UNIVERSITY OF LJUBLJANA FACULTY OF ECONOMICS

MASTER'S THESIS

THE IMPACT OF THE NEEDS FOR BUSINESS ANALYTICS ON BUSINESS PROCESSES

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ALEKSANDRA MARTINENKO

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TABLE OF CONTENTS

Ι	NTRO	DUCTION	1					
1	I INFORMATION SYSTEM AND TECHNOLOGY							
	1.1	Technology components – hardware and software	4					
	1.1	.1 Hardware	4					
	1.1	.2 Software	5					
	1.2	Technology components - data and database approach	6					
2	DA	TA MANAGEMENT AND DATA MODELLING	9					
	2.1	Domains10	0					
	2.2	Names	0					
	2.3	Predicates	1					
	2.4	Entities	1					
	2.5	State	1					
	2.6	Sets of Entities 11	2					
	2.0	Attributes	=					
	2.7	Database development	5					
	2.0	Normalization 14	5					
	2.9							
	3 10		-					
•	2.10	Importance of data management and data modelling 1'	7					
3 N	2.10 BU	Importance of data management and data modelling	7 5 8					
3 M	2.10 BU IODE	Importance of data management and data modelling	758					
3 M	2.10 BU 10DE 3.1	Importance of data management and data modelling 17 SINESS PROCESS MANAGEMENT AND BUSINESS PROCESS 18 LLING NOTATION 18 Information processes 27 1 Collecting	7 5 8 2					
3 M	2.10 BU 10DE 3.1 3.1	Importance of data management and data modelling 17 SINESS PROCESS MANAGEMENT AND BUSINESS PROCESS 18 LLING NOTATION 18 Information processes 22 .1 Collecting 2 Organising	7 5 8 2 3 3					
3 N	2.10 BU 10DE 3.1 3.1 3.1 3.1	Importance of data management and data modelling 17 SINESS PROCESS MANAGEMENT AND BUSINESS PROCESS 18 LLING NOTATION 18 Information processes 22 .1 Collecting .2 .2 Organising 22 .3 Analysing 24	7 5 8 2 3 4					
3 N	2.10 BU 10DE 3.1 3.1 3.1 3.1 3.1 3.1	Importance of data management and data modelling 17 SINESS PROCESS MANAGEMENT AND BUSINESS PROCESS 18 LLING NOTATION 18 Information processes 22 .1 Collecting .21 .2 Organising .22 .3 Analysing .24 .4 Storing and retrieving .24	7 5 8 2 3 4 4					
3 N	2.10 BU IODE: 3.1 3.1 3.1 3.1 3.1 3.1 3.1	Importance of data management and data modelling 17 SINESS PROCESS MANAGEMENT AND BUSINESS PROCESS 18 LLING NOTATION 18 Information processes 22 .1 Collecting .2 Organising .3 Analysing .4 Storing and retrieving .5 Processing	7 5 8 2 3 4 4 5					
3 M	2.10 BU IODE: 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1	Importance of data management and data modelling 17 SINESS PROCESS MANAGEMENT AND BUSINESS PROCESS 18 LLING NOTATION 18 Information processes 22 .1 Collecting .2 Organising .3 Analysing .4 Storing and retrieving .5 Processing .6 Transmitting and receiving	7 5 8 2 3 3 4 4 5 5					
3 M	2.10 BU IODE: 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1	Importance of data management and data modelling 17 SINESS PROCESS MANAGEMENT AND BUSINESS PROCESS 18 Information processes 22 .1 Collecting 22 .2 Organising 22 .3 Analysing 22 .4 Storing and retrieving 22 .5 Processing 22 .6 Transmitting and receiving 22 .7 Displaying 22	7 5 8 2 3 3 4 4 5 5 5					
3 N	2.10 BU IODE: 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.2	Importance of data management and data modelling 17 SINESS PROCESS MANAGEMENT AND BUSINESS PROCESS 18 LLING NOTATION 18 Information processes 22 .1 Collecting 22 .2 Organising 22 .3 Analysing 22 .4 Storing and retrieving 24 .5 Processing 22 .6 Transmitting and receiving 23 .7 Displaying 23 Information behaviours and values 24	7 5 8 2 3 3 3 4 4 5 5 5 5					
3 N 4	2.10 BU IODE: 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1	Importance of data management and data modelling 1' SINESS PROCESS MANAGEMENT AND BUSINESS PROCESS 11 LLING NOTATION 12 Information processes 2' .1 Collecting 2' .2 Organising 2' .3 Analysing 2' .4 Storing and retrieving 2' .5 Processing 2' .6 Transmitting and receiving 2' .7 Displaying 2' .7 Displaying 2' .7 Information behaviours and values 2' .7 ERETAIL LOCAL BUSINESS CASE 2'	7 5 8 8 2 3 3 3 4 4 5 5 5 6 6					
3 M	2.10 BU IODE: 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1	Importance of data management and data modelling 1' SINESS PROCESS MANAGEMENT AND BUSINESS PROCESS 11 LLING NOTATION 13 Information processes 2' .1 Collecting .2 Organising .3 Analysing .4 Storing and retrieving .5 Processing .6 Transmitting and receiving .7 Displaying .7 Displaying .7 Displaying .7 Displaying .7 Displaying .7 About VZ Skupina .2 About VZ Skupina	7 5 8 2 3 3 4 4 5 5 5 6 7					
3 N 4	2.10 BU IODE: 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1	Importance of data management and data modelling 1' SINESS PROCESS MANAGEMENT AND BUSINESS PROCESS 11 Information processes 2' .1 Collecting 2' .1 Collecting 2' .2 Organising 2' .3 Analysing 2' .4 Storing and retrieving 2' .5 Processing 2' .6 Transmitting and receiving 2' .7 Displaying 2' Information behaviours and values 2' About VZ Skupina 2' About methodology 2'	7 5 8 2 3 3 4 4 5 5 5 6 7 8					
3 N 4	2.10 BU IODE: 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1	Importance of data management and data modelling 1' SINESS PROCESS MANAGEMENT AND BUSINESS PROCESS 11 Information processes 22 .1 Collecting 22 .1 Collecting 22 .2 Organising 22 .3 Analysing 22 .4 Storing and retrieving 22 .5 Processing 22 .6 Transmitting and receiving 22 .7 Displaying 22 Information behaviours and values 22 About VZ Skupina 24 About methodology 23 Business process model 24	7 5 8 2 3 3 4 4 5 5 5 6 7 8 9					

4	4.5	Ir	nformation processes within the information system	41
	4.5	5.1	Transaction Process System	41
	4.5	5.2	Inventory management	44
	4.5	5.3	CRM and Business Analytics	47
4	4.6	D	ata modelling and data management	49
4	4.7	D	Patabase	51
5	NF	EEL	D FOR DATA MANAGEMENT AND ANALYTICS	53
4	5.1	С 	Current situation of business process correlation with the need for analyt	ics .55
5	5.2 busii	M ness	Iain pitfalls resulting from no correlation between analytical needs as processes	nd 58
4	5.3 corre	O elat	Overview of all future possible improvements in order to impro- tion between the needs for analytics and the business process	ove 60
CC	DNC	LU	SION	66
RE	FEI	REN	NCES LIST	69
AP	PEN	NDI	ICES	73

LIST OF FIGURES

Figure 2: The relationship between data and information.7Figure 3: DIKW model that is used by AGT International to convert raw, unstructureddata into useful information8Figure 4: Defining classes and superclasses within a database13Figure 5: One-to-many relationship between a loan product and a customer14Figure 6: The model of a database system15Figure 7: How we benefit from data modelling18Figure 8: Flow object event of BPMN20Figure 10: Pool and lane in BPMN20Figure 11: Flow of information and goods in the business29Figure 12: As-is business process model of the process of ordering the inventory32Figure 13: Main screen in the InfoPOS application33Figure 14: As-is business process model of the sales process35	Figure 1: Two categories of softwires (software)	5
Figure 3: DIKW model that is used by AGT International to convert raw, unstructureddata into useful information8Figure 4: Defining classes and superclasses within a database13Figure 5: One-to-many relationship between a loan product and a customer14Figure 6: The model of a database system15Figure 7: How we benefit from data modelling18Figure 8: Flow object event of BPMN20Figure 9: Flow object activity of BPMN20Figure 10: Pool and lane in BPMN22Figure 11: Flow of information and goods in the business29Figure 12: As-is business process model of the process of ordering the inventory33Figure 14: As-is business process model of the sales process	Figure 2: The relationship between data and information	7
data into useful information.8Figure 4: Defining classes and superclasses within a database.13Figure 5: One-to-many relationship between a loan product and a customer.14Figure 6: The model of a database system.15Figure 7: How we benefit from data modelling.18Figure 8: Flow object event of BPMN.20Figure 9: Flow object activity of BPMN.20Figure 10: Pool and lane in BPMN.22Figure 11: Flow of information and goods in the business.29Figure 12: As-is business process model of the process of ordering the inventory.32Figure 13: Main screen in the InfoPOS application.33Figure 14: As-is business process model of the sales process.35	Figure 3: DIKW model that is used by AGT International to convert raw, unstructu	red
Figure 4: Defining classes and superclasses within a database13Figure 5: One-to-many relationship between a loan product and a customer14Figure 6: The model of a database system15Figure 7: How we benefit from data modelling18Figure 8: Flow object event of BPMN20Figure 9: Flow object activity of BPMN20Figure 10: Pool and lane in BPMN22Figure 11: Flow of information and goods in the business29Figure 12: As-is business process model of the process of ordering the inventory32Figure 13: Main screen in the InfoPOS application33Figure 14: As-is business process model of the sales process35	data into useful information	8
Figure 5: One-to-many relationship between a loan product and a customer	Figure 4: Defining classes and superclasses within a database	13
Figure 6: The model of a database system15Figure 7: How we benefit from data modelling18Figure 8: Flow object event of BPMN20Figure 9: Flow object activity of BPMN20Figure 10: Pool and lane in BPMN22Figure 11: Flow of information and goods in the business29Figure 12: As-is business process model of the process of ordering the inventory32Figure 13: Main screen in the InfoPOS application33Figure 14: As-is business process model of the sales process35	Figure 5: One-to-many relationship between a loan product and a customer	14
Figure 7: How we benefit from data modelling18Figure 8: Flow object event of BPMN20Figure 9: Flow object activity of BPMN20Figure 10: Pool and lane in BPMN22Figure 11: Flow of information and goods in the business29Figure 12: As-is business process model of the process of ordering the inventory32Figure 13: Main screen in the InfoPOS application33Figure 14: As-is business process model of the sales process35	Figure 6: The model of a database system	15
Figure 8: Flow object event of BPMN20Figure 9: Flow object activity of BPMN20Figure 10: Pool and lane in BPMN22Figure 11: Flow of information and goods in the business29Figure 12: As-is business process model of the process of ordering the inventory32Figure 13: Main screen in the InfoPOS application33Figure 14: As-is business process model of the sales process35	Figure 7: How we benefit from data modelling	18
Figure 9: Flow object activity of BPMN20Figure 10: Pool and lane in BPMN22Figure 11: Flow of information and goods in the business29Figure 12: As-is business process model of the process of ordering the inventory32Figure 13: Main screen in the InfoPOS application33Figure 14: As-is business process model of the sales process35	Figure 8: Flow object event of BPMN	20
Figure 10: Pool and lane in BPMN22Figure 11: Flow of information and goods in the business29Figure 12: As-is business process model of the process of ordering the inventory32Figure 13: Main screen in the InfoPOS application33Figure 14: As-is business process model of the sales process35	Figure 9: Flow object activity of BPMN	20
Figure 11: Flow of information and goods in the business	Figure 10: Pool and lane in BPMN	22
Figure 12: As-is business process model of the process of ordering the inventory32 Figure 13: Main screen in the InfoPOS application	Figure 11: Flow of information and goods in the business	29
Figure 13: Main screen in the InfoPOS application33Figure 14: As-is business process model of the sales process35	Figure 12: As-is business process model of the process of ordering the inventory	32
Figure 14: As-is business process model of the sales process	Figure 13: Main screen in the InfoPOS application	33
	Figure 14: As-is business process model of the sales process	35

Figure 15: Standard components for point-of-sale	36
Figure 16: Diagram of application solutions	38
Figure 17: As-is business process model of entering items into the inventory system	40
Figure 18: The main window in the POS application used in the sales process	42
Figure 19: Choice of the method of payment	42
Figure 20: Archive of transactions	43
Figure 21: A bill issued by a salesperson	44
Figure 22: The main window in the POS application used in inventory management	45
Figure 23: The window 'Materials/items' in the POS application used to access and	
create items	46
Figure 24: The window for creating the entity	46
Figure 25: Part of the sales business process model where the customer is defined	47
Figure 26: The window for subscribing a customer to Ascara newsletters	48
Figure 27: Subscribing to Ascara newsletters via website	48
Figure 28: Summary report on a campaign in MailChimp	49
Figure 29: The flow of data and information	52
Figure 30: Flow of data between hardware, software and server	53
Figure 31: Correlation between the information system and the technology with the	
information process and the needs for analytics	55
Figure 32: Possibilities for displaying information of point of sale; by store	56
Figure 33: Possibilities for displaying information of point of sale; by article	57
Figure 34: Possibilities for displaying information of point of sale; by customer	57
Figure 35: Report on the campaign on MailChimp	58
Figure 36: Two labels of two different articles from two different trademarks	51
Figure 37: To-be business process model of entering items into the inventory system.	53

LIST OF TABLES

Table 1: The summary of the concepts of entity, state, class, super	rclass and selection. 14
Table 2: Table of customers and products	
Table 3: List of types of items by gender	

Table 4: List of codes from labels of items in stock by barcode	62
Table 5: Overview table of needs, propositions, benefits and pitfalls	65

LIST OF APPENDICES

Appendix 1: Povzetek (Summary in the Slovene language)1	L
Appendix 2: Interview questionnaire	7

LIST OF ABBREVIATIONS

- BI Business Intelligence
- **BPD** Business Process Diagram
- **BPM -** Business Process Modelling
- **BPMI** Business Process Management Initiative
- **BPMN** Business Process Modelling Notation
- **CPU -** Central Processing Unit
- **CRM** Customer Relationship Management
- **DBMS** Database Management System
- DIKW Data, Information, Knowledge and Wisdom
- GIGO Garbage In, Garbage Out
- IBM International Business Machines Corporation
- **IBV** Information Behaviours and Values
- \mathbf{ID} Identification
- IMP Information Management Practices
- **IS** Information System
- IT Information Technology
- **ITP** Information Technology Practices

- KPI's Key Performance Indicators
- POS Point of Sale
- **QR-CODE -** Quick Response Code
- $\ensuremath{\textbf{SME}}$ Small and Medium-sized Enterprises
- **TPS** Transaction Processing Systems

INTRODUCTION

Business analytics is not at all a new concept. New technologies and capabilities that have emerged rapidly and at a high level are tightly related to business analytics. This trend makes it possible even for an average business person with an average knowledge of technology, from finance to marketing to merchandising and beyond, to analyse and understand data. Nowadays, it is known as self-service analytics, which is an approach to advance analytics that enables business users to manipulate data, with no need to have knowledge in high statistics or information technology (hereinafter IT) (Rouse, 2014). Every kind of business is craving to harness the power of information to create a demanddriven merchandising and supply chain, in which way it will also reduce costs and drive operational excellence to new heights to deliver a shopping experience that outdoes its competitors. To put it simply, in such a way the business gains a competitive advantage and with business analytics that is possible. However, everything comes at a cost of something else. An explosion of customers' awareness and business information, in a variety of forms, is creating countless challenges, especially in the retail segment. The new technology makes consumers more connected, more empowered, and more demanding, and they can choose where, how, and when they want to shop. It is truly a buyer's market (LeClaire, Dahlstorm & Braun, 2014, p. 5).

