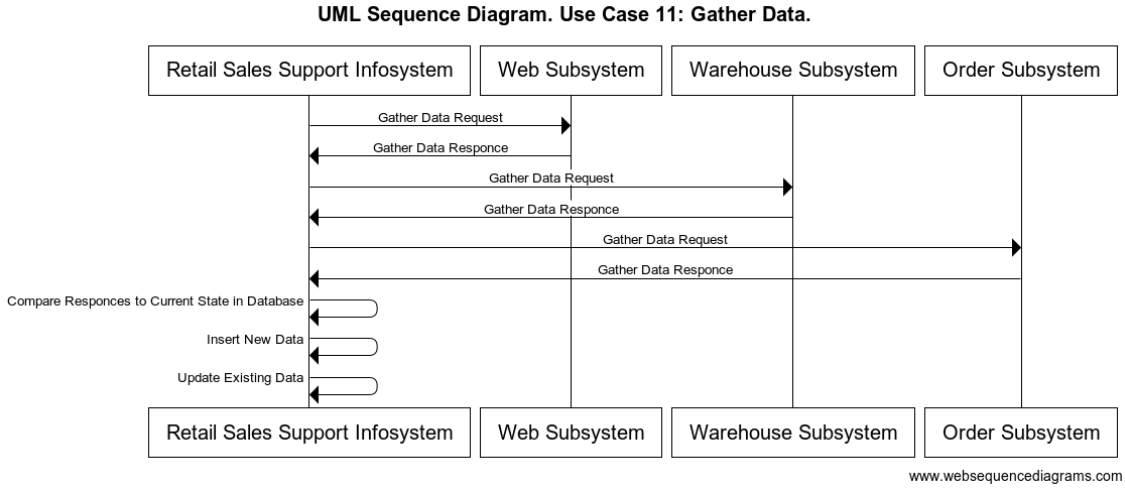

Figure 20. UML Sequence Diagram. Use Case 11: Gather Data. Source: composed by the Author.

On the UML Sequence Diagram, a successful data gathering sequence is displayed, on basis of which the data for graph creation is sourced. The Retail Sales Support Infosystem sends requests and gathers data responses of each source and consequently compares the responses to the current state in the database, as well as inserts new data and updates existing data.

6.3 Entity Relationship Diagram

The Entity Relationship Diagram is displayed in Figure 21, which represents the main schema of the solution that is being designed.

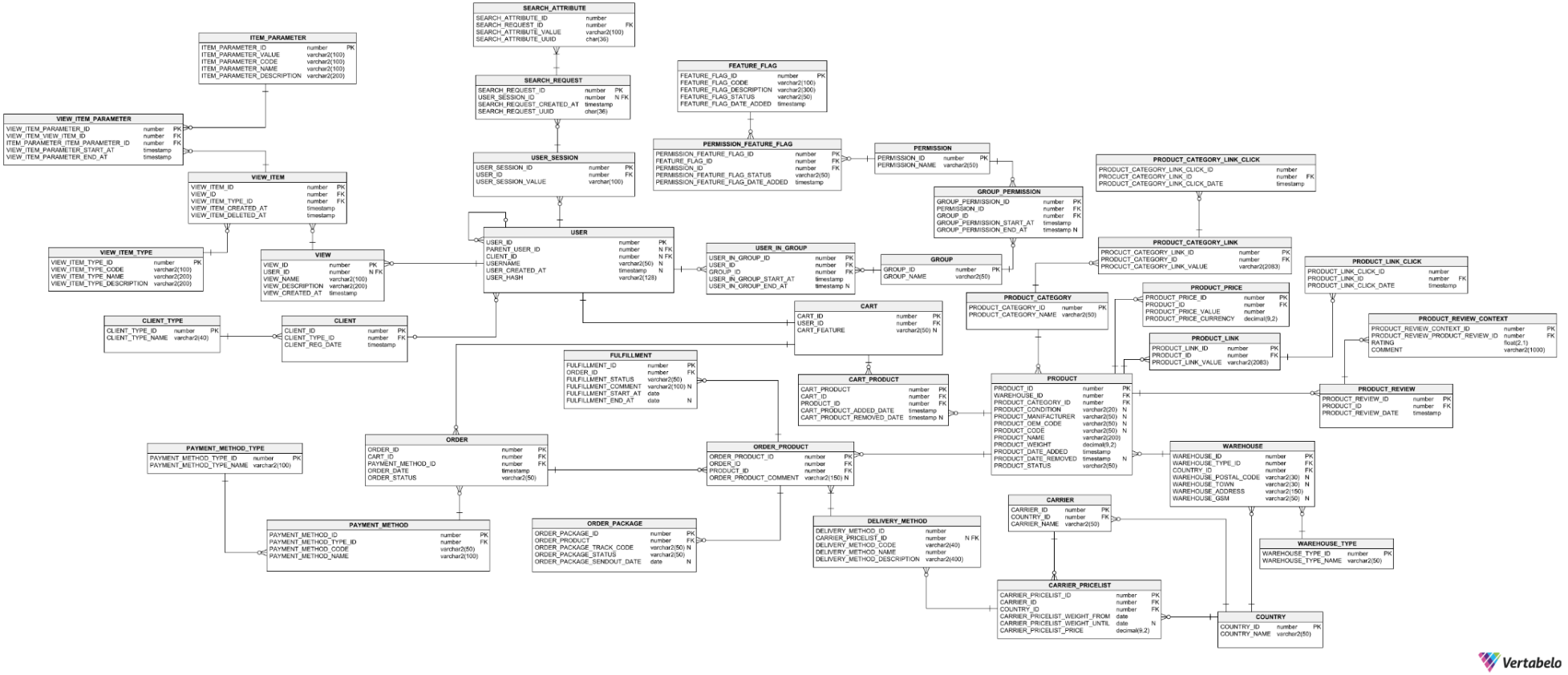

Figure 21. Entity Relationship Diagram. Source: composed by the Author.

The Entity Relationship Diagram represents data model of the infosystem. The database is used to store the data gathered from the sources to be used for displaying the statistics filtered by the user set parameters. As the infosystem will gain additional data sources, it is possible to connect additional tables for storing needed data.

Semantics for the ERD are described in Appendix 3.