Nowadays, it is quite common to ask yourself who your customers are. Do you know how likely it is that people will buy your product? Customers leave footprints almost everywhere. They do not even need to buy something from you, and you are still able to collect data on them. These footprints can be collected from simple browsing on your website, some mobile searches, answering the surveys, from your staff, contacting your call centre, and, of course, from a purchase. They leave clues about who your customers are, who influences them, what they are buying, how often and where they shop, and much more (LeClaire, Dahlstorm & Braun, 2014).

Business analytics includes the technologies and applications in such a way that it enables organisations to mine data to the most detailed insights that can improve their decisionmaking. With a clear picture of who your customers are, you can develop and deliver a complete offer or a special customer experience desired by your customers. Today, online product reviews and recommendations are the new "word of mouth". What is more, this has a bigger impact on others' opinion as well as a greater reach. Also, new purchasing channels continue to emerge. Mobile phones have become the primary type of device to keep a customer constantly up to date, interactive and connected. The result of all that is the increase in complexity for any segment in the industry to accurately understand customer behaviour and purchase patterns, to protect their margins and position on the market. Crucial and the most basic things have become complex and more expensive, beginning from customer attainment, retention, and growth. Taking into account the today's customers' habits and behaviour, the Institute business analytics contribution to retailers can be summed up in these six ways (LeClaire et al., 2014, p. 7):

- 1. Analysing customer behaviour, buying patterns and sentiment which connects us with the customer.
- 2. Delivering personalised promotions for the right products at the right time and in the customers' preferred method to motivate purchases.
- 3. Accurately predicting demand to optimise assortment, protect margins, and drive profitability.
- 4. Understanding top customers, how to retain and grow them and how to ensure additional customers.
- 5. Creating a brand experience to build customer loyalty, considering the omni-channel approach of many customers who want to leverage all channels on their shopper journeys.
- 6. Gathering information about as well as analysing influencers of your customers and understanding how they impact your customers' purchasing decisions.

However, the business analytics is useless or even harmful for the business if the data is not modelled and managed well. There is a good saying or a concept in computer science – GIGO which stands for "garbage in, garbage out", and it is meant to explain that if you have "bad" input, you will receive "bad" output (Computer Hope, 2017).

To prevent this from happening, having insights into data modelling is the best start to structure and format data because it is valid, reliable and useful, and our analysis brings about "good", reliable, results. The aim of data management is to improve the quality of the data and increase the correlation with business processes in a way that they are supporting each other. Data modelling, as a discipline of data management, emphasizes on that correlation and also importance of business processes being supported by information system (hereinafter IS) and information processes. The biggest factor for achieving it, through data modelling, is a good defined blueprint and documenting to achieve high data quality and the correlation between the business process and information. By means of a blueprint and by documenting we also prolong the life of our systems since it is easier to maintain them. An important concept of data modelling is data structure, which is considered as the fundament and the most important thing given that we are overwhelmed with data each day, making our data useful and our systems productive, and finally increasing the quality and importance of analytics (Schmidt, 1998). A useful improvisation of the importance of data modelling is the case taken from the book "Data Modelling for Information Professionals" written by Bob Schmidt and edited by David Warren, PhD. The author compares a tourist map and a regular map of a city. If you provide a tourist with a regular map, with all the details of a city, they will miss the most important things and might even get lost. In other words, the map offers too much data. However, if the tourist is given a tourist map of a city, there is a higher possibility they will visit all its important places and monuments.

The purpose of my master's thesis is to examine the importance of the correlation between analytics and business, as well as correlation between business processes and information processes, coordinated by data modelling and data management principles ensuring that the correlation is even possible. This correlation and system help in making the analytics correct, valid, relevant and timely, and ensure proper decision-making.

The goal of my master's thesis is to explain and analyse based on real-life examples what elements of an information system and technology need to be established within the company for achieving the optimal results from analytics in order to satisfy business needs. The research question is how to archive that synergy or what the usual mistakes that need to be avoided in the process of archiving are. Thus, after the establishments made in the first part and stating the research question, the second part will provide the theoretical background and will develop the hypotheses on how the data should be structured, the business process management and modelling, as well as modelling and managing data to achieve positive effects on the correlation between analytics and information processes. The next two parts will focus more on the methodology used in the research, theory implementation and analysis of the empirical study, a real-life case, local small and medium-sized enterprises (hereinafter SME) and the retail company VZ Skupina d.o.o. Finally, part four discusses the findings, provides solutions and concludes the research.

1 INFORMATION SYSTEM AND TECHNOLOGY

The integration of any kind of processes and the data often present one of the most difficult barriers (Becker, Uhr & Vering, 2015). However, first we need to define the information system and its purpose. "The system utilises computer hardware and software; manual procedures; models for analysis, planning, control and decision making; and a database. The emphasis is on information technology (IT) embedded in organizations" (Symons, 1991, p. 181). This is a specific definition, explaining the clear purpose of the information system and technology. However, I agree more with the definitions provided below, due to the fact that they are more general, applicable and I found them easier to understand.

Other definitions are as follows:

- "Information systems are combinations of hardware, software, and telecommunications networks that people build and use to collect, create, and distribute useful data, typically in organizational settings" (Valacich & Schneider, 2009). "Information systems are interrelated components working together to collect, process, store, and disseminate information to support decision making, coordination, control, analysis, and visualization in an organization" (Laudon & Laudon, 1999).

One can conclude that there are parts or components that work together and make up an information system. It is an important aim, a picture, a conclusion or a guide one has while building an information system that will work and be useful. What is more, these components also have a purpose in an organisation. One of the most important purposes is to add value to the business (Bourgeois, 2014).

In his book, David T. Bourgeois used a simplified way to describe what an information system is. He states that the "information system for businesses and beyond" is made up of five components: hardware, software, data, people, and process. The first three belong to the category of technology. However, the last two, people and process, are really what separates the technological part of the information system from the non-technological part (Bourgeois, 2014).

In the text below I will explain in more detail all five previously defined components of the information system and while doing so, I will also take a look at some example cases to find out how and which information systems are used. The most important question, however, is what information systems are used in real-life cases. The answers may differ from case to case, especially depending on the type of business, since not all types of business require the same information system. Taking this into account, I will focus more on the information system used in retail business, due to the business case in the empirical part.

1.1 Technology components – hardware and software

The hardware, software, and database are the technology components of the information system that is also known as information technology (IT). The information technology is nowadays integrated in the operations and management of an organisation.

1.1.1 Hardware

Hardware is a physical component of a computer, technology or, in our case, an information system. It is everything that can be touched by our own hands. It consists of computers and all the parts that make up a computer. These components include the mouse, keyboard, processor, monitor, printer and disk drives. Nowadays, with all the technology going forward, they also include sensors, cameras, iPads, mobile phones, touchscreens etc.

If we take a look at the case of Amazon Go, a convenient store that actually does not have a traditional point-of-sale or a transactional processing system, we will be surprised at how much the standards in retail stores have been changed. There is no checkout required, due to the store's so-called "just walk out technology", which is based on an Amazon Go app; one enters a store, takes a product and pays after receiving the whole list of things one has picked up during shopping. Hardware here includes customer phones, the register where you scan your app identification (hereinafter ID) number and cameras, along with sensors in the shelves and heavy computing technology that allows Amazon's "just walk out technology" to track what items a shopper has taken (Weise, 2018). In other words, no cashier or cashier self-scanner, just sensors and cameras that track you.

1.1.2 Software

Software determines the work to be performed and controls the operation of the system. Software is intangible, which is opposite to hardware. The benefits of this component are that there are no natural limits to its possibilities to controle and manipulate other components.



Figure 1: Two categories of softwires (software)

Source: Shrestha (2017)

However, because of the lack of physical constraints, software systems can quickly become extremely complex, difficult to understand and expensive to change (Sommerville, 2011). Software is a general term for the various kinds of programmes that are used on a daily basis to operate computers and related devices.

There are several categories of software, but it can be summarized into two main categories, as shown in

Figure 1 Two categories of softwires (software) (Sommerville, 2011):

- Operating system software makes the hardware usable. Examples of operating systems include Microsoft Windows on a personal computer and Google's Android on a mobile phone. It is a critical part of any computer or any other device.
- Application software usually helps people to complete different tasks. One can say
 that application software does something useful. It is more user-oriented and not

preinstalled. It is not a crucial part of a computer or any device until it is required by the user to be installed. Some examples of application software are Microsoft Excel, Firefox, Chrome and Angry Birds.

I have excluded data from this part on purpose, even though it is a technical component. Considering it as the crucial element in ensuring the correlation between business needs and business processes, I have dedicated to cover it under the separate chapter. Data have to be defined or predefined regardless of a stage in implematation or improvement process of the information system. This needs to be done in order to analyse the data that is of good quality or as unbiased as possible.

Similarly, the data analysis will ensure valuable information to contribute to decisionmaking.

1.2 Technology components - data and database approach

Looking at it separately, a piece of data is not really useful. Data represents the raw bits and pieces of information with no context or any kind of meaning. But if it is aggregated, structured, modelled and organised together properly into a database, data can become a powerful tool for any kind and size of business. Organisations do their best to collect all kinds of data and then use it to make decisions. The aftermaths of these decisions can then be analysed based on key performance indexes, such as effectiveness, and based on these results the businesses can be improved.

It is important to distinguish between two types of data. Data can be quantitative or qualitative. Quantitative data is numerical data that can together with its results be measured and used for any kind of mathematical calculations. Qualitative data is descriptive. In some cases, a number can be qualitative, too. Let us consider the situation when you are asked to say what your favourite number is. If you say that your favourite number is 7, this is qualitative data because it is descriptive, since it is not the result of a measurement or a mathematical calculation (Davoren, 2018).

If you are in a big shop and you ask a cashier how much a particular item is, they will not be able to tell you that without some additional information regarding the product. They need to know the brand, its weight, colour, type or, with today's technology, they only need to know the barcode or any kind of code the item is tagged with. For them, as well as for you, the barcode gives less information than what we mentioned before, i.e. type, weight, brand, etc. The barcode comprises useful data in a system, since it is a key to all the information we need about the item - price, weight, year, supplier, etc. The barcode can be of great help, but without the system it is useless, it is yet another piece of data. Only when we type a barcode into the system (which can be a simple type of software) does it provide us with information. When data has meaning attributed to it, it becomes information, see Figure 2 (Gordon, 2007).

Information also exists outside the information system. This information is collected from the outside world based on our knowledge. However, this information needs to be processed into data, making it possible to store and process it further in our system. When one needs this information again, in the near or far future, one is able to access and process it in such a way that the data gains meaning and becomes information.



Figure 2: The relationship between data and information

Source: Adopted from Gordon (2007)

To better understand and have a clear picture about the differences between various types of data, information and knowledge, I find the data, information, knowledge and wisdom (hereinafter DIKW) model used by AGT International helpful.

Figure 3 below represents a modified DIKW model used by AGT International that provides advanced IoT solutions enhanced with AI technology to customers in different industries all over the world (AGT International, 2018).

This modified DIKW model is used to convert raw, unstructured data into useful information that the clients further use in the process of decision-making (Mannion, Optimal Analysis Algorithms are IoT's Big Opportunity, 2015).

Figure 3: DIKW model that is used by AGT International to convert raw, unstructured data into useful information



Source: Elecstonics360 (2015)

The DIKW model or DIKW pyramid is used for presenting the relationship between data, information, knowledge and wisdom. The modified model, as shown in Figure 3, is a method that explains the flow between the above-mentioned components with the addition of the component of actions and decisions at the top of the pyramid or, in other words, end of the flow.

We have stated that data is useless without attributing meaning or a context to it, which finally transforms the data into information. So, can any type of data be given meaning? Probably yes when humans do it, by using common sense. However, it is difficult even for them when there is nothing the data can be associated with, especially when taken out of the context.

To solve this problem, first we need to categorise inputs based on what is being sensed or is logical. Next, we name the source of the sensation. Finally, we associate the sensation with the object and attribute relevance that connects them. When this is done, there are a few more steps left. We still need to define domains, names and predicates in order to finally give meaning to the data. These are the basic steps, so they should be as specific as possible to minimise any bias or deviation in our data (Schmidt, 1998).

2 DATA MANAGEMENT AND DATA MODELLING

Data needs to be available, accessible whenever and wherever it is required. By processing data, we get information, so it is important that the data we are processing is of good quality. Only with good quality data can we guarantee accurate information. Good quality means that data is accrued, correct, consistent, complete and up to date. Similarly, the meaning of the data needs to be unambiguous (Gordon, 2007). These are important factors in conducting any kind of business analytics.

Unfortunately, lots of businesses have lots of data problems. This is due to possible duplications of data which is most of the time seen as a good thing, since the same data is stored in different places. A known side-effect of this practice is called data redundancy (Silverston, 2001).

Storing the same data in two or more different systems has its side-effects. However, if it is only entered into one place and nowhere else, it can cause a lot of harm to the whole picture. Some other data problems that can also be related to data duplication are inconsistency, misinterpretation and misunderstanding of the data as the result of cohesion and standardisation of the definition and the meaning attributed to the data. One of the solutions to this kind of problem is to make data sharable between systems or departments. Yes, this can easily cause different problems mentioned above, such as misunderstanding or misinterpretation. So, to minimise the possible mismatching, misunderstanding, duplication and low quality of the data in the database, we need to model the database system. Nowadays, there is a need for corporate data models, where each part of the business does not have separate data warehouses, but only a single data warehouse. However, this stretches beyond the topic of my theses, so I will not be dealing with it in detail. It is worth mentioning, although it is by no means a perfect solution. The only effective way to guarantee the effectiveness of the information system and data accuracy is to understand data, how data and information processes fit together and the relationship, in order to integrate systems (Silverston, 2001).

Data modelling help us to develop common principles and rules when building information systems. The aim is to help us understand all properties of data and its uses in order to have efficient and effective database systems (Schmidt, 1998). There are certain basic principles and fundamentals that need to be covered at the beginning of designing our model, and they are largely related to the information. We have to know what information we need. After defining, based on our knowledge and experiences, what information we need, we have to understand which part of our business this information belongs to in order to know how to structure data and create different systems of our business to be able to interact and exchange data. Finally, we define our information processes based on everything previously said so our business analysis is supported by these information processes (WebFinance Inc., 2018).

As a basic concept and fundamental, I will be starting with domains. Then I will be naming things and adding predicates. Finally, I will define entity, states, relationships and attributes. These all need to be predefined before starting with database development.

2.1 Domains

The term is often used to describe any set of values from which a response to a question may be selected. In a way, the domain helps us with data validation of the raw data that we get from source, and many different sources with different types of data (Schmidt, 1998).

With the domain, we narrow down the number of possible answers from the sources of our data to get the most correct data as possible. By narrowing down the number of possible answers, we are ensuring the quality of our data.

2.2 Names

Names are arbitrary symbols signifying nothing; they are labels intended to distinguish one thing from another. Their utility to an information system depends on their remaining meaningless and unique. Domains cannot be described, but they certainly have meaning. A name has no inherent relationship to another name. For a system, it is important that the name stays unique since it is in most cases used to access data about something in the database. This kind of name is called the key (Schmidt, 1998).

In the real world, humans can work without names. They only need a set of descriptive information to associate it with a certain thing or person. Most of the time, this represents a problem, since you cannot tag enough descriptors to a thing to make it completely identifiable. For a computer to identify a thing without a unique name or number, especially in case of a huge database, is almost impossible. For instance, if a customer asks a seller how much a t-shirt is when there is no barcode, the seller will need hours to find the article, and still they would not be sure that it is the right one. There will be no way to find the specific item among dozens of items with the name 't-shirt'. Especially since so many a time it happens that the name of the article can list 10,000 articles containing the word 't-shirt' in their names. Nevertheless, a barcode as a number does not mean anything to the seller or the buyer. It only plays the part of a unique key that allows the seller to get the information about an item in the system, since human brain cannot store as much information as a computer can.

2.3 Predicates

Predicates describe things. However, if they are not integrated into the system well, they can be useless and confusing. The predicates need to be predefined and they are based on the question "What do we need to know?". To answer that question, we need to be aware of what we are doing, selling or developing. The result of questioning what we know are the facts (Schmidt, 1998).

Predicates are, for example, type of item, date of sale, date of entry, amount sold, discount applied, selling price, gross-margins per item, supplier, category of the item etc. The number or information received with regard to these products are the facts that are then used in the analyses.

Most of the time, a predicate does not stand alone, there is usually a set of predicates that is associated with a thing. Sets of predicates are basically all kinds of predicates pertaining to a single thing. Such a defined set is called an entity or a state to which the set of predicates is related (Schmidt, 1998).

2.4 Entities

The entity is a specific thing. It usually represents something significant to an enterprise on which one wants to keep track of (Silverston, 2001). If we consider our example, an entity is like an item, with the set of predicates related to it, regardless of the process it requires. For example, it is a shirt, blouse, jeans, jacket, etc. However, an entity is also a customer's or a sales representative's tax number, supplier code or even the shop itself. So, everything that is considered important enough to keep record of is the entity. It is recommendable to record, collect and store the data based on entities. This helps to establish logical relationships and proper data management, in a way it is useful for the user. This also provides relevant information and mirrors the needs of a business. Entities are defined by people. So, when establishing entities, it is important that one understands the business, knows what is relevant, knows how to measure or scale (Schmidt, 1998). It is always advisable to document and clearly define what the entity is in one's particular case.

2.5 State

Each entity can have many states. The state is a change. The change happens based on predicates. In daily business, an item can switch from state to state during regular business processes, from ordering, delivering, storing to selling. To explain this, let us imagine a person is applying for a housing loan. First, the customer provides a bank advisor with basic information, name, address, marital status, employment, etc. This information is usually entered into the system and is also part of the application form. Usually, both the

customer and the application form receive unique identification numbers important for the system. The customer is currently a potential customer, meaning that they can even be marked by a flag in the system to be highlighted as a potential customer. An offer or a pre-offer is also entered into the system.

After the eligibility check has been carried out by the risk advisors, if the offer is seen as eligible and in line with the customer's abilities, the pre-offer becomes an actual offer. In that case, the potential customer becomes the bank's regular customer. When the offer is signed, it is a contract that binds both sides, the borrower and the lender (Georgescu & Jeflea, 2015). This is a perfect example of how the same entity has changed status and, due to that, the predicates.

It is useful to define states since they are related to the processes in business. In this way it is easier to keep track and make an improvement in the business process. Most importantly, it makes it easier to understand the processes and requirements when we are deciding on improving or automating something (Schmidt, 1998).

2.6 Sets of Entities

There are three sets of entities: classes, superclasses and selections. It is crucial that we fully understand the criteria that differentiate these three sets in order to be able to develop databases and design information processes in a way that our systems are integrated and our data is accurate.

"The class is the set of all entities having all the same predicates and arguments regardless of what process needs the data" (Schmidt, 1998, p. 116). This is opposite to how the entity is defined, as set of predicates for the same thing. State is a kind of subset of predicates resulting from subsets of all processes. It represents something that is more general. In databases we can find something like an invoice, products, equipment, etc. These represent classes which are usually defined as tables.

Finally, superclasses are sets of entities having the same states, subsets or predicates. They have fewer predicates and, as a result, consist of more entities then the class. However, when we need to create a set of entities based on the value of predicates rather than on the existence of predicates, we are actually creating selections. Selections are used when we need to extract specific data from a database when programming a software system. Entities can be part of a single class but may also belong to any of the superclasses. How is that possible? Figure 4 below shows superclasses and classes in a database and in the real life. Let us consider class related to names of companies. In this class we can have entities like Lek d.d., UniCredit Banka Slovenije d.d., Petrol d.d., VZ Skupina d.o.o. All these entities belong to the same class since they have the same

predicates – they are all legal entities. If we consider other superclasses of private individuals, this will include normal people.

Entities belonging to a single class of companies cannot belong to the class of individuals, since the entities that belong to each of the classes have their own predicates, which are the same within the class (Schmidt, 1998). On the other hand, if we have a class called partners, here we can also find the same entities that belong to a different class of companies. Presented in this way, within a database, a superclass can be understood as a set of classes. Seen from the outside, classes and superclasses can be understood as the same.



Figure 4: Defining classes and superclasses within a database

Source: Adapted from Schmidt (1998)

The predicate describes the entity. It is actually a unique identifier of each entity and as well of each class. It provides us with with the information which enable us to connect the names to other predicates and attributes, as a result we are able to obtain information on that entity. Let us consider the example of a bank presented in Figure 5 below. The loan products are a superclass, and within that superclass there are classes of long-term loans and short-term loans. The entity here is customer 1234432, the number being a unique customer ID particular customer can appear in both classes. If we know the unique customer ID number, we can access many similar classes and, finally, we get the complete picture containing customer name, address, what product they bought, the profitability, etc. Here we can see that a single customer can have many products or many addresses. Conversely, a particular loan product, can be owned by a particular customer; there are

exceptions of course. The essence of the relationship is that there is a predicate, which provides information about a particular entity, describes it (Schmidt, 1998).

Figure 5: One-to-many relationship between a loan product and a customer



Source: Own work.

To have a better understanding of the basic concept of data modelling, one may find useful the interpretation in Table 1 taken from the book Data Modelling written by Bob Schmidt and David Warren, which represents the summary of all these concepts and the main differences between them.

Table 1: The summary of the concepts of entity, state, class, superclass and selection

Concept	is group of	based on having	which results in	Concept becomes a
Entity	Predicates	The same argument	Each Predicate pertaining to one and only one Entity	Record
State	Predicates	The same argument and relevance to a process	Any Predicate pertaining to any number od States	Projection of some fields of a record. Software encapsulates validation rules
Class	Entities	The same set od Predicates	Each Entity pertaining to one and only one Class	Table
Superclass	Entities	The same Predicates and relevance to a process	Any Entity pertaining to any number of Superclasses	Projection of some fields and a union of records having those fields
Selection	Entities	The same value in some Predicate(s) and relevance to a process	Any Entity pertaining to any number of selections	Select statement

Source: Adapted from Schmidt (1998)

When establishing the relationship, it is important to name it, since in that way we are giving meaning to that relationship. In Figure 5 the relationship is named "products held by customer".

This relationship works in both ways. A single customer can have many products, and many products can be held by a single customer. This is also known as cardinality. There are three combinations of cardinality: many-to-many, one-to-many and one-to-one.

2.7 Attributes

"Attributes are a special kind of predicate that describes things according to some domain" (Schmidt, 1998, p. 197). Attributes can be easily mixed up with adjectives. However, the main difference is that attributes represent the facts known about something. They may appear in the form of property, quality or characteristic related to a particular person or thing. An attribute is the associating of a domain to an entity.





Source: Université libre de Bruxelles (2008)

2.8 Database development

Before the introduction of databases, data was stored in "specifically constructed files designed for and associated with the application programs" (Gordon, 2007, p.11). These files had to be designed and associated with the application programme. This caused a lot of complications when it was necessary to change the application, since it was necessary then to adapt and associate data to the new application.

Luckily, today data is recorded or stored in a computer system's database.

A database manages data as a "shared resource, providing both logical and physical independence" (Gordon, 2007, p. 12). Still, data needs to be stored somewhere physically, which is today done by means of a disk.

The difference between the today's file storing and application storing that was used before is that there is a "suite of software called database management system" (Gordon, 2007, p. 13). The database management system (hereinafter DBMS) is, in simple words, a set of programmes used to access the interrelated data. It is used to create, maintain and provide controlled access to database users.

The model in Figure 6 represents the tight relationship between user, application, DBMS and database.

The DBMS makes it possible for an end user/user to perceive five basic actions relating to data in a database (Senanayake, 2016):

- 1. create,
- 2. read,
- 3. update and
- 4. delete.

The DBMS essentially serves as an interface between the database and the end users or application programmes, ensuring that data is consistently organised and remains easily accessible. Metadata or in other literature known as database definition or scheme defines the logical part of the data system, i.e. the data. It is a specification of the properties of all the data in the database (Gordon, 2007).

When creating a database, the latter needs to be designed so it can meet the information requirements of each system in order for the information processes to be conducted properly and for the database to be filled in with the correct data. When designing the database, we are creating a model. In other words, we are conducting data modelling. (Schmidt, 1998).

2.9 Normalisation

Normalisation represents the crucial process when developing the database. After identifying the data objects, we need to define their relationships, tables that are required and the columns within the tables.

We can consider Table 2 below that contains the information about the customer, unique customer identification number, product, product identification number, product code and sales data. What is evident from the table below is that certain customers appear more than once, since one customer can hold more products.

However, while product code does not appear multiple times, the product name and the identification number do. To avoid these repetitions, i.e. data redundancy, normalisation suggests that we divide the table into a few smaller ones.

There are three stages of the normalisation process: first normal form, second normal form and third normal form.

Customer	Customer_na	Product	Product_na	Sales_d	Product_c
_id	me	_id	me	ate	ode
115577	Aleš Zub	11144	Credit_card	2017-01- 19	111
112247	Dejan Kekec	11441	Debit_card	2016-02- 21	112
224477	Nikola Arsic	21148	Home_loan	2016-02- 21	445
224477	Nikola Arsic	33114	Saving	2017-01- 18	214
112247	Dejan Kekec	33114	Saving	2017-06- 20	774
224477	Nikola Arsic	77441	Deposit	2016-06- 20	664
134486	Alenka Vidic	11144	Credit_card	2014-05- 21	554

Table 2: Table of customers and products

Source: Guru99 (no date)

2.10 Importance of data management and data modelling

One often forgets about the resources of a company, not considering them as important, even though they are the main factor that influence all the decision-making processes. What is the reason for this pattern? The one reason that can be considered as the most influential is that people often look at the information as part of IT responsibilities. They forget that the information received from a computer or the information gathered manually is actually the same information.

The only difference is in the means and methods used to gather, collect, store and retrieve the information. In the first case, we gather the information through different IT systems and applications that generate information in a structured way.

However, if this is done manually, we will need to use large quantities of paper and it will take a long time to gather any kind of information.

When it comes to storing, the same information is saved, the difference is only in how the information is stored and how we access that information (Schmidt, 1998).

In the information gathering process the quality of information plays an important part. The information needs to be up to date, complete, accessible, understandable, transparent, etc. We derive information by processing data. There are several common problems that cause data to be of poor quality, thus providing us with poor quality information. Usually, the problem lies in duplication, inconsistency, misinterpretation, etc.

By practising data management, we lower the risk of getting poor quality data and, consequently, poor quality information that influence the decision-making in a negative way. To manage data in the right way, it needs to be understood as well as the purpose of that data for the business it is used in (Gordon, 2007). We facilitate the understanding of the data and the correlation with the business processes by modelling the data. The benefits for the business deriving from this correlation are presented in Figure 7.

Figure 7: How we benefit from data modelling



Source: West (2011)

3 BUSINESS PROCESS MANAGEMENT AND BUSINESS PROCESS MODELLING NOTATION

In this part I will focus on defining the business processes in our case study and modelling. The main reason for that comes from the importance of the correlation between business processes and the information system that supports the information processes, which then provides the correlation between business processes and analytical needs.

Business process management (hereinafter BPM) is a management discipline focused on improving corporate performance by managing a company's business processes. BPM refers to design, improvement, measurement and management of all-important processes in the organisation (Hammer, 1990). As an approach, BPM sees processes as important assets of an organisation that must be understood, managed and developed to announce and deliver value-added products and services to clients or customers.

A business process represents "the end-to-end work across an enterprise that creates customer value" (Brocke & Rosemann, 2010, p. 4). Business processes as they are, create

value to the business by creating value for the customer. It is important that the business processes are defined, documented, monitored and modelled (Aguilar-Savén, 2004).