6.4 Prototypes

In following chapter, the Author provides prototypes for the system that is being created in form of wireframes. The aim that Author strives for is to provide initial view and an idea of how the system itself and what results of its data compilation might look like on the first versions of developed product. On the upcoming figures, Author displays prototypes of initial vision of the views that were discussed with stakeholders during interview process.

On the Figure 22, an Admin–Panel Prototype is pictured.

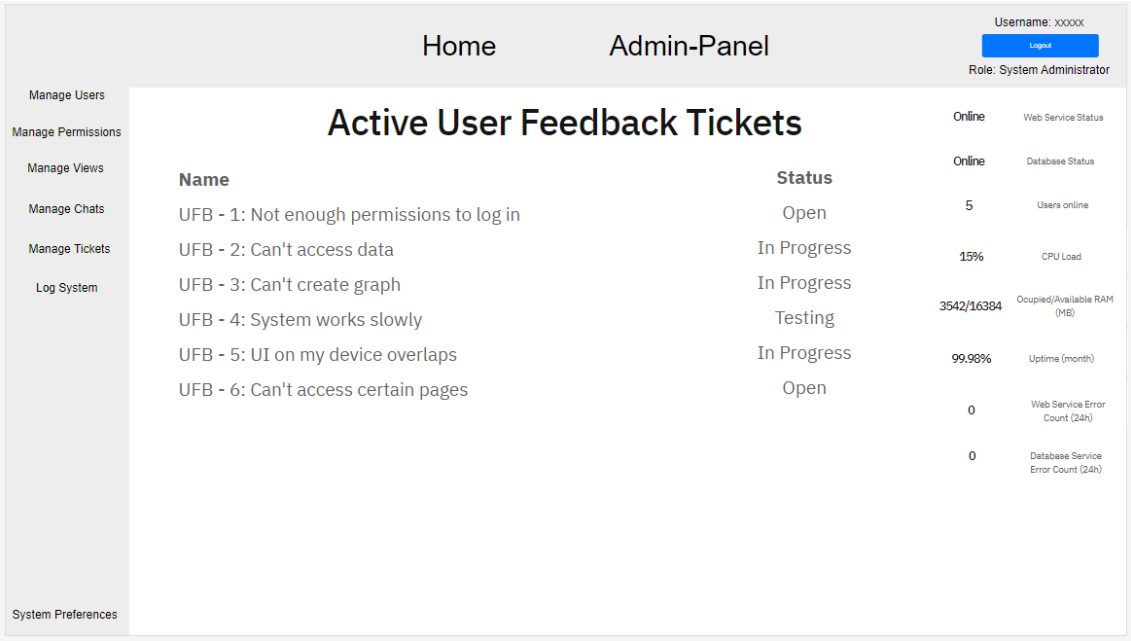

Figure 22. Admin–Panel Prototype and View from System Administrator perspective. Source: composed by the Author.

The admin–panel is accessible only to System Administrator, who is the main responsible person for operating the activity of the system. The main system monitoring parameters are displayed on the right side in a simple monitoring section. The main idea behind these

parameters is to acquire a view of crucial parameters of the system and get instant glance if something is wrong.

The right–side panel displays the following:

- Web Service Connectivity Status
- Database Connectivity Status
- Users Online
- CPU Load percentage
- Uptime percentage during the month
- Web Service Error Count
- Database Service Error Count

In the further development cycle, most of the monitoring values can be accessed and viewed in bigger picture as standalone web pages.

On the main section of admin–panel active user feedback tickets are displayed. System Administrator should handle the tickets in priority to provide immediate response with a solution and maintain positive user experience.

On the left side of the admin–panel, the System Administrator may do the following:

- Manage Users
- Manage Permissions
- Manage Views
- Manage Chats (Support chats)
- Manage User Feedback Tickets
- Access Log subsystem

This main functionality will assure that the system can be properly administrated on the MVP level of software development. Of course, further on, the functionality will be extended during further discussions and business requirement changes.

On the Figure 23, a prototype of Home Page for standard user is displayed.

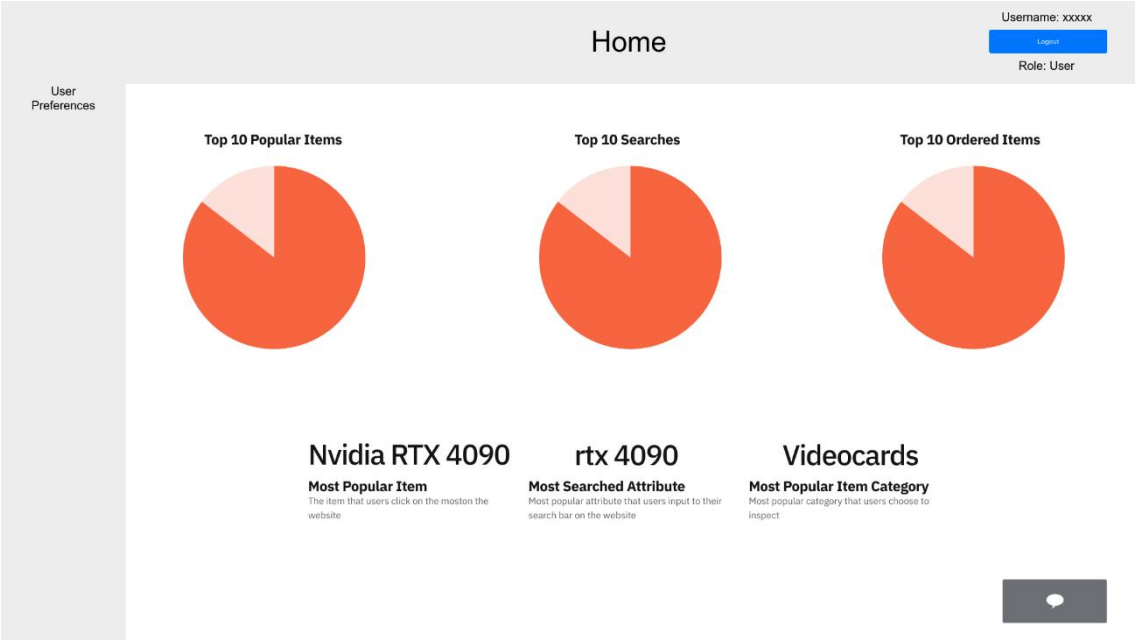

Figure 23. Prototype of Home Page for Standard User. Source: composed by the Author.

The initial prototype of the Home Page displays three circular graphs of top 10 popular products, searches and ordered products, as well as in a simple conclusive form the most popular product, most searched attribute and most popular product category are being displayed. This view will be totally configurable, so the layout, size and positioning of the graphs can be changed, as well as the shown graphs will have a dependency on user permissions, providing additional security to the application. Initial idea is to have a single–page view with initial graphs, but it might be possible that there will be different views (CEO view, employee view (divided by specialists) – this will be decided in further prototyping during product development cycle.

In Figure 24, a Trusted User view is displayed.

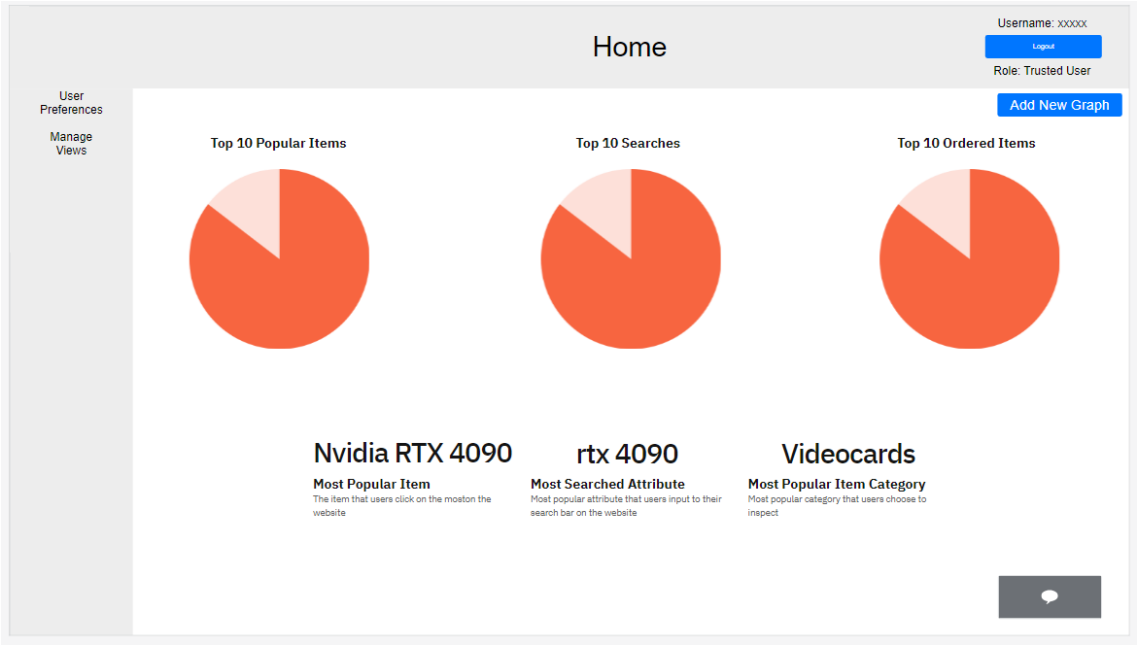

Figure 24. Prototype of Home Page View of Trusted User. Source: composed by the Author.

Trusted user has an ability to add new graphs and manage views, which are being divided by user permissions. It was discussed that there will be a specialist, who will be managing the graphs according to requirements from business and director board. Further on, the graphs will be displayed on the page according to the user permissions.

In Figure 25, a prototype of „Manage Permissions“ view is displayed.

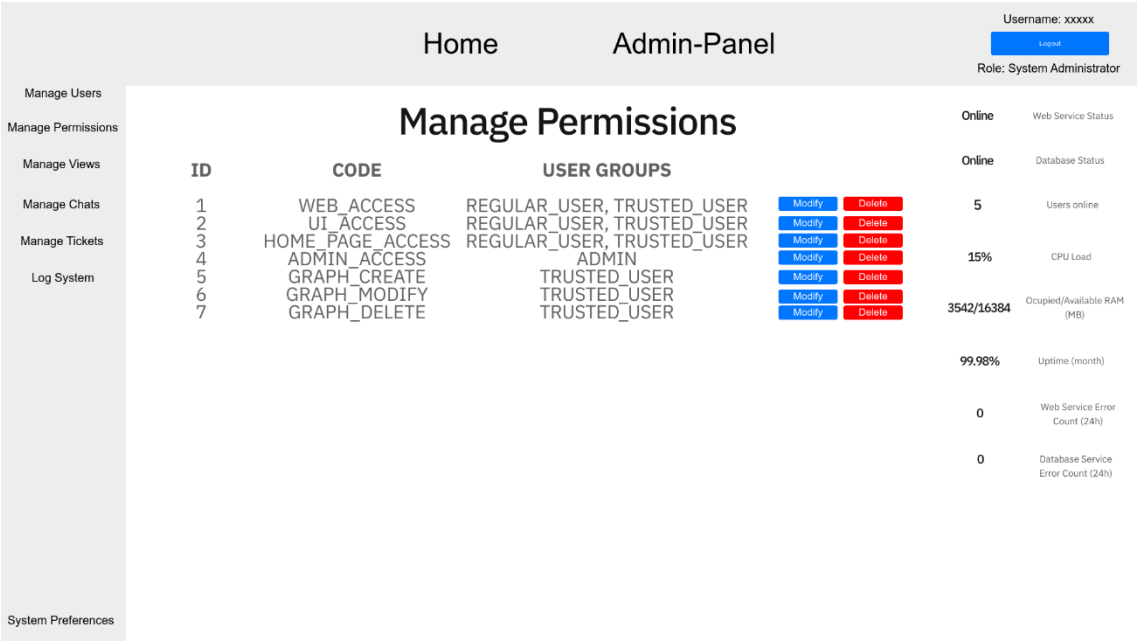

Figure 25. Prototype of "Manage Permissions" View of System Administrator. Source: composed by the Author.

On the prototype of “Manage Permissions” view, a list of initial permissions is displayed and how it would look for the System Administrator. The permissions themselves will be dictated by the database and in case of adding new permissions to the system, it will be possible to set the functionality permission allows and with which feature flags the permissions are related. As of current prototype, only a view of designed permissions during initial analysis and design of the infosystem is shown. The permissions and their adding features inside UI will be developed further on.