Business process modelling is important if we want to conduct data modelling correctly. The main goal of having good quality data in data modelling and data management is to understand the business. Having good quality data, informational processes, systems and analytics can support the business process. Further on, supporting business processes means that they are tracked and all the information is recorded, collected, stored and retrieved for the purpose of analytics, which can then be used to analyse and improve them (West & Fowler, 2010).

The best way to understand business processes is by conducting interviews and by modelling them, in order to analyse, understand, improve and use them for developing informational processes in which data is needed to be recorded for business needs (Giaglis, 2001).

This approach closely resembles other total quality management or continual improvement process methodologies and BPM proponents also claim that this approach can be supported, or enabled, through technology (Smith & Fingar, 2006).

Gartner defines the business process as an event-driven, end-to-end processing path that starts with a customer request and ends with a result for the customer. Business processes often cross departmental and even organisational boundaries (Gartner, Inc., 2018).

One of the main purposes of business process management, based on the view of an organisation as a system of interlinked processes, involves concerted effort to map, improve and adhere to organisational processes (Chang, 2005). Its purpose is to model ways to improve efficiency, account for new circumstances or gain competitive advantage. Process modelling claims a more disciplined, standardised, consistent and overall more mature and scientific approach.

It facilitates process visibility and has to satisfy an increasingly heterogeneous group of stakeholders (from the CXO to the end-user) and modelling purposes. It must be scalable, configurable and usually be able to provide a bridge between IT capabilities and business requirements. Process modelling is an area where artists (heavy right brain utilisation) meet scientists (heavy left-brain utilisation), internal knowledge workers meet external knowledge owners, business meets IT. It is not only about the final artefacts (the models), which represent the outcome of these modelling sessions, but it is the process of modelling itself and it has an impact on subsequent activities and projects, which deserves attention (Rosemann, 2006).

The method has been undergoing a standardisation push in the past few years and is now often called by a slightly different name: business process model and notation (hereinafter BPMN) (Lucid Software Inc., n.d.).

The business process management initiative (hereinafter BPMI) has developed a standard BPMN. Thus, BPMN creates a standardised bridge for the gap between the business process design and process implementation.

BPMN defines a business process diagram (hereinafter BPD), which is based on a flowcharting technique tailored for creating graphical models of business process operations. A business process model, then, is a network of graphical objects, which are activities (i.e. work) and the flow controls that define their order of performance (Fettke, 2008).

When conducting process modelling of our SME case, I have been guided by how it is presented in the article by Stephen A. White, »Introduction to BPMN«. In the article he defines three flow objects.

Event Flow Object is represented by a circle and is something that "happens" during the course of a business process. These events affect the flow of the process and usually have a cause (trigger) or an impact (result) (Camunda Services GmbH, 2018). First comes the starting event, where the process starts. The end event represents the final step in the process, which is shown in Figure 8.





Source: White (2008)

Activity Flow Object is represented by a rounded-corner rectangle and is within the business process. It is represented by the same shape (Figure 9) (Camunda Services GmbH, 2018).





Source: White (2008) **20**

Gateway Flow Object is represented by the familiar diamond shape and is used to control the divergence and convergence of sequence flow (Figure 10). It is a decision point that can adjust the path based on conditions or events. Thus, it will determine traditional decisions, as well as the connecting objects. They can be exclusive or inclusive, parallel, complex, or based on data or events. For modelling our case, I will mainly be using exclusive gateway, since most of the time we need to decide on one path over another (Lucid Software Inc., n.d.).

Figure 10: Gateway symbols in Business Process Modelling notation



Source: Lucid Software Inc. (2018)

The flow objects are connected in a diagram to create the basic skeletal structure of a business process. There are three connecting objects that provide this function. These connectors are:

- Sequence flow is represented by a solid line with a solid arrowhead (Figure 11) and is used to show the order (the sequence) and to connect activities that will be performed in a process (Fettke, 2008).
- Message flow is represented by a dashed line with an open arrowhead (Figure 11) and is used to show the flow of messages between two separate process participants (business entities or business roles) that send and receive them.
- Association is represented by a dotted line with a line arrowhead (Figure 11) and is used to associate data, text, and other artefacts with flow objects (Lucid Software Inc., n.d.).

Figure 11: Connecting objects of BPMN



Source: White (2008)

Many process modelling methodologies utilise the concept of swim lanes as a mechanism to organise activities into separate visual categories in order to illustrate different functional capabilities or responsibilities (Fettke, 2008). BPMN supports swim lanes with two main constructs. The two types of BPD swim lane objects are as follows (Lucid Software Inc., n.d.):

- Pool, which represents a participant in a process. It also acts as a graphical container for partitioning a set of activities from other pools, usually in the context of B2B situations.
- Lane is a sub-partition within a pool and will extend the entire length of the pool, either vertically or horizontally. Lanes are used to organise and categorise activities.



Figure 10: Pool and lane in BPMN

Source: Polančič (2013)

3.1 Information processes

Information processes are part of each particular system. They can be the same, in each different system, while the data, especially when it comes to its type, can be the same or different. Information processes can be defined as series of steps involved in the transformation of raw data into actionable information (WebFinance Inc., 2018). Successful organisations, whether large, medium or small, leverage available technologies to manage business activities and assist in making decisions. They use information systems to collect data and process it according to the needs of the analyst, manager or business owner. Businesses operate more efficiently by using varied information systems to interact with customers and partners, curtail costs and generate revenues (Davoren, 2018).

I have previously grouped information systems into four basic types and, according to my opinion, main categories. First is the Transaction Processing System, followed by the Inventory Management System. Third is the Customer Relationship Management System, finally followed by the Business Intelligence System. The purpose of a system is to organise the processes.

There are seven main sub-processes that I will focus on in this master's thesis (WebFinance Inc., 2018).

3.1.1 Collecting

It is a process during which data is gathered from the real world and entered into the information system - the source is the real world, to put it simply. Further on, the way the information is entered and by what means represents the source of the information for the system (Marchand, Kettinger & Rollins, 2000).

Collecting is the main input process. To make this more understandable, we can compare this with collecting data from a point of sale. To collect data is not only to capture the data required, but also to understand what type of data is required, where it comes from and how it will be structured, stored and encoded (Gordon, 2007). The source of data is where it originates from. This could include websites, points of sale, customers and temperature sensors. When determining which data source is best suited for your system, there are some issues to consider, such as the availability of data, quality of data, type of data, the way to connect data from different sources and join it together, and of course, the most important one, cost of data (Powers, 2000).

To decide what data is required, the first step is to analyse business needs. Then come the capabilities of the system and its purpose to be able to support the needs of the business previously analysed. What should always be kept in mind is the process of determining the data required without collecting the same data multiple times or collecting data that can instead be calculated using data that has already been acquired (Powers, 2000).

Data modelling and data management play a crucial role in this process, i.e. collecting the correct data, in a correct way and from a correct place (Gordon, 2007).

3.1.2 Organising

Data should be organised in a way so it can be used by other information processes. This process does not change the data itself, but it modifies the way it is structured, stored and represented, by determining its form. The aim of organising is not only to provide data to other information processes, but to be able to do so in the most efficient way (Marchand et al., 2000).

Structuring as a part of organising is the process that arranges the data in a specific and logical way. The structuring is designed in such a way, as previously explained, that it enables the information processes in the most efficient way, to use the data that has been organised (Powers, 2000).

Representing as a part of organising is the process that encodes the data in a way that is efficiently understood by the information processes using it (Powers, 2000).

3.1.3 Analysing

When information is entered into a system, it becomes data (Mannion, Optimal Analysis Algorithms are IoT's Big Opportunity, 2015). The process of analysing transforms data into useful information. It translates the data so that it makes sense and can be understood by people. Data is analysed for a variety of reasons, such as to identify trends, model or simulate a scenario or to study the effects of change. Whenever data is analysed the actual data does not change, it is just displayed in a way that can be easily understood (Becker et al., 2015).

Information that has been analysed will not be precise if all factors influencing the outcome are not considered – you will most likely get incorrect information. So, this is the point where the decision about what data to collect and how the data is interconnected and structured. The big influence on this decisions has the source we use to collect and gether data, due to the fact that the data is collected and gethered by different sources, so regarding to that we need to adapt the way how the data is stuctured (Gordon, 2007).

3.1.4 Storing and retrieving

Storing and retrieving represents an important step since useful information is stored and after a certain time can also be retrieved, reanalysed and compared. Having past data iscrucial in analysing, focusing and decision-making. Storing and retrieving is an important process in an information system. Without it one would not be able to reuse data without recollecting it. Storing is the process of saving the data onto a storage device and retrieving is the process of reloading that stored data so that it can be used (Schulz, 2018).

There are two types of storage, volatile and non-volatile. Volatile storage is storage that requires electrical energy to remember the data being stored such as random-access memory (RAM), whereas non-volatile storage is storage that can maintain the data without electrical energy such as floppy disks and hard disk drives (Rouse, 2018).

3.1.5 Processing

Processing allows for data to be updated, altered or edited. It is the only process that changes the existing data in the system. Processing enables manipulation of the data by updating and editing it.

Also, processing often becomes the most required part in other information processes. In a computer-based system, processing is performed by the central processing unit (hereinafter CPU). An example of processing in an information system is editing an essay using Microsoft Word. In analysing data there is a variety of tools that can be used, e.g. Excel, SAS, R or any other tool (Powers, 2000).

3.1.6 Transmitting and receiving

Transmitting and receiving allow for data to be shared, exchanged between information processes, thereby improving connection and synergy within the system and between information processes (Wikidot.com, 2011).

This information process basically transfers data and information between information systems. It enables communication between different devices and all successful communication requires three basic components, i.e. the sender, the medium and the receiver (Powers, 2000).

3.1.7 Displaying

Displaying is an output of all information systems and its processes. This process is important for connecting business- and IT-minded people. It outputs the final information from an information system. Displaying usually signifies presenting information on a screen. Displaying information requires making decisions about how the information will be displayed. Some common display devices are monitors, printers and speakers. An example of displaying is filming a video of a friend's birthday (Powers, 2000).

To understand and build information systems that will support the needs of analytics, information processes must be understood (Bourgeois, 2014).

3.2 Information behaviours and values

For an information system to be effective it is important that the employees understand the importance of information. They need to accept the rules how to communicate all the information from the real world to the system, so the management is able to receive that information in a more structured way in order to analyse and make a proper decision (Marchand et al., 2000).

It is important to keep in mind that interaction of people, information and technology can have a huge impact on business performance. In today's world it is, due to the pressure of market competition, a normal reaction that companies are more focused on information system and technology then on communicating changes about the values, practice and priorities. They forget that the machines and system are used by people (Bouée, 2015).

It is always good if a company is information oriented.¹ There are three factors that need to be covered - information technology practices (hereinafter ITP), information management practices (IMP) and information behaviours and values (hereinafter IBV). In the previous chapter I focused on information technology practices while talking about the information system and technology. The chapter Information Processes is also tightly related to information management practices. For that reason, I will mostly focus on information behaviours and values.

The IBV refers to the capability of a company to promote behaviours, culture, mind-set and values in its people for effective use of information. This means that certain practices need to be implemented and exercised among the individuals and the groups (Marchand et al., 2000):

- Integrity promotes the integrity of information, no information as such should be misused or hidden for the sake of personal benefit; good information integration results in effective sharing of sensitive information.
- Formality refers to use and trust of using formal sources of information.
- Control is disclosure of information about business performance to all employees to influence and direct individuals and, subsequently, company performance.
- Transparency is when all members trust each other enough to talk about failures, errors and mistakes in an open and constructive manner and without fear of unfair repercussions.
- Sharing is the free exchange of non-sensitive and sensitive information. Sharing occurs between individuals in teams, across functional boundaries and across organisational boundaries.
- Proactiveness is when the employees actively seek out and respond to changes in their competitive environment and think about how to use this information to enhance existing and create new products and services.

4 SME RETAIL LOCAL BUSINESS CASE

The example that I will be using in order to demonstrate the importance of the correlation between business processes and need for business analytics, which is equal to business

¹ "Information orientation (IO) measures the capabilities of a company to effectively manage and use indormation" (Marchand et al., 2000).

needs, with the help of data modelling, is the Slovenian domestic micro business VZ Skupina d.o.o. whose main activity is retail. Also, I will demonstrate on a real-life example how this synergy can be achieved or is achieved in this particular case and what the pitfalls are if this synergy does not exist. I will show how this can contribute to improving the business processes and the performance of the business, as a result of the correlation with the need for analytics that plays the main role in decision-making conducted by the business owner.

The company's core business is sales. Therefore, everything related to sales is important, from profitability, margin, inventory turnover, gross margins (Nicasio & Stanley, n.d.), customer basket size², average transaction value³ (Serpa, 2017).

First, I will analyse the business and design an "as-is" BPMN model. In order to do that, I have conducted an interview with the employees and the owners and documented all the information. The model that will come as a result of that will be a workflow of all business processes within the company. Based on my field experience, understanding the needs of the business and its owners as well as the BPM theory modelling, I will develop a "to-be" BPMN. The "to-be" model will also be tightly related to the data management needs. Furthermore, I will cover data management, since it is necessary to present the data and explain how the needs of particular data influence business processes and the model. In the final or the execution part, I will describe the process of implementation.

4.1 About VZ Skupina

As the main part of its business, VZ Skupina d.o.o. owns a retail store Ascara Outlet. The company's vision is to provide good quality clothing of the world-known brands at the lowest price possible, keeping service at the highest level.

This is an example of an outlet store, which means it sells clothes that is in overstock in regular stores or comes from previous seasons. The store offers all kinds of clothing as well as shoes and accessories for men, women and children. It has a shop located in the most popular Slovenian industry zone, BTC Ljubljana, and another in BTC Novo mesto.

For a few years, I was an employee in Ascara Outlet. My job included direct sales and strategic planning; in other words, I was a salesperson. At the same time, however, I was helping the owner to improve business processes by obtaining, tracking and analysing information for the purpose of improvement.

² It represents several units in a single transaction. (Retail Angle, n.d.)

³ Average transaction value represents the average volume and the value of customer purchase. It is calculated by deviding total value of all transactions by the number od transactions. (Patten, 2013)

The structure of the company is simple. There are five employees. One of the employees is the director and owner of the company. He makes all the main decisions, strategic and financial. The other four employees are salespeople, and I myself was one of them. Besides working in direct sale, I had an active role in strategic planning. We tried to make a system that would improve the control of stock and sales, in turn improving the latter. Since it was a small company, it was easy to communicate the information, make decisions and act quickly.

All the main activities were carried out in Ljubljana, BTC Shopping Centre, where the store was located. Thus, all decisions made there were communicated to the other store located in BTC Shopping Centre in Novo mesto, 40 kilometres south-east from Ljubljana. I was the main person responsible for communicating all the information to the other shop. We used two communication channels, phone and e-mail.