6.4.1 Feedback From Stakeholders

The prototypes were presented to the main stakeholders of the idea: CEO and Director Board, as well as Datagate OÜ employees. In total, there were 17 participants in the feedback collection process. The results of the feedback are displayed in form of pie–charts and the numbers on the charts mean the quantity of participants voted for exact option.

Admin–Panel Prototype

The admin–panel prototype feedback results are presented in Figure 26.

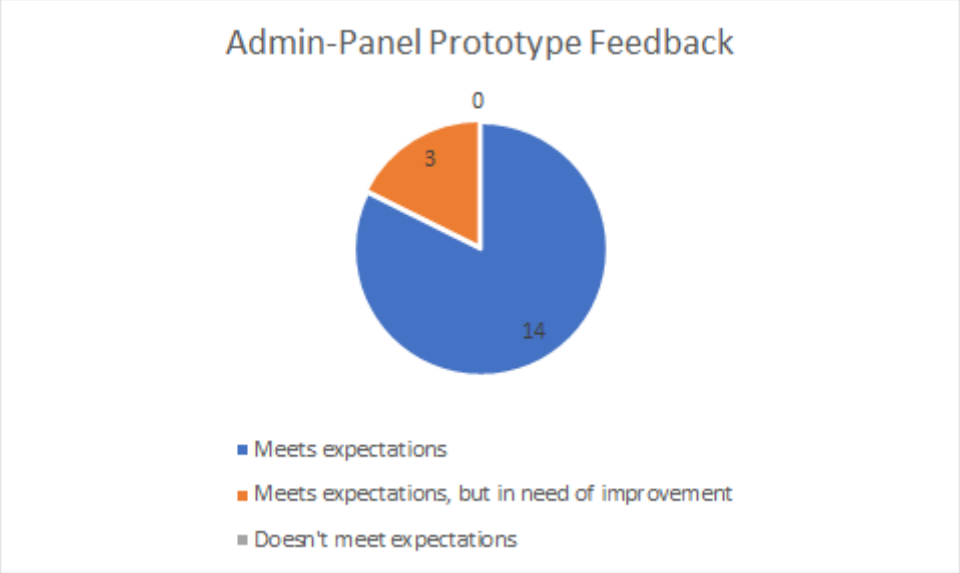

Figure 26. Admin–Panel Prototype Feedback. Source: composed by the Author.

The admin–panel prototype received quite positive feedback from most of the stakeholders, though needs of improvement were also found. The improvements that were suggested were: improvements in UI design, more functionality in the future. In scope of

MVP solution, it was agreed that these improvements can be developed further on and currently the prototype meets expectations of stakeholders.

Home Page and Trusted User View Prototypes

The home page and trusted user view prototype feedback results are presented in Figure 27.

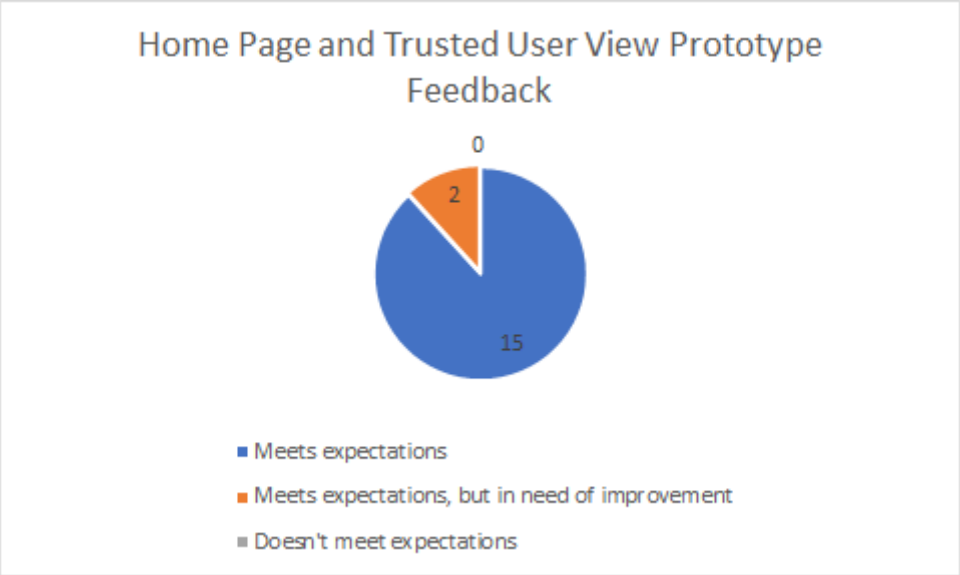

Figure 27. Home Page and Trusted User View Prototype Feedback Results.
Source: composed by the Author.

The feedback results regarding the home page and trusted user view prototypes turned out to be positive as well. The improvement suggestions contained: additional functionality for different types of charts, improved UI. Same as with admin–panel prototype feedback, it was decided that the current prototype for MVP solution meets the expectations of stakeholders.

“Manage Permissions” View Prototype

The “Manage Permissions” view prototype feedback results are presented in Figure 28.

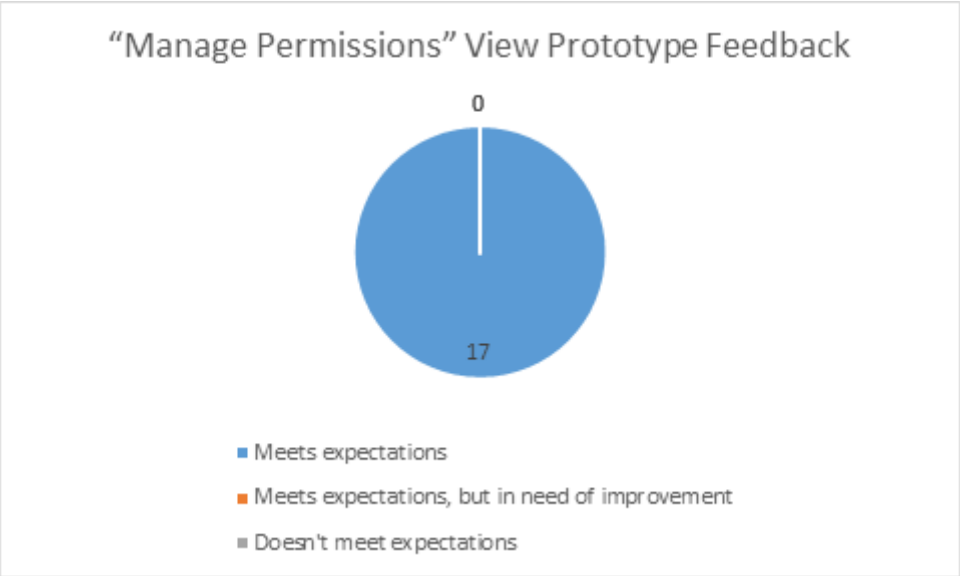

Figure 28. “Manage Permissions” View Prototype Feedback Results. Source: composed by the Author.

The “Manage Permissions” view prototype passed the feedback assessment with flying colors, meeting expectations of all participants. During the discussion it was agreed that for the MVP solution, the permissions can be added from the server side of the infosystem, but further on to the development of the system, it might be possible to create permission groups by the System Administrator as well.

7 Summary & Conclusion

The objective of the thesis was to analyze and design a structured and scalable infosystem as a tool, which will assist to solve the problem of declining website retail sales and will enable the company to gain knowledge of the client behavior in periods of time along with more detailed sales data statistics.

Following results have been achieved in the master's thesis:

- An analysis and design of retail sales support infosystem for Datagate OÜ company was created. The defined problem was taken as a basis for business analysis, during which the working environment of the company was analyzed along with their competitors to better understand the needs for future infosystem. Along the way, existing solutions on the market were analyzed and compared with the planned infosystem. Finally, the business rules and requirements were mapped, along with system requirements and IT architecture vision. The prototypes received positive feedback from the stakeholders;

- By introducing the system into the workflow processes, the gained information will assist the company to acquire better knowledge of the company's retail sales web platform environment;

- The data output of the proposed infosystem will not only be a basis for more effective business decisions, but will enable to bring more structure to the offered products on the website, as well as assist to provide most relevant offers and advertisements to the market;

- This implementation will not only save the time of the company on planning the sales and advertisements but will also avoid extensive investments in less productive advertisement focus points.

The solution prototype testing received positive feedback from Datagate OÜ representatives and shared motivation to have the solution developed on the basis of composed analysis and design vision. Even though the solution that was developed specifically for Datagate OÜ, it is still possible to have the solution applied to any company that is working with web sales and wishes to get better understanding of the focus points that should be enchanced for most productive sales activity on their web store.

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Appendix 2 – Use Case Descriptions

UC1: User Registration

ID and name	UC1: User Registration
Main actor	System Administrator
Description	System Administrator registers users into the system.
Prerequisite terms	System Administrator has access to the system.
Subsequent terms	User is registered with according to permissions.
Standard pattern	1. System Administrator performs user registration via database, setting username, password and permissions; 2. System Administrator performs testing procedure for user login and checks correct operation of permissions; 3. System Administrator forwards login information to physical user via agreed contact channel.
Exceptional events	**User testing procedure failed, system administrator finds root cause** 1. System Administrator performs user registration via database, setting username, password and permissions; 2. System Administrator performs testing procedure for user login and checks correct operation of permissions; 3. Testing procedure fails;

	4. System Administrator analyses failure root cause; 5. System Administrator find root cause and performs a solution; 6. System Administrator performs testing procedure for user login and checks correct operation of permissions; 7. Test procedure returns successful result; 8. System Administrator forwards login information to physical user via agreed contact channel. **User testing procedure failed, system administrator does not find root cause** 1. System Administrator performs user registration via database, setting username, password and permissions; 2. System Administrator performs testing procedure for user login and checks correct operation of permissions; 3. Testing procedure fails; 4. System Administrator analyses failure root cause; 5. System Administrator does not find root cause; 6. System Administrator submits ticket to maintenance team; 7. After receiving solution from development team, system performs testing procedure once again; 8. Testing procedure returns successful result; 9. System Administrator forwards login information to physical user via agreed contact channel.

Usage Frequency	Every time the user wishes to register.
Business Requirements	• User can be registered only by system administrator; • Usernames are unique; • User credentials are in protected and encrypted form.

UC2: Authorization

ID and name	UC2: Authorization
Main actor	User, System Administrator
Description	User logs into the System using his credentials, same as System Administrator.
Prerequisite terms	User is created and is active in the System.
Subsequent terms	User is logged into the System.
Standard pattern	1. User opens the System application and is being forwarded to authentication view from any endpoint of the system, if user is not logged in; 2. User inputs his credentials; 3. System controls if there is such user in the system; 4. System controls permissions; 5. System starts user session;

	6. System opens last opened endpoint or index page in case permissions for the view are not present.
Exceptional events	**Login is not successful, because there is no such user in the system.** 1. User opens the application and is being forwarded to authentication view from any endpoint of the system, if user is not logged in; 2. User inputs his credentials; 3. System controls if there is such user in the system; 4. System does not find user in the system; 5. System returns credentials error; **Login is not successful, because user does not have appropriate permissions.** 1. User opens the application and is being forwarded to authentication view from any endpoint of the system, if user is not logged in; 2. User inputs his credentials; 3. System controls if there is such user in the system; 4. System checks permissions; 5. System returns permission exception.
Usage Frequency	Every time the User or System Administrator wish to log into the system or login session expires.
Business Requirements	• Exceptions should be in readable and reportable form to system administrator;

	• Exceptions should be logged to log system.

UC3: Accessing System Endpoints (Pages)

ID and name	UC3: Accessing system endpoints (pages)
Main actor	User, System Administrator
Description	When browsing the endpoints of the system, it controls permissions on access request.
Prerequisite terms	User is logged in and has active session.
Subsequent terms	Page is accessed.
Standard pattern	1. User accesses one of system's endpoints; 2. System checks permission availability; 3. Permission check returns successful result; 4. Page and parameters are loaded.
Exceptional events	**User does not have sufficient permissions to view the page.** 1. User opens one of system's endpoints; 2. System checks permission availability; 3. Permission check fails; 4. System returns error and returns the user to initial page.
Usage Frequency	Every time the user accesses system's pages.