4.2 About methodology

Based on my work experience in the company and the information gathered from the interview that was conducted on 3 March 2018, in order to demonstrate how the correlation is realised or should be realised, I will write about the business model of the company, how the business functions, what the main KPIs are, how sales and inventory are monitored, how entities, relationships and names are established, etc.

I worked in the company for 3 years and my job entailed entering items into the system, creating barcodes, making decisions about the prices, direct sales, participating in the decisions regarding discounts, i.e. the discount amount and to which products it would apply, and finally, checking inventory status. I communicated with the owners on a daily basis.

I also conducted an interview with the owner in order to gain insight into how the business functions, the specifics of his job and responsibilities and check the needs for analytics. The interview consisted of 14 questions (which you may find in Appendix 2) and took 1 hour to complete.

To understand the business model better, the owner and I agreed that the focus of our interview, conducted on 3 March 2018, would be the many aspects of the process itself and the relation between them and the expectations of the owner towards improving the model. It was necessary first to understand the whole strategic model so that we would be able to adapt the re-engineered process toward that scope.
4.3 Business process model

Business process model (hereafter BPM) in retail business is a technique which is helpful in defining the strengths and weaknesses by which then one can manage and improve the business and strategy to achieve the best fitting model to serve the business needs accurately (Aagesen & Krogstie, 2010).

This chapter will focus on warehousing, from ordering specific items to their delivery. You may find the answer to questions like what really needs to be changed by asking yourself another question, such as which process is the costliest and what chances are there for dividing it or even changing it. In addition, the interview contains questions regarding sales, as it is believed that bad sales come as the result of an underdeveloped model of warehousing.

Figure 11 represents the flow of goods and the flow of information. The flow of goods is divided in two parts, between supplier and merchant and between merchant and end customer. Flow of information is not divided, it goes back and forth between supplier, merchant and end customer.





Source: Own work.

The company's business processes include several groups of processes that are done at different levels of a company.

One level includes processes that are carried out at the warehouse. At this level, the company orders and receives goods from the supplier.

Further on, the process of sorting the goods has been carried out. Sorting was done by means of categorisation, e.g. according to brand, the price initially applied in regular stores and the type of goods. After that, the company supplies the goods to its stores. I will go into more detail and explain the steps in the next section. The company outsources

the logistics between supplier and warehouse, whereas it uses its company vehicle to supply goods internally.

The supplying of the stores takes place once a week. Every three to four weeks discounts are applied to a group of products selling too slowly. That way the company tries to freshen up its stores and make room for new items.

Twice to three times a year the stores have sales offering up to 50% discount on all items, in which they are unlike regular stores, which simply burn items or sell them to outlet stores such as Ascara if they do not manage to sell them during the sale season. Moreover, regular checks of inventory are performed, so when various items lay in the store for a longer period of time or there is a large number of the same items that need to be sold off, decisions regarding groups of items that need to be discounted are made, and they are based on the insights of the store's employees and the data gathered at the point of sale.

All the usual questions regarding the items that should be discounted, information on any events planned in the stores, or any other issue raised in an of the other shops is first communicated to the employees working in the Ljubljana store, and finally, if necessary, to the owner, as well. The communication between the stores is carried out via e-mails or, in some cases, the phone. The communication with the customers is also carried out in each store separately, depending on where the customers are from. Informing about the discounts or any other campaigns is done from the Ljubljana store.

When it comes to the types of clothes being sold or the sizes, the offer is hardly ever the same. This is what makes the customers motivated to visit the stores more often. While the changing offer has its positive sides, at the same time it is flawed. For example, the offer of men's clothing is not constant; at times it is possible to buy a suit, while other times there are no suits to buy. As a consequence, the store may lose a customer or two. This uncertainty may drive customers away, especially if they are absolutely sure that they will find the desired item elsewhere.

Figure 12 shows the as-is model of the process of ordering the inventory that only applies to the Ljubljana store. The salespeople in Novo mesto did not participate in this process. However, they did provide certain qualitative data, e.g. what the customers usually looked for, whether the store offered room for more clothing, etc.

The most demanding processes in our real-life retail case took place in the warehouse. The main challenge of these processes is the impact on sales and business as a whole. In most cases, the details of best practices are not that easily provided to the public. In fact, in almost every case the underlying system is protected from being copied by a competitor. The retail outlet store Ascara had a regular supplier providing goods on a regular basis, i.e. every other month, but there were also several other suppliers that were contacted in certain situations. Whichever the case, the same process applied.

The supplier was contacted by the person responsible for negotiating the conditions of the delivery, and in most cases that person was the owner of the store. The supplier was then asked if they could update the store on their current offer and their situation. After providing that information, the next step was usually negotiating on the specifics of the delivery and the offer. If the negotiations were successful, the supplier was required to send a pre-invoice to the person representing the company and negotiating the deals. After the pre-invoice was checked and the conditions were satisfying, without any additional costs appearing and all that had been negotiated included, the final invoice was demanded.

In the event of any discrepancies, the company representative would once again contact the supplier and try to conclude the deal. Most of the time, a deal was closed successfully However, if a deal was unsuccessful, the representative was required to contact another supplier.

When the final invoice was delivered to the company, the latter was obliged to pay the full amount before the goods could be shipped. Upon the fulfilment of this condition, the supplier would make sure the goods were shipped to Ljubljana. Usually, the delivery time was less than four working days.

When the goods finally arrived to the warehouse, the CRM number was sent to the supplier to confirm that the goods had been delivered. The process of sorting the goods into several categories was then started. The goods were categorised according to brand, type and other criteria required for further processing, which included determining the price of each item. After the process of sorting, the items were labelled with prices and entered into the system by their unique codes. Simultaneously, two things were carried out - entering items into the system and preparing delivery notes listing items that were to be supplied to each of the stores. The items previously prepared for supply were then transported to the store, where the salespeople would double-check if the delivery notes matched the goods received.

After all these steps had been completed, the final document of the goods was generated by conducting synchronisation with the inventory stock. The final document was then saved and could not be modified in the future. The invoice and the final document were then compared to eliminate any mismatches regarding the quantity or the conditions of the goods or brands that had been delivered. In case of mismatches, the company representative contacted the supplier to notify them about the situation regarding the goods and to obtain information about future deliveries. Here, the process was finished. However, the main task a a salesperson had was conducted during the sales process. The first thing that the employee needed to do was sign in into the InfoPOS application, as shown in the picture below, by entering their username (*uporabniško ime*) and password (*geslo*). The application would then recognise the user and the rights they had, which enabled for the sales to be tracked by salesperson. After signing in into the app, automatic processing for previous days was done to prepare the database for new changes in the system.





Source: Own work.

In the app, the start-up window is opened first. From there, a salesperson can access the inventory, scan items and issue bills, as well as perform all the required administrative work. The main window is shown in Figure 13 below.

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Figure 13: Main screen in the InfoPOS application

Source: Own work.

It is always necessary to enter the barcode. The items that a salesperson is able to sell are limited by the list of items that are in stock in the inventory system. The salesperson cannot sell items that are not included in the in-stock inventory database. This is done by displaying barcodes and quantities. The only thing that is not controlled is the discount amount. This is the responsibility of a salesperson, who is trusted not misuse their position. The only way to monitor this is via the cloud app, by performing a cross-check of all items on discount by looking at the delivery date, the campaign or the discount amount.

The items entered in the start-up window are not communicated further until the salesperson chooses to call for an action, by clicking on the means of payment box. The latter concludes the action and the system is instantly modified. The first modification is to the inventory, namely the stock is decreased by the quantity of items just sold. The second modification occurs in the transaction system, where a new transaction is created. The third modification occurs in the cloud app, where the items just sold are added as well as the most recent transaction along with the amount.

When a salesperson scans an item (Figure 13), all the relevant information is displayed in the window. The relevant information includes the barcode, name of the article, quantity to be sold, discount amount and the final price of the item in question. If the salesperson, when adding more articles to the list, cannot scan the barcode on the label or if there are more articles that are the same, it is possible to manually enter or change the number, e.g. for quantity.

Before issuing a receipt, the salesperson needs to select their customer (Figure 14). There are 3 types of customers. The most frequent type is the new customer (non-loyal customer). Another type is the loyal/regular customer – they usually have loyalty cards that bring them additional discounts and the store manager is able to identify them and further interact with them through marketing channels or measure the effect of promotions. The last type of customer is the legal entity. They require special treatment and the store usually follows a special type of protocol for issuing their receipts, with certain data entered into the system, e.g. tax number, name, street, etc.

The next step to conclude the sale successfully is to select the payment method. Figure 19 shows methods of payment: cash, debit/credit card, subvention, transaction account, personal promotion, other.

When method of payment has been chosen, the approval of the transaction by the tax authority is carried out and the same receipt/transaction is sent to the application server and added to the archive.

When the receipt is printed on the POS printer, the sale/transaction is successful and the process of sale is concluded.

When it comes to the third level, i.e. the marketing, the store has no separate marketing department. The advertising and marketing is carried out by the salespeople. In other words, the store employees have to be multi-skilled workers, which makes it possible for the company to lower some of the costs.

The store employees, for example, actively use Facebook for advertising purposes. On average five times a week, the workers from the Ljubljana store post pictures of newly arrived items and update customers on the current offers and campaigns. The company's website is currently used as an information point for anyone looking for basic information on the store, such as contact information and location. The company intends to redesign the website and start to use it for communication with its customers, but this project is currently on hold. Other services, such as logistics, accounting and IT, are at the moment being outsourced by the company.

Going back to the topic of my thesis, I aim to focus on modelling, analysing and suggesting improvements to the process of delivering/receiving the goods from suppliers. This process is considered to be the most challenging, especially if the company ever wanted to grow and expand, opening its stores in other locations in Slovenia and Croatia.



Figure 14: As-is business process model of the sales process

Source: Own work.

4.4 Information system and technology used

As previously mentioned, the information system consists of hardware and software. In our case, hardware can be called point-of-sale hardware (Cahier Live LLC, n.d.). The POS includes a receipt printer, which has a quick response code (hereinafter QR- CODE)printing function, cash drawer, bar code scanner and credit card swapper or POSterminal. Internet access and a printer that supports QR-CODE printing are required by new regulations.

The Internet has become a requirement since the implementation of the new Fiscal Law in Slovenia in 2016, whereby every receipt issued by a venture is automatically sent to the fiscal/tax authority, receiving a unique number by which it is then authorised online (Fiscal Solutions d.o.o., n.d.).

It is also necessary to have a printer that supports QR-CODE so that the issued receipt can be easily checked for accuracy. Figure 15 below shows the basic components of the point-of-sale.



Figure 15: Standard components for point-of-sale

I refer to these components as standard because they are used in almost every store or venture. Of course, there are also some more advanced systems with terminals that can perform scanning and enable payment via smartphone.

When it comes to software, the operating system is the same as in every other device, the only difference being that it needs to be licenced, which is required by law. The operating system in my example is Windows, but others are also possible, e.g. Linux⁴. In th store discussed Windows is used because it is more user-friendly, people are more familiar with it and it supports all application software that is required in everyday business. The application software is not preinstalled. Our store uses a few types of application software.

Source: Ebrahimi (2012)

⁴ Linux is an operating system. (The Linux Fundations, 2018)

The most important application software is a cloud-based POS system. It is the latest trend in POS software and is increasing in popularity every day among SMEs. What makes it different from the usual POS systems is the fact that the system itself can be or is, in our case, directly accessed from the web and is usually compatible with most point-of-sale hardware, including printers, cash register drawers, etc. The company licences the application from an outside provider.

The main benefits from using cloud-based POS software is that vendors can easily access customer data, sales data, anytime and anywhere, by using the Internet, a phone or a computer. It is possible to access it from the web by using a variety of Internet browsers (Bluebird Global Ltd, 2018).

The software used in our case is called InfoS POS (www.pos-blagajne.com). The software can manage transactions and inventory. The app was developed in Microsoft Visual Studio⁵. The source code that is written in the language supported by Visual Studio is translated into the intermediate language⁶. Code IL and other source codes are stored in the folders holding the manifesto. From there on the information is transferred with C# into the machine code (Ješarević, 2016).

Figure 16 shows all the functions the programme is used for and the relationship between users. There are five types of participants, direct and indirect application users. These users are the salesperson, owner, tax authority, supplier and administrator. The owner is a specific user, given that they cover the inventory, monitoring and analysing.

The log-in function allows the user to start the application. By typing their username and password, the person is identified and periodical data processing of archived data is verified.

A delivery note is a document through which the items delivered by a supplier are entered into the inventory system via the application. When entering the item into the system, each item receives identity, a barcode that identifies it. The item is identified by the attributes. Once entered into the system, the item represents the entity.

For example, a t-shirt of a particular brand represents the entity that has attributes such as price, time of delivery, category or domain, etc. The barcode is the unique identifier to link the item with all the relevant information that is stored in the system.

⁵ Microsoft Visual Studio is a tool for programming applications in the C,C++ and C++/CLI language. (Glenn, 2016)

⁶ Intermediate language (IL) is a programming language used by compliers for the .NET Framework used to translate computer language into machine code.





Source: Adapted from Ješarević (2016)

In our inventory, the barcode does not only represent the key for receiving information from the system; it is also useful to our salespeople. There is a meaning behind each barcode that helps a salesperson in their work. Each barcode has five components:

- The brand component tells the salesperson which brand an item is.
- The price component denotes the real price of an item including tax. For example, for a t-shirt of the Levis brand delivered in March 2018 and costing €7.99, the barcode would look like this: LE7990318.
- The month of delivery represents the month in which the item is delivered by the supplier. It does not represent the month in which the item is entered into the system. In the barcode LE7990318, 03 stands for the month of delivery.
- The year of delivery represents the year when the item is delivered and not the year when the item is entered into the system. For example, if the delivery was in December 2017 and it took a whole month for the item to be entered into the system, the year in

question is 2017, not 2018. In the barcode above, LE7990318, the last two digits, i.e. 18, represent the year of delivery.

The item component is the last part of the barcode and it represents the clothing category of the item. The clothing categories are divided by gender and type, e.g. blouse, t-shirt, polo shirt, etc. It is represented by a three-decimal number at the very end of the barcode. Finally, we have the complete barcode; LE7990318118, whereby 118 stands for a male t-shirt.

These components are useful to a salesperson and the owner in many scenarios. For example, they can receive information on the discounts. When there is a sale season, the store makes categories under which particular discounts are valid. Items delivered six months ago or those delivered in October, November and December are discounted by 50%, items delivered before that time are discounted by 70%, while others are not discounted at all.

Inter-store stock transfer is a very important function offered by the software. It is commonly used by Ascara because it represents the easiest way to transfer the inventory from store to store, enabling full control over the inventory in both stores.

When products are delivered by the supplier, they are entered into the system in Ljubljana, and from the full amount the amount that goes to the store in Novo mesto is simply subtracted. This is a centralized system for inventory management. The process is shown in Figure 17.

The process of entering items into the system requires a lot of time. In the first step, after the items have been delivered, the selection process is carried out. The items are divided into different clothing categories.

First, we categorise clothing by brand. Based on the brand, further categorisation and pricing is carried out. The same type of clothing is priced differently based on the brand. Some brands are high-level brands and are not that affordable in regular stores. Other brands are mid-level brands, meaning that they are more affordable in regular stores then the high-level brands. Low-level brands are welcome only in some seasons, when the demand for a particular item cannot be fulfilled by the high-level and mid-level brands.



Figure 17: As-is business process model of entering items into the inventory system

Source: Own work.

What does this actually mean? The percentages of blouses, dresses, pants and shirts provided by the supplier are always known for a particular brand. The percentages can very, of course, but the variations are not that high. In different seasons, different types of items are the season's top items. The logic behind this is quite simple. From March/April until May people buying long-sleeved shirts, cardigans, trousers and light jackets. From May/June until August there is a high demand for elegant dresses with short sleeves and casual dresses without sleeves. From August until December cardigans are in high demand, as are light down jackets, trench coats, trousers, long-sleeved shirts and t-shirts. Finally, from December until March/April people mostly look for sweaters, warm cardigans, elegant long-sleeved dresses, trousers, winter jackets, hats and scarves.

Based on the season's trends, orders are planned. For some brands, the supplier is able to provide more trousers and blouses, while for others they can ensure more elegant dresses, elegant trousers and coats. Moreover, some brands are focused more on casual wear, so such an order will include more jeans, trousers, t-shirts and casual shirts. So, based on the fact what season it is, the order is placed in order to satisfy the demand.

As previously mentioned, different types of clothing are priced differently based on the brand. For example, a high-level brand blouse pricing range is from \notin 24.99 to \notin 39.99, whereas a mid-level blouse would be priced from \notin 15.99 to \notin 29.99. Low-level brand blouses cost from \notin 8.99 to \notin 13.99.

4.5 Information processes within the information system

4.5.1 Transaction Process System

Issuing a receipt to a customer is easy, given that the application is quite user-friendly. All that is needed for issuing a receipt is written in words or put in pictures. As previously explained, each article has its barcode and that barcode is printed together with the information about the name and the material of the product. When printed, it is tagged to the item.

When a salesperson wants to issue a receipt, it does so by scanning the barcode, which is then recognised by the system and other relevant information is given, such as name, price, discount and quantity, i.e. a single item if scanned once. This is presented in Figure 18.

There are three payment methods available. The most common one is cash, followed by bank cards and, finally, BTC coupons. Each option needs to be manually selected by a salesperson. In case of a coupon and cash, the process is done when the salesperson chooses the option for that method of payment. In case of a bank card, given that the POS system or app is not connected to the terminal, the salesperson first needs to select the right method of payment in the app that issues a receipt, and then or before that, they are required to enter the same amount into the terminal, which is the means of communication between a bank, the customer and the merchant.

When issued, each receipt is verified by tax authorities and then further communicated to the inventory management and the cloud.

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Figure 18: The main window in the POS application used in the sales process

Source: Own work.

Figure 19: Choice of the method of payment



Source: Own work.

The possibilities of payment are shown in Figure 19. There are three payment methods availableof: cash (*gotovina*), bank card (Eurocard, Visa, Visa Electron, Diners, American Express) and other (*subvencija* = subsidy, *transakcijski račun* = transaction account, *lastna promocija* = personal promotion, *ostalo* = other). There is another option available, which has not been mentioned under the categories because it is in fact the possibility to

combine more options as the payment method in a single transaction, *več načinov plačila* = more methods of payment.

Figure 20 shows a window displaying transactions which can there be verified and stopped, in case that is necessary. We can see a serial number, year of transaction, store branch, tax authority authorisation status, method of payment, date, amount, etc. This basic window is accessible all the time and it can provide information such as the average number of transactions, sales by the hour, sales by the salesperson, payment method, etc.

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							v	ww.pos-blag	ajne.com	- InfoS - proj	gram	za gostinstvo, trgo	vino in s	storitve	MP2-d	lemo-sl v2	.5.3.3									

Figure 20: Archive of transactions

Source: Own work.

In Figure 21 we see that every receipt and transaction is marked by a unique number, in this case P001-1-4863 for receipt1 and P001-1-4824 for receipt 2. This number is used as a unique number in our database as well as the tax authority's database. There is also the method of payment, in this case it is cash for receipt no. 1 and bank card for receipt no. 2. In the system, it is important to select the right type of bank card, since different conditions apply for each band card. Thus, after the line for the method of payment comes a line specifying the type of bank card, in this case Eurocard. Each receipt and transaction

also includes the date and hour of issuing the receipt. At the bottom there is a QR-code that is required by the tax authority.

Bill 1	Bill 2
VZ Skupina d.o.o. Dunajska cesta 105, 1000 Ljubljana DDV ID: S139253074	
Smartinska 162, 1000 Ljubliana	VZ Skupina d.o.o. Dunajska costa 105, 1000 Ljubliana
RAČUN – POOL 1. 4883 Način plačila: GOTOVINA Datum 28.7.2018 – Čan: 12:18:51 Dokument pripravil:Nataša P.	Trgovina "Ascara" Smartinska 162, 1000 Ljubljana
Šifra Nazivartikla/storitve Čena x kol. (en.more) Skupai(FUR)	KOPIJA 1 RACUN PODI-1 4874 Načio plotije KARIJCA
BIT1999161217 Bonita by Tomla 19,99 x 1,0000 (kos) - 10,00	VRSTA KARTICE: MAESTRO 57,48
ZA PLAČILO: 10,00 EUR	Datum 28.7.2018 Čas: 18:15:18 Dokumont pripravil:Nataša M.
Popust na celoten račun 50,00% Popust pa artikla 9,99 EUR	Sifra Naziv artikla/storitve Cona x kol. (en.more) Skupaj(EUR)
DAVKI: Naziv Osnova Stopnja(%) Znosek(EUR) DDV 8,20 22.00 1,80	BIT109009/49 Benita by Tembriller states 19,90 × 1,0000 () + 10,00 BIT2408101/21 Benita by Tembriller JAKNA 24,69 × 1,0000 () + 12,50 S0209002181/1 S.01iver blače 20,90 × 1,0000 () = 20,90 061801T190014 Benita by Tem Faiter bluza 19,90 × 1,0000 () + 13,90
Reklamacije uposlevam 14 dni od nakupa izd Potrebno je imeti račnu in etiketo izdelka me pos-blazajne si 040/585 905	ZA PLAČILO: 57,48 EUR
EOR: 6815c200 6525 426c ac71 f2d0f35aaa0c Z01: 0145528501d50755aco3575dd35dc0aa	Popust na 1. postavko: 50,00% Popust na 2. postavko: 50,00% Popust na 3. postavko: 30,00% Popust na 4. postavko: 30,00%
	Popusit na artikle 37,48 EUR
	DAVKI: Naziv Osnova Stopnja(%) Znesok (EUR) DUV 47.12 22.00 10.36
	Hvala! Reklamacije upostevam 14 dni od nakupa izd Potrebno je imeti račnu in etiketo izdelka
	111 - 2 0 1 - 62.0 14514082
	TUR: BC72b12a 4C47 4ba7 Bitc 07601801408 Z01: 3aa3d245b68fe2ecbe2/b6ctd/U8ed1e

Figure 21: A bill issued by a salesperson

Source: Own work.

4.5.2 Inventory management

The inventory is controlled by consignment, which is part of the application and supports the statement in the part of the asset in financial statements of the company.

The consignment is a document that includes items, quantity, margins, selling prices, barcodes, names, discounts by the supplier and the revenue after selling all the quantities at that given price. The barcodes are not delivered by the supplier or given on the product, as said before they are created by the salespersons with respect to certain rules. The consignment is shown in picture below, Figure 22.

Through this document, the inventory is controlled. It is possible to enter items into the inventory management system. In other words, it is possible to add them and it is also possible to remove them, in accordance with the consignment document.