Business Requirements	• Permissions should be defined during user registration; • Permissions can be modified for given user.

UC5: Managing Permissions

ID and name	UC5: Managing Permissions
Main actor	System Administrator
Description	Managing permissions allows to limit access to system functionalities for user groups.
Prerequisite terms	System Administrator has accessed Admin–Panel and has active session.
Subsequent terms	Permissions are successfully declared.
Standard pattern	1. System Administrator accesses “Manage Permissions” menu; 2. Permissions are edited for user groups; 3. System gives positive feedback from user edit procedure; 4. Permissions are saved.
Alternative patterns	**System Administrator decides to add a new permission type.** 1. System Administrator accesses “Manage Permissions” menu; 2. “New Permission” menu is accessed; 3. New permission is configured (parameters are declared, feature flags are enabled);

	4. Permission is saved. **System Administrator decides to delete a permission type.** 1. System Administrator accesses “Manage Permissions” menu; 2. Permission for deletion is selected; 3. System notifies System Administrator of which feature flags it contains and which user groups it affects; 4. System Administrator agrees to delete the permission; 5. Permission is deleted from main list; 6. Permission is logged to inactive permission list.
Usage Frequency	Every time System Administrator accesses “Manage Permissions” menu.
Business Requirements	• Permissions should contain agreed feature flags for user groups; • Permissions should be stored in inactive list in case of need to restore.

UC6: Managing Users

ID and name	UC6: Managing Users
Main actor	System Administrator
Description	Managing users allows to edit preferences for selected user or manage its existence in the system.

Prerequisite terms	System Administrator has accessed Admin–Panel and has active session.
Subsequent terms	User preferences are successfully changed or user is deleted.
Standard pattern	1. System Administrator accesses “Manage Users” menu; 2. User preferences are modified; 3. User preferences are saved; 4. System Administrator confirms that user preferences are correctly saved; 5. User List is saved.
Alternative patterns	**System Administrator decides to delete a user** 1. System Administrator accesses “Manage Users” menu; 2. System Administrator accesses “Delete User” context; 3. System Administrator deletes user; 4. System shows positive feedback of user deletion; 5. System Administrator confirms that user is deleted; 6. User List is saved.
Usage Frequency	Every time System Administrator accesses “Manage Users” menu.
Business Requirements	• Permissions should contain agreed feature flags for user groups; • Permissions should be stored in inactive list in case of need to restore.

UC7: Submitting Support Ticket

ID and name	UC7: Submitting Support Ticket
Main actor	User
Description	Support Tickets are meant for issues that users face during the use of the system for the System Administrator to manage.
Prerequisite terms	User is logged into the system and has active session.
Subsequent terms	Support Ticket is submitted.
Standard pattern	1. User accesses “Submit Support Ticket” menu; 2. User fills all required fields; 3. User submits the ticket; 4. System saves the ticket with unique code; 5. System assigns the ticket to System Administrator 6. System sends a notification to the System Administrator about new ticket; 7. System displays successful message to the User.
Exceptional events	**Support Ticket does not submit, returns an error.** 1. User accesses “Submit Support Ticket” menu; 2. User fills all required fields; 3. User submits the ticket; 4. System displays error message and error type;

	5. Error is logged to Log System.
Usage Frequency	Every time User accesses “Submit Support Ticket” menu and submits a ticket.
Business Requirements	• “Submit Support Ticket” menu should contain a guide for correct form of ticket.

UC8: Managing Tickets

ID and name	UC8: Managing Tickets
Main actor	System Administrator
Description	System Administrator manages Support Tickets that come from Users.
Prerequisite terms	System Administrator has accessed Admin–Panel and has active session.
Subsequent terms	Support Ticket is managed.
Standard pattern	1. System Administrator accesses “Manage Tickets” menu; 2. System Administrator chooses a ticket from the list; 3. System Administrator analyses contents of the ticket.
Alternative patterns	**Support Ticket issue is resolved.** 1. System Administrator accesses “Manage Tickets” menu; 2. System Administrator analyses contents of the ticket; 3. System Administrator solves the issue; 4. System Administrator closes the ticket;

	5. Support Ticket is saved to Ticket History. **Support Ticket issue is not resolved but taken into work.** 1. System Administrator accesses “Manage Tickets” menu; 2. System Administrator analyses contents of the ticket; 3. System Administrator sets status to “In Progress”;
Usage Frequency	Every time System Administrator accesses “Manage Tickets” and decides to manage a ticket.
Business Requirements	• “Manage Support Ticket” menu should contain history of tickets; • Tickets should have categorization by issue type and allow the types to have subtypes for proper administration.

UC9: Using Online Chat

ID and name	UC9: Using Online Chat
Main actor	User
Description	User has access to Online Chat system to contact System Administrator in real time. This approach is used for small problems before submitting a Support Ticket.
Prerequisite terms	User is logged on to the system and has active session.
Subsequent terms	Chat session is created and user submitted a message.
Standard pattern	1. User accesses chat menu;

	2. User submits a message; 3. Chat session is created by the System; 4. User message is submitted to the chat session; 5. System sends a notification of submitted message from the User to System Administrator;
Exceptional events	**Online Chat system is not available.** 1. User accesses chat menu; 2. System outputs a message in the chat window that chat is not available; 3. User submits a support ticket.
Usage Frequency	Every time User submits a message through Online Chat system.
Business Requirements	• Online Chat should be accessible from user interface.

UC10: Managing Chats

ID and name	UC10: Managing Chats
Main actor	System Administrator
Description	Chats that are being started by Users are managed by System Administrator.
Prerequisite terms	System Administrator has accessed Admin–Panel and has active session.

Subsequent terms	Chat is managed.
Standard pattern	1. System Administrator accesses “Manage Chats” menu; 2. System Administrator chooses a Chat from the list; 3. System Administrator analyses contents of the chat.
Alternative patterns	**System Administrator decided to end chat session.** 1. System Administrator accesses “Manage Chats” menu; 2. System Administrator chooses a Chat; 3. System Administrator analyses contents of the chat; 4. System Administrator communicates with User; 5. Question gets resolved; 6. System Administrator ends chat session; 7. System sends notification that the chat session is ended to User.
Usage Frequency	Every time User submits a message through Online Chat system.
Business Requirements	• Online Chat should be accessible from user interface.

Appendix 3 – ERD Semantics

Table USER

Column name	Type	Properties
USER_ID	number	PK
PARENT_USER_ID	number	FK
CLIENT_ID	number	FK
USERNAME	varchar2(50)	NOT NULL
USER_CREATED_AT	timestamp	NOT NULL
USER_HASH	varchar2(128)	NOT NULL

Table USER_IN_GROUP

Column name	Type	Properties
USER_IN_GROUP_ID	number	PK
USER_ID	Number	FK
GROUP_ID	number	FK
USER_IN_GROUP_START_AT	timestamp	NOT NULL
USER_IN_GROUP_END_AT	timestamp	

Table GROUP

Column name	Type	Properties
GROUP_ID	number	PK
GROUP_NAME	varchar2(50)	NOT NULL

Table GROUP_PERMISSION

Column name	Type	Properties
GROUP_PERMISSION_ID	number	PK
PERMISSION_ID	number	FK
GROUP_ID	number	FK
GROUP_PERMISSION_START_AT	timestamp	NOT NULL
GROUP_PERMISSION_END_AT	timestamp	

Table PERMISSION

Column name	Type	Properties
PERMISSION_ID	number	PK
PERMISSION_NAME	varchar2(50)	NOT NULL

Table PERMISSION_FEATURE_FLAG

Column name	**Type**	**Properties**
PERMISSION_FEATURE_FLAG_ID	number	PK
FEATURE_FLAG_ID	number	FK
PERMISSION_ID	number	FK
PERMISSION_FEATURE_FLAG_STATUS	varchar2(50)	NOT NULL
PERMISSION_FEATURE_FLAG_DATE_ADDED	timestamp	NOT NULL

Table ORDER

Column name	**Type**	**Properties**
ORDER_ID	number	PK
CART_ID	number	FK
PAYMENT_METHOD_ID	number	FK
ORDER_DATE	timestamp	NOT NULL
ORDER_STATUS	varchar2(50)	NOT NULL

Table FULFILLMENT

Column name	Type	Properties
FULFILLMENT_ID	number	PK
ORDER_ID	number	FK
FULFILLMENT_STATUS	varchar2(50)	NOT NULL
FULFILLMENT_COMMENT	varchar2(100)	
FULFILLMENT_START_AT	date	NOT NULL
FULFILLMENT_END_AT	date	

Table WAREHOUSE

Column name	Type	Properties
WAREHOUSE_ID	number	PK
WAREHOUSE_TYPE_ID	number	FK
COUNTRY_ID	number	FK
WAREHOUSE_POSTAL_CODE	varchar2(30)	NOT NULL
WAREHOUSE_TOWN	varchar2(30)	NOT NULL
WAREHOUSE_ADDRESS	varchar2(150)	NOT NULL
WAREHOUSE_GSM	varchar2(50)	NOT NULL

Table CART

Column name	Type	Properties
CART_ID	number	PK
USER_ID	number	FK
CART_FEATURE	varchar2(50)	

Table CLIENT

Column name	Type	Properties
CLIENT_ID	number	PK
CLIENT_TYPE_ID	number	FK
CLIENT_REG_DATE	timestamp	NOT NULL

Table WAREHOUSE_TYPE

Column name	Type	Properties
WAREHOUSE_TYPE_ID	number	PK
WAREHOUSE_TYPE_NAME	varchar2(50)	NOT NULL

Table PRODUCT

Column name	Type	Properties
PRODUCT_ID	number	PK
WAREHOUSE_ID	number	FK

PRODUCT_CATEGORY_ID	number	
PRODUCT_CONDITION	varchar2(20)	
PRODUCT_MANIFACTURER	varchar2(50)	
PRODUCT_OEM_CODE	varchar2(50)	
PRODUCT_CODE	varchar2(50)	NOT NULL
PRODUCT_NAME	varchar2(200)	NOT NULL
PRODUCT_WEIGHT	decimal(9,2)	
PRODUCT_DATE_ADDED	timestamp	NOT NULL
PRODUCT_DATE_REMOVED	timestamp	
PRODUCT_STATUS	varchar2(50)	NOT NULL

Table PRODUCT_CATEGORY

Column name	**Type**	**Properties**
PRODUCT_CATEGORY_ID	number	PK
PRODUCT_CATEGORY_NAME	varchar2(50)	NOT NULL

Table CLIENT_TYPE

Column name	**Type**	**Properties**
CLIENT_TYPE_ID	number	PK
CLIENT_TYPE_NAME	varchar2(40)	NOT NULL

Table CART_PRODUCT

Column name	**Type**	**Properties**
CART_PRODUCT	number	PK
CART_ID	number	FK
PRODUCT_ID	number	FK
CART_PRODUCT_ADDED_DATE	timestamp	NOT NULL
CART_PRODUCT_REMOVED_DATE	timestamp	

Table COUNTRY

Column name	**Type**	**Properties**
COUNTRY_ID	number	PK
COUNTRY_NAME	varchar2(50)	NOT NULL

Table CARRIER_PRICELIST

Column name	**Type**	**Properties**
CARRIER_PRICELIST_ID	number	PK
CARRIER_ID	number	FK
COUNTRY_ID	number	FK
CARRIER_PRICELIST_WEIGHT_FROM	date	NOT NULL
CARRIER_PRICELIST_WEIGHT_UNTIL	date	

CARRIER_PRICELIST_PRICE	decimal(9,2)	NOT NULL

Table CARRIER

Column name	**Type**	**Properties**
CARRIER_ID	number	PK
COUNTRY_ID	number	FK
CARRIER_NAME	varchar2(50)	NOT NULL

Table ORDER_PACKAGE

Column name	**Type**	**Properties**
ORDER_PACKAGE_ID	number	PK
ORDER_PRODUCT	number	FK
ORDER_PACKAGE_TRACK_CODE	varchar2(50)	
ORDER_PACKAGE_STATUS	varchar2(50)	NOT NULL
ORDER_PACKAGE_SENDOUT_DATE	date	