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	Zap. št.	Šifra artikla	Naziv artikla	KOL	BREZ RAB. B	EZ RAB.	(%)	/EN.M.	SK.	(%)	J/EN.M.	PROD./EN.	PROD.SK.		
120	120	BTT19990218194	Bonita by Tom Tailor majica	1,00	2,57	2,57	0.00	2.57	2.57	537.50	10.00				
121	121	RTT19990218187					0,00		2,37	057,00	16,39	19,99 1	9,99		
122		D1113330210107	Bonita by Tom Tailor jopa	9,00	2,62	23,58	0,00	2,62	23,58	525,39	16,39	19,99 1 19,99 1	9,99 79,91		
122	122	BTT19990218191	Bonita by Tom Tailor jopa Bonita by Tom Tailor jopa	9.00 1.00	2.62 2,66	23,58 2,66	0,00	2,62 2,66	2,57 23,58 2,66	525,39 515,99	16,39 16,39 16,39	19,99 1 19,99 1 19,99 1	9,99 79,91 9,99		
122	122 123	BTT19990218191 CO29990218141	Bonita by Tom Tailor jopa Bonita by Tom Tailor jopa Comma bluza	9,00 1,00 6,00	2,62 2,66 2,29	23,58 2,66 13,74	0,00 0,00 0,00	2,62 2,66 2,29	2,57 23,58 2,66 13,74	537,56 525,39 515,99 973,45	16,39 16,39 16,39 24,58	19,99 1 19,99 1 19,99 1 19,99 1 29,99 1	9,99 79,91 9,99 79,94		
122 123 124	122 123 124	BTT19990218191 CO29990218141 BTT2000218000	Bonta by Tom Tailor jopa Bonta by Tom Tailor jopa Comma bluza Bonta by Tom Tailor poškodovano	9,00 1,00 6,00 1,00	2.62 2.66 2.29 3.67	23,58 2,66 13,74 3,67	0,00 0,00 0,00 0,00	2,62 2,66 2,29 3,67	23,58 2,66 13,74 3,67	537,56 525,39 515,99 973,45 -55,33	16,39 16,39 16,39 24,58 1,64	19,99 1 19,99 1 19,99 1 29,99 1 2,00 2	9,99 79,91 9,99 79,94 ,00		
123 124 125	122 123 124 125	BTT19990218191 CO29990218141 BTT2000218000 SO19990218307	Bonta by Tom Tailor jopa Bonta by Tom Tailor jopa Comma bluza Bonta by Tom Tailor poškodovano S.Oliver brezrokavnik	9,00 1,00 6,00 1,00 1,00	2.62 2.66 2.29 3.67 4.63	23,58 2,66 13,74 3,67 4,63	0,00 0,00 0,00 0,00 0,00 0,00	2,62 2,66 2,29 3,67 4,63	23,58 2,66 13,74 3,67 4,63	537,58 525,39 515,99 973,45 -55,33 253,89	16,39 16,39 16,39 24,58 1,64 16,39	19,99 1 19,99 1 19,99 1 29,99 1 2,00 2 19,99 1	9,99 79,91 9,99 79,94 ,00 9,99		
123 124 125 126	122 123 124 125 126	BTT19990218191 CO29990218141 BTT2000218000 SO19990218307 SO49990218144	Bonta by Tom Talor jopa Bonta by Tom Talor jopa Comma bluza Bonta by Tom Talor poškodovano S.Oliver breznokavnik S.Oliver suknjič	9,00 1,00 6,00 1,00 1,00 1,00	2,62 2,66 2,29 3,67 4,63 6,33	23,58 2,66 13,74 3,67 4,63 6,33	0,00 0,00 0,00 0,00 0,00 0,00 0,00 0,00	2,62 2,66 2,29 3,67 4,63 6,33	2,57 23,58 2,66 13,74 3,67 4,63 6,33	537,36 525,39 515,99 973,45 -55,33 253,89 547,32	16,39 16,39 24,58 1,64 16,39 40,98	19,99 1 19,99 1 19,99 1 29,99 1 2,00 2 19,99 1 49,99 4	9,99 79,91 9,99 79,94 ,00 9,99 9,99		
123 124 125 126 127	122 123 124 125 126 127	BTT19990218191 CO29990218141 BTT2000218000 SO19990218307 SO49990218144 CO54990218144	Bonta by Tom Talor jopa Bonta by Tom Talor jopa Comma bluza Bonta by Tom Talor poškodovano S Oliver braznkavnik S Oliver suknjič Comma, suknjič	9,00 1,00 6,00 1,00 1,00 1,00 1,00	2,62 2,66 2,29 3,67 4,63 6,33 5,94	23,58 2,66 13,74 3,67 4,63 6,33 5,94	0,00 0,00 0,00 0,00 0,00 0,00 0,00 0,00 0,00	2,62 2,66 2,29 3,67 4,63 6,33 5,94	2,57 23,58 2,66 13,74 3,67 4,63 6,33 5,94	537,38 525,39 515,99 973,45 -55,33 253,89 547,32 658,82	16,39 16,39 24,58 1,64 16,39 40,98 45,07	19,99 1 19,99 1 19,99 1 29,99 1 2,00 2 19,99 1 49,99 4 54,99 5	9,99 79,91 9,99 79,94 00 9,99 9,99 9,99		
122 123 124 125 126 127 128	122 123 124 125 126 127 128	BTT 19990218191 CO29990218141 BTT2000218000 SO19990218307 SO49990218144 CO54990218144 SO44990218301	Bonta by Tom Talor jopa Bonta by Tom Talor jopa Comme bluza Bonta by Tom Talor po8kodovano S Oliver transformski S Oliver suknjič Comma, suknjič S Oliver bolero	9,00 1,00 6,00 1,00 1,00 1,00 1,00 1,00 1,00	2,62 2,66 2,29 3,67 4,63 6,33 5,94 5,81	23,58 2,66 13,74 3,67 4,63 6,33 5,94 5,81	0,00 0,00 0,00 0,00 0,00 0,00 0,00 0,0	2,62 2,66 2,29 3,67 4,63 6,33 5,94 5,81	2,57 23,58 2,66 13,74 3,67 4,63 6,33 5,94 5,81	537,38 525,39 515,99 973,45 -55,33 253,89 547,32 658,82 534,72	16,39 16,39 24,58 1,64 16,39 40,98 45,07 36,88	19,99 1 19,99 1 19,99 1 29,99 1 20,00 2 19,99 1 49,99 4 54,99 5 44,99 4	9,99 79,91 9,99 79,94 .00 9,99 9,99 9,99 4,99 4,99		
122 123 124 125 126 127 128 129	122 123 124 125 126 127 128 129	BTT19990218191 CO29990218141 BTT2000218000 SO19990218307 SO49990218144 CO54990218144 SO44990218301 BTT1990218201	Bonta by Tom Talicrippa Bonta by Tom Talicrippa Comma bluza Bonta by Tom Talicr polikodoveno S Oliver brenorkavnik S Oliver skenjič Comma, suknjič Comma, suknjič S Oliver toleno Bonta by Tom Talicr bluza	9,00 1,00 6,00 1,00 1,00 1,00 1,00 1,00 4,00 4,00	2.62 2.66 2.29 3.67 4.63 6.33 5.94 5.81 2.57	23,58 2,66 13,74 3,67 4,63 6,33 5,94 5,81 10,28	0,00 0,00 0,00 0,00 0,00 0,00 0,00 0,0	2,62 2,66 2,29 3,67 4,63 6,33 5,94 5,81 2,57	2,57 23,58 2,66 13,74 3,67 4,63 6,33 5,94 5,81 10,28	537,36 525,39 515,99 973,45 -55,33 253,89 547,32 658,82 534,72 537,56	16,39 16,39 16,39 24,58 1,64 16,39 40,98 45,07 36,88 16,39	19,99 1 19,99 1 19,99 1 29,99 1 20,00 2 19,99 1 49,99 4 54,99 5 44,99 4 19,99 7 20,00 7	9,99 79,91 9,99 79,94 00 9,99 9,99 4,99 4,99 9,96		
122 123 124 125 126 127 128 129 130	122 123 124 125 126 127 128 129 130	BTT19990218191 CO2990218191 BTT2000218100 SO1990218307 SO4990218307 SO4990218307 SO4990218301 BTT1990218201 BTT19990218201 CO2990103182	Bonta by Tom Talkrippa Bonta by Tom Talkrippa Come bluza Bonta by Tom Talkri polikodovano Softver breziskavnik SOliver zaknjič Come, suknjič Soliver boleno Bonta by Tom Talkri bluza Come, sukn	9,00 1,00 6,00 1,00 1,00 1,00 1,00 1,00 4,00 4,00	2.62 2.66 2.29 3.67 4.63 6.33 5.94 5.81 2.57 3.47	23,58 2,66 13,74 3,67 4,63 6,33 5,94 5,81 10,28 13,88	0,00 0,00 0,00 0,00 0,00 0,00 0,00 0,0	2.62 2.66 2.29 3.67 4.63 6.33 5.94 5.81 2.57 3.47	2,57 23,58 2,66 13,74 3,67 4,63 6,33 5,94 5,81 10,28 13,88	537,36 525,39 515,99 973,45 -55,33 253,89 547,32 658,82 534,72 537,56 608,41	16,39 16,39 16,39 24,58 1,64 16,39 40,98 45,07 36,88 16,39 24,58	19,99 1 19,99 1 19,99 1 29,99 1 20,00 2 19,99 1 49,99 4 54,99 5 44,99 4 19,99 7 29,99 1 20,00 2 19,99 7 29,99 1 20,99 1 20,99 1	9,99 79,91 9,99 79,94 00 9,99 9,99 4,99 9,99 4,99 9,96 19,96		
122 123 124 125 126 127 128 129 130 131	122 123 124 125 126 127 128 129 130 131	BTT19990218191 C029990218141 BTT2000218000 S019990218307 S049990218307 S04990218144 C054990218144 S044990218301 BTT19990218201 C02999103182 BTT29990318344	Bonta by Tom Taliorippa Bonta by Tom Taliorippa Come bluza Bonta by Tom Talior polikodoveno S Oliver sukryliš Comer, aukryliš Comer, aukryliš S Oliver bolero Bonta by Tom Taliori bluza Come, krilo Bonta by Tom Talior toba	9,00 1,00 6,00 1,00 1,00 1,00 1,00 1,00 4,00 4,00 1,00 2,00	2,62 2,66 2,29 3,67 4,63 6,33 5,94 5,81 2,57 3,47 4,54	23,58 2,66 13,74 3,67 4,63 6,33 5,94 5,81 10,28 13,88 4,54	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	2.62 2.66 2.29 3.67 4.63 6.33 5.94 5.81 2.57 3.47 4.54 3.70	2.37 23,58 2,66 13,74 3,67 4,63 6,33 5,94 5,81 10,28 13,88 4,54 7,59	537,36 525,39 515,99 973,45 -55,33 253,89 547,32 658,82 534,72 537,56 608,41 351,18 233,20	16,39 16,39 16,39 24,58 1,64 16,39 40,98 45,07 36,88 16,39 24,58 20,48 16,39	19,99 1 19,99 1 19,99 1 29,99 1 20,00 2 19,99 1 49,99 4 54,99 5 44,99 4 19,99 1 29,99 1 29,99 1 20,99 1 20,99 2	9,99 79,91 9,99 79,94 00 9,99 9,99 4,99 9,96 19,96 4,99 4,99		
122 123 124 125 126 127 128 129 130 131 132	122 123 124 125 126 127 128 129 130 131 132	BTT19990218191 C029990218141 BTT2000218000 S019990218307 S049990218307 S04990218307 S04990218301 BT19990218201 C029991003182 BTT24990318344 BTT19990318344	Bonta by Tom Talicrippa Bonta by Tom Talicrippa Comma bluza Bonta by Tom TalicripoBkodovano S.Oliver theranckawik S.Oliver budryš Comma, skrijič S.Oliver boleno Bonta by Tom Talicri bluza Comma, skrida Bonta by Tom Talicri toha Bonta by Tom Talicri toha	9,00 1,00 6,00 1,00 1,00 1,00 1,00 1,00 4,00 4,00 1,00 2,00 2,00	2.62 2.66 2.29 3.67 4.63 6.33 5.94 5.81 2.57 3.47 4.54 3.79 2.24	23,58 2,66 13,74 3,67 4,63 6,33 5,94 5,81 10,28 13,88 4,54 7,58	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	2.62 2.66 2.29 3.67 4.63 6.33 5.94 5.81 2.57 3.47 4.54 3.79 2.24	2.37 23.58 2.66 13.74 3.67 4.63 6.33 5.94 6.33 5.94 10.28 13.88 4.54 7.58 6.49	537,36 525,39 515,99 973,45 -55,33 253,89 547,32 658,82 534,72 537,56 608,41 351,18 332,33 659,70	16,39 16,39 24,58 1,64 16,39 40,98 45,07 36,88 16,39 24,58 20,48 16,39 24,58 20,48	19,99 1 19,99 1 19,99 1 29,99 1 20,00 2 19,99 1 49,99 4 54,99 4 19,99 1 29,99 1 29,99 1 24,99 2 29,99 1 29,99 2 19,99 2 29,99 2 29,99 2 19,99 2 29,99 1	9,99 73,91 9,99 73,94 00 9,99 9,99 4,99 9,96 19,96 4,99 9,98		
122 123 124 125 126 127 128 129 130 131 132 133 134	122 123 124 125 126 127 128 129 130 131 132 133 134	ETT19990218191 CO29990218141 BTT2000218000 SO19990218307 SO49990218144 CO54990218144 SO44990218301 CO29991003182 BTT19990218201 CO29991003182 BTT19990318344 BTT19990318344	Bonta by Tom Talicrippa Bonta by Tom Talicrippa Comma bluza Bonta by Tom Talicrippa Rodowano S Oliver beronckavnik S Oliver beronckavnik S Oliver boleno Bonta by Tom Talicribuza Comma, kriol Bonta by Tom Talicribuza Bonta by Tom Talicribus Bonta by Tom Talicribus Comma, Ikrio	9,00 1,00 6,00 1,00 1,00 1,00 1,00 1,00 4,00 4,00 2,00 2,00 1,00 1,00	2.62 2.66 2.29 3.67 4.63 6.33 5.94 5.81 2.57 3.47 4.54 3.79 3.24 4.66	23,58 2,66 13,74 3,67 4,63 6,33 5,94 5,81 10,28 13,88 4,54 7,58 6,48 6,48	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	2.62 2.66 2.29 3.67 4.63 6.33 5.94 5.81 2.57 3.47 4.54 3.79 3.24 4.66	2.37 23,58 2,66 13,74 3,67 4,63 6,33 5,94 6,33 5,94 10,28 13,88 4,54 7,58 6,48 4,66	537,58 525,39 515,99 973,45 -55,33 253,89 547,32 658,82 534,72 537,56 608,41 351,18 332,33 658,70 480,28	16,39 16,39 24,58 1,64 16,39 40,98 45,07 36,88 16,39 24,58 20,48 16,39 24,58 20,48 16,39 24,58 20,48 16,39 24,58 20,48 16,39 24,58 20,48 16,39 24,58 20,59 20,59 20,59 20,59 20,59 20,59 20,59 20,59 20,59 20,59 20,59 20,59 20,59 20,59 20,	19,99 1 19,99 1 19,99 1 29,99 1 200 2 19,99 1 20,99 1 49,99 4 54,99 5 44,99 2 29,99 1 29,99 1 24,99 2 19,99 3 29,99 2 19,99 3 29,99 2 19,99 3 29,99 2	9,99 73,91 9,99 73,94 00 9,99 9,99 4,99 9,96 4,99 9,96 4,99 9,98		

Figure 22: The main window in the POS application used in inventory management

Source: Own work.

There is also a special way the item is entered into the inventory through the consignment document. First, it is created in the system in the window Material/items (*Materiali/artikli*, Slo.), which is shown in Figure 23. In this window we are able to access all the information about the items that are part of the inventory management system. There are also items that are still in the store, items that were part of the inventory and the ones that are not in the store anymore. In this window, creation of new items is possible and all the attributes for each entity are visible.

Also, in this window it is possible to modify the existing items, by adjusting the barcode, the categories, the name, the price etc. After we decided that we defined the item as it should be, we are able to print out the tags for the clothing. Tags contain the information that is related to the item, such as the barcode, the name and the price. Through this window we are also able to delete each item. By doing this, the item is no longer part of the inventory system. A deleted item is possible to find in the consignment documents that were previously saved and synchronised, but any adjustments are not possible. Also, in the archive we can find all transactions and previous inventory stock reports.

Figure 23: The window 'Materials/items' in the POS application used to access and create items

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DOR		10 MIC Cha	&OS15990617181		SOther stories puli	361	15,99	1,000 22	Dodatni barcode:		aktivnih	
			&OS19990617174		SOther stories hlače	361	19,99	22	Kat.:			
,	U RACUNA:	080218182K	&OS6990617121		SOther stories majica	361	6,99	22	Naziv (opis):		omogoci izbiro	
	PREJEL:	7 Sabine	&OS9990617		Other stories superge	361	9,99	22	En mere:		CTDL tipko	
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c	POMBA:		09843254409		Esprit ženske hlače	1	37,00	22	DOD4WjaC:	V3I -	nokaži cene in	
			100000484144		Vla ženske hlače	1	20,00	22		👷 Počisti polja		
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14 - 5	121	od 134	1000286927977		Rinascimento ž.majica	1	9,99	22	Cijena iza	branog artikla		
	Zap. št.	Šŕra artikla	1000301259328		RINASCIMENTO Ž. HLAČE	201	9,99	22	s PDV-o	m i povr. nakn.:		
			1000303364228		RINASCIMENTO Ž. BLUZA	201	24,99	22		10,99		
120	120	BTT19990218	1000304199652		Rina Scimento ž. bluza	1	13.00	22	Stanje:	1.000		
▶ 121	121	BTT199902181	1000597371		Vero moda ž.obleka	1	9,99	22	Clika			
122	122	BTT199902181	100059737375		Vero moda ž.obleka	1	19,95	22	Olikd.			
123	123	CO2999021814	100059737733		Vero moda ž majica	1	9,99	22				
124	124	BTT200021800	100061687066		Selected ženska bluza	1	15.00	22				
125	125	SO1999021830	100064721612		Vero moda - majica nkratki rokavi	1	19.00	22				
126	126	SO4999021814	100069853560		Only ž.obleka	1	19,95	22				
127	127	CO5499021814	100069853636		Only ž pulover	1	5,99	22				
128	128	504499021830	100071479409		Vero moda ž.obleka	1	30.00	22				
129	129	BTT199902182	1004000054449		ESPRIT ČEVLJI	210	33,99	22				
130	130	CO2999100318	1007645		Vero moda ž malica	1	10 00	22 -				
131	131	BTT24990318						,	J Izpis etiket za izbrane izdelke	tikete za police 1	Združi artikle	
132	132	BTT199903183		🕂 Doda	Úredi 🔰	Izbriši			21	Etikete za police 2		
133	133	CO2999021819				•			3			
134	134	CO3299021820			www.pos-blagaine.	om - InfoS - I	program za gostins	tvo, traovino in stority	/e MP2-sl v2.5.6	1		

Source: Own work.

Figure 24: The window for creating the entity

🖾 🔬 Mate	əriali - šifrant					×
Šifra materiala		Generirai ěifnu	Naziv	materiala (opi	s):	
Bar Code:						
Interna šifra: Enota mere: Šitra kategorije: Stopnja DDV-ja:	1 Razno] 				
Slika:	22 %			Intrastat po Intrastat šifra	odaci a:	
				Masai	Traž	21
				0,00		a. ~
□ v	rodi naročila za materi	ial		Naziv:		
Definiranje Cen	cen na (brez DDV-ja):					
	Cena z DDV:					
	Prok	diēi 🗸 OK				
www.	.pos-blagajne.com - InfoS -	program za gostinstvo, t	rgovino in sto	oritve MP2-demo	-sl v2.5.3.3	

Source: Own work.

To create the entity a separate window is opened, as shown in Figure 24, where we enter the barcode under "*Šifra materiala*" ("Material Code"). Next, we assign the category under "*Šifra kategorije*" ("Category Code"). The price is entered under "*Cena z DDV*" ("Price incl. VAT") and the name is under "*Naziv materijala – opis*" ("Material Name – Description"). When the entity is created, it is possible to print the tag with the price and barcode and it can be entered into the delivery note, via which the quantity and the cost are then communicated sent to the inventory system and database.

4.5.3 CRM and Business Analytics

The CRM system is simple. There are two ways of receiving information about customers. The main and the most effective way of gathering information about a customer is in the store. During the sale process, as shown in Figure 14, there is a step at which we defining the customer. This part of the sale process is shown in Figure 25.