Table ORDER_PRODUCT

Column name	**Type**	**Properties**
ORDER_PRODUCT_ID	number	PK

ORDER_ID	number	FK
PRODUCT_ID	number	FK
ORDER_PRODUCT_COMMENT	varchar2(150)	

Table PRODUCT_LINK

Column name	**Type**	**Properties**
PRODUCT_LINK_ID	number	PK
PRODUCT_ID	number	FK
PRODUCT_LINK_VALUE	varchar2(2083)	

Table DELIVERY_METHOD

Column name	**Type**	**Properties**
DELIVERY_METHOD_ID	number	PK
CARRIER_PRICELIST_ID	number	FK
DELIVERY_METHOD_CODE	varchar2(40)	NOT NULL
DELIVERY_METHOD_NAME	number	NOT NULL
DELIVERY_METHOD_DESCRIPTION	varchar2(400)	NOT NULL

Table SEARCH_REQUEST

Column name	Type	Properties
SEARCH_REQUEST_ID	number	PK
USER_SESSION_ID	number	FK
SEARCH_REQUEST_CREATED_AT	timestamp	NOT NULL
SEARCH_REQUEST_UUID	char(36)	NOT NULL

Table SEARCH_ATTRIBUTE

Column name	Type	Properties
SEARCH_ATTRIBUTE_ID	number	PK
SEARCH_REQUEST_ID	number	FK
SEARCH_ATTRIBUTE_VALUE	varchar2(100)	NOT NULL
SEARCH_ATTRIBUTE_UUID	char(36)	NOT NULL

Table PAYMENT_METHOD

Column name	Type	Properties
PAYMENT_METHOD_ID	number	PK
PAYMENT_METHOD_TYPE_ID	number	FK
PAYMENT_METHOD_CODE	varchar2(50)	NOT NULL
PAYMENT_METHOD_NAME	varchar2(100)	NOT NULL

Table PAYMENT_METHOD_TYPE

Column name	Type	Properties
PAYMENT_METHOD_TYPE_ID	number	PK
PAYMENT_METHOD_TYPE_NAME	varchar2(100)	NOT NULL

Table PRODUCT_CATEGORY_LINK

Column name	Type	Properties
PROCUCT_CATEGORY_LINK_ID	number	PK
PRODUCT_CATEGORY_ID	number	FK
PROCUCT_CATEGORY_LINK_VALUE	varchar2(2083)	NOT NULL

Table VIEW

Column name	Type	Properties
VIEW_ID	number	PK
USER_ID	number	null
VIEW_NAME	varchar2(100)	NOT NULL
VIEW_DESCRIPTION	varchar2(200)	NOT NULL
VIEW_CREATED_AT	timestamp	NOT NULL

Table VIEW_ITEM

Column name	Type	Properties
VIEW_ITEM_ID	number	PK
VIEW_ID	number	FK
VIEW_ITEM_TYPE_ID	number	FK
VIEW_ITEM_CREATED_AT	timestamp	NOT NULL
VIEW_ITEM_DELETED_AT	timestamp	

Table VIEW_ITEM_TYPE

Column name	Type	Properties
VIEW_ITEM_TYPE_ID	number	PK
VIEW_ITEM_TYPE_CODE	varchar2(100)	NOT NULL
VIEW_ITEM_TYPE_NAME	varchar2(200)	NOT NULL
VIEW_ITEM_TYPE_DESCRIPTION	varchar2(200)	NOT NULL

Table VIEW_ITEM_PARAMETER

Column name	Type	Properties
VIEW_ITEM_PARAMETER_ID	number	PK
VIEW_ITEM_ID	number	FK
ITEM_PARAMETER_ ID	number	FK

VIEW_ITEM_PARAMETER_START_AT	timestamp	NOT NULL
VIEW_ITEM_PARAMETER_END_AT	timestamp	

Table ITEM_PARAMETER

Column name	**Type**	**Properties**
ITEM_PARAMETER_ID	number	PK
ITEM_PARAMETER_VALUE	varchar2(100)	NOT NULL
ITEM_PARAMETER_CODE	varchar2(100)	NOT NULL
ITEM_PARAMETER_NAME	varchar2(100)	NOT NULL
ITEM_PARAMETER_DESCRIPTION	varchar2(200)	NOT NULL

Table USER_SESSION

Column name	**Type**	**Properties**
USER_SESSION_ID	number	PK
USER_ID	number	NOT NULL
USER_SESSION_VALUE	varchar(100)	NOT NULL

Table PRODUCT_PRICE

Column name	**Type**	**Properties**
PRODUCT_PRICE_ID	number	PK
PRODUCT_ID	number	FK
PRODUCT_PRICE_VALUE	number	NOT NULL
PRODUCT_PRICE_CURRENCY	decimal(9,2)	NOT NULL

Table PRODUCT_REVIEW

Column name	**Type**	**Properties**
PRODUCT_REVIEW_ID	number	PK
PRODUCT_ID	number	FK
PRODUCT_REVIEW_DATE	timestamp	NOT NULL

Table PRODUCT_REVIEW_CONTEXT

Column name	**Type**	**Properties**
PRODUCT_REVIEW_CONTEXT_ID	number	PK
PRODUCT_REVIEW_ID	number	FK
RATING	float(2,1)	NOT NULL
COMMENT	varchar2(1000)	NOT NULL

Table FEATURE_FLAG

Column name	Type	Properties
FEATURE_FLAG_ID	number	PK
FEATURE_FLAG_CODE	varchar2(100)	NOT NULL
FEATURE_FLAG_DESCRIPTION	varchar2(300)	NOT NULL
FEATURE_FLAG_STATUS	varchar2(50)	NOT NULL
FEATURE_FLAG_DATE_ADDED	timestamp	NOT NULL

Table PRODUCT_LINK_CLICK

Column name	Type	Properties
PRODUCT_LINK_CLICK_ID	number	PK
PRODUCT_LINK_ID	number	FK
PRODUCT_LINK_CLICK_DATE	timestamp	NOT NULL

Table PRODUCT_CATEGORY_LINK_CLICK

Column name	Type	Properties
PRODUCT_CATEGORY_LINK_CLICK_ID	number	PK
PROCUCT_CATEGORY_LINK_ID	number	FK
PRODUCT_CATEGORY_LINK_CLICK_DATE	timestamp	NOT NULL