The customer may be asked if they want to become a member of the loyalty program, in which way they will benefit by having a 10% discount on all regular prices, and to be subscribed to the list of subscribers for receiving newsletters. If the customer agrees, they are provided with a form that they have to fill up with the information such as name, last name, address, city, e-mail, etc. The salesperson then assigns to the customer a code that is written on the loyalty card. Each e-mail is unique and each card number is unique, which enables the system to identify each customer in the loyalty programme list.

Figure 25: Part of the sales business process model where the customer is defined



Source: Own work.

The same e-mail address is then added to the MailChimp mailing list "Ascara Newsletters", as shown in Figure 26 below. It is crucial that the same e-mails are entered into the system in the application under the loyalty programme and the list for receiving newsletters via MailChimp. One of the reasons for that lies in the fact that the list is then used to communicate via MailChimp all the news regarding some special offers or new collections.

Customers that do not accept to be members of the loyalty programme cannot be identified in the future, even if they subscribe to receive newsletter via website, which is to be explained in more detail in the next paragraph. The only customers that can be analysed and identified are the ones that have been subscribed by the salesperson and entered into the loyalty programme list within the POS application.

	O a danin madiabilma aran (kata (0.4
P www.pos-kase.info	staumint matching convisity				Druci zaznam
Campaigns Templates	Lists Reports			Create	sta Outlet Help C
	Lists			Create List	
	Sort by Custom order. + Delete			Opt-in Settings	
	Created Jan 13, 2015 12:47 pm No racing yet	3 77.8% Subscribers Opens	0.0% Clicks	🔩 Stats 👻	
	Ascara Newsletter Created Sep 25, 2014 5:88 am X X X X X Add a subscriber	781 22.6% Subscribers Opens	2.0% Cicks	* 💑 Stats v	
	Email naslov *	hem. What's this?			
	If this person is already on my list, update This person will not receive a confirmation added manually wort have an opt-in IP an	their profile. email from MailChimp. Subscribers ldress or date in your records.			
	Subjective Cancel				

Figure 26: The window for subscribing a customer to Ascara newsletters

Source: Own work.

Another way for the customer to subscribe to newsletters is via the website Ascara.si (see Figure 27). However, this type of subscription does not enable the store to identify that particular customer or track their behaviour.

Figure 27: Subscribing to Ascara newsletters via website

Ascara - Outlet	*	Been - O ×
← → C @ ascaras	51	St :
	Domov	Kdosmo Trgovina Kontakt
		: Vsi izdelki so pri nas vsaj 50% ceneji kot v redni prodaji.
	Prijava na e-novice Prijavite se na Ascara Outlet e-novice in bodite informirani o vseh popustih, akcijah in prihodu novih artiklov. Izmal nadiov Prijava	
	Kontaktirajte nas:	f Facebook

Source: Own work.

That is why the first type of subscription is the preferred one, whereby a customer leaves their personal information, which enables us to track their behaviour. The MailChimp enables its users to get a detailed report on each of the campaigns (see Figure 28).



Figure 28: Summary report on a campaign in MailChimp

Source: Own work.

The most important part of the report for the owner of the store is that it provides us with the list of subscribers (which can also be exported) who have viewed the campaign, given that the e-mail address is unique for each customer and is entered in the form. This way it is possible to make a connection between sales by customer and the list of subscribers that have read the e-mail, thereby gaining insight into how effective the campaign was. However, this system is not that relevant due to the small number of subscribers; the actual point-of-sales is still more relevant and useful.

4.6 Data modelling and data management

As explained in the previous chapters, the company has developed some standards. Standards are important in data modelling, since by developing standards the probability for bias in the data is lower. With standards we eliminate or lower the biases in the data caused by human.

When conducting data modelling, the business rules need to play the highest and only role. In the company, they adapt the processes, the way the information is provided into the system, rules, etc. to the business needs in order to optimise and improve their service and offer. The crucial role and biggest challenge in data modelling is data management. How we enter information into the system and how we use this information are two main questions that need to be answered first.

When entered into the system, the information becomes data which actually has no meaning. To better understand why, I will explain this based on the example from my theses. Let us consider the following numbers: SO1217141, CO1017174, BTT0916132, etc. These numbers or codes has no meaning to you. However, they do become

meaningful the moment I tell you that these are barcodes. In our case, each group of items has its own unique barcode, which will be explained later. Now, these codes or numbers become pieces of information which are further used in any analysis of sales or inventory, and in that way, they represent information which is of help in the decision-making process.

Domain. A store has its own loyalty programme. The salesperson asks a customer to fill in a form. It includes all the usual questions, such as name, surname, address, e-mail and a code that links the customer to the loyalty card that they receive from the store. After the form has been filled up, the salesperson enters the information into the system. When entering the address, there is a limited number of options the salesperson can enter for postal code and city. They cannot, for example, enter a nonexciting postal code. It is impossible to enter number 12 or the letter M and say it is Maribor, the system will not allow the entry. They can only enter 2000 and the system will recognise it as Maribor, or vice versa. So, this is one example of how the domain influences the way software works by establishing a set of reasonable values.

Туре	Μ	F	С
Blouse, long sleeves	111	112	113
Blouse, no sleeves	114	115	116
Blouse, short sleeves	117	118	119
Jacket, jeans	211	212	213
Jacket, light mid-season	214	215	216
Jacket, sport, light	217	218	219
Jacket, winter	220	221	222
Trousers, elegant	311	312	313
Trousers, everyday	314	315	316
Trousers, jeans	317	318	319
Polo t-shirt, long sleeves	411	412	413
Polo t-shirt, short	414	415	416
sleeves			
Shirt, long sleeves	511	512	513
Shirt, short sleeves	514	515	516
Shorts	611	312	613
Skirt, long, middle	711	712	713
Skirt, short	714	715	716
T-shirt, long sleeves	811	812	813
T-shirt, no sleeves	814	815	816
T-shirt, short sleeves	817	818	819

Table 3: List of types of items by gender

Source: Own work.

Another domain that exists are the categories for clothing. Firstly, there are certain brands and their acronyms. For instance, the Levi's brand has the LE, Springfield has the SP, AmyGEE has the AG, Lee has the LEE and Signal has the SI acronym. So, for each brand there is only one option. Secondly, if we look at the clothing categories, the list is longer. Let us consider only the main categorisation of clothing used by the company. In the first column, we can see the "Type", which is divided into 7 categories, further on divided according to the length of sleeves, season and type of use. The second column tells us who the type of clothing is meant for: male, female or child. This information, based on type and gender, becomes one part of the barcode.

Entity. it is crucial to identify the entity. This includes employee entity, administrator entity, clothing and service.

Names. If we consider our example, we can define the barcode as a name.

There is another type of name and it is for a group of articles that have been delivered at the same time from a particular supplier. A group of articles always receives a name, which is actually a code by which we categorise the articles. Let us consider our example. A group of particular items were delivered on March 2018, from a supplier No name and it was 3 lots. Thus, they received the name 18NN305, whereby 18 represents the year, NN represents the supplier, 3 represents the number of lots and 05 represents the month.

There is also a code that each customer receives when they become member of the loyalty programme. In that case, e-mail address is also used as a name.

Predicates. In our case, if we consider transaction processing, the predicates are the transaction date, transaction number, transaction type, transaction amount, etc. All this information can be seen on the receipt, but organised differently.

If we consider the products that are sold at a particular date or period, then the predicates are barcode, transaction number, discount, quantity, name, price, selling price.

Relationships. In both the transaction and the sales base, we have a unique identifier. Based on what we want to analyse or show, we make relationships. If we want to see how many transactions there were and the amount of a particular product, we create a relationship by connecting the transaction number from the transaction summary with the transaction number in the sales base – one to many relationship.

4.7 Database

Data are automatically and periodically processed. The first purpose of this action is for all the non-approved receipts to be approved by the tax authority. In case a receipt has already been approved or is being approved, in the next automatic processing/updating of data it will not be processed. Another purpose of this is to synchronise all the data with the server and to save it into the cloud. In this process, everything is updated into the cloud, from receipts to articles entered into the system, loyal customers, sold items, methods of payment, etc.

In addition, this system and especially the cloud service enables the transfer of articles between two applications and the database. Figure 29 demonstrates the flow of data and information.

There is currently the main database, where all items and transactions are stored, all delivery notes synchronised and everything is then archived. Data is entered from the store, by different means and through different processes, such as sales or inventory management. When the item is entered into the system, and adjusted, it can also be transferred, via interdelivery notes, whereby the items are transferred from one location to the other. It is done by subtracting the quantity of items that are in the system and adding the same items via delivery note to the database of another database.



Figure 29: The flow of data and information

Source: Own work.

In the main database, all the items that have been transferred from one store to another are stored, even though they are also stored into the database of another store. Of course, they are saved with different attributes and in different tables. For example, they do not belong to the "stock on hand" table, but to items that are moved. As shown in Figure 29, the transfer is possible in both ways.

As already mentioned, the stock adjustments are possible at points of sale when we sell something. However, it is also possible to adjust the stock if a customer is returning the item. They may simply be returning it and not buying anything else instead, or they may just be exchanging an item for something else. In the first case, we subtract the items from the table of items that has been sold and increase the quantity for the number of items that has been returned. In the second case, we add back item as in the first case, and subtract the item that customer took instead. Of course, if there is a difference in the prices, it should be covered by the customer or the store.

Figure 30 shows the flow of the same information between the hardware, the software and the web server. For every hardware there has to be software installed to enable further communication with the web server and update the data in the cloud. Together with the software, the database is also integrated. On the web server, there is an application through which the updates on the server are enabled. To access the cloud information, you need any type of hardware, internet and browser, via the same web server application. In our case, there is also a database on the web server, since there are two stores, and two application are used, which represents two different sources of data. The data is synchronised to the main web database via wide area network.



Figure 30: Flow of data between hardware, software and server

Source: Ješarević (2016)

5 NEED FOR DATA MANAGEMENT AND ANALYTICS

The main purpose of and need for data analytics is looking for recommendations that will make businesses more profitable or efficient.

Due to the fact that the business from our example is categorised as a small- and mediumsize enterprise, all decisions are made by the director (as is usually the case), who is at the same time the owner of that business. In our case, the owner does not participate in direct sales, his responsibilities are monitoring the processes, monitoring the inventory and the sales, placing orders and other administration tasks. He covers all the vital activities for the business to survive. Of course, even though he uses insights from his workers, he relies mostly on data. In order to make the right decision, he needs an easy access to data and real-time information.

As it is a small local business, there are a few key performance indicators (hereinafter KPI's) defined by business needs that play the main role in decision-making. The KPI's are discussed with the owner of the company, whereby he briefly describes their importance in his decision-making process.

These are:

- Margin
- Inventory turnover⁷
- Gross margin return⁸
- Sales count⁹
- Average transaction value
- Product returns¹⁰
- Customer behaviour and season trend

Based on these indicators, the owner makes all decisions regarding its business. For decision makers, i.e. business owners, it is important to have the correct, accessible and up to date data.

Information provided by the analytics is the main trigger in making any decisions, especially when planning in advance, for example, for the period of one year. Figure 37 shows the correlation between the information system and the technology with the information process and the needs for analytics. It is presented as a harmonised ecosystem whose components are correlated and integrated into one another. This is especially the case with the information system and the technology with the information process, that in the end play a crucial role in connecting the business processes and the needs of analytics.

⁷ Inventory turnover measures the rate at which stock is sold. We calculate stock turn using the formula Cost of Goods Sold / Average Inventory. (Nicasio & Stanley, n.d.)

⁸ Gross Margin Return on Investment tells you the amount of money you got back (i.e. ROI) for every euro you spent on inventory. (Nicasio & Stanley, n.d.)

⁹ Sale count refers to the number of transactions completed in your store. You can easily find this by looking at your POS data. (Nicasio & Stanley, n.d.)

¹⁰ Product return tells you the percentage of product return. A high product return rate could indicate problems in merchandise quality, customer service, or even marketing. (Nicasio & Stanley, n.d.)



Figure 31: Correlation between the information system and the technology with the information process and the needs for analytics

Source: Own work.

In this part, I will sum up all the needs, pitfalls and potential solutions related to the analytics and the correlation between the business processes and the information processes with the needs for analytics.

5.1 Current situation of business process correlation with the need for analytics

The most used means to get constant access to information on sales is through a cloudbased POS application, which enables that all data on sales are stored on the server and then accessible through this application. The only thing that is required to enable the use of this application is to have a valid username and password, as well as the Internet connection. Accessing information is possible by logging in through a website on Chrome or Opera browser.

L .	27	ין יוי וי ת	C	1. 1 .	· ·	C	· · · 1	1
HIGHTO	47.	PACCIDILITIOC	tor	dignlawing	intormation	nt nn	int of cale	hy store
IIIIII	54.		101	uisdiaving	mormanon	$v_1 v_2$	<i>ini oi suie</i> .	UV SIDIE
			<i>J</i> -	r i i i i i i i i i i i i i i i i i i i		- J F -	· · · · · · · · · · · · · · · · · · ·	

ZA GOSTINSTVO, TR IN STORITVE	II US GOVINO POS		
oprodaja - poročila Promet po prodajalnicah	19.03.2016.	Do: 19.03.2016.	Potrdi
Promet za obdobje Promet po izdelkih Promet po chupingh izdelkov	Promet po pro	odajalnah	
Promet po kategorijah	ŠTEVILKA	NAZIV	SKUPAJ Z DDV-jem
Promet po mesecih	1	P001-Ljubljana	646,44
Promet po dnevih	2	P002 - Novo mesto	78,37
Promet po strankah			Sum=724,81
Promet po karticami kupcev	Export	t	

Source: Own work.

For accessing information on a daily basis and to be able to do a quick check on sales, as well as to view sales for the whole week, month or year, this is the perfect solution. Also, the application, if previously adapted to the user's needs, provides the view of sales in different dimensions, such as over time, by shop, by item, by category, by day, by customer, by employee, etc. These dimensions can be manipuleted and adapted to user's needs. Figure 32 shows a list of all possibilities to present sales, while sales by store for the date 19.03.2018 is selected. I chose this date randomly, and after I came to an agreement with the owner that the sales on this date are of no relevance to him, I could use this for demonstration.

Figure 33 shows the possibility to present sales by item. From the picture it is evident that there are 10 rows that represent the attributes to each of the items. First, we have the key, the barcode, then the name, measure, cost of goods, selling price before discount, quantity, discount (%), margin (%), net revenue and selling price with tax after the discount. It is also possible to sort the table by descending/ascending discount, price or quantity.

Figure 33: Possibilities for displaying information of point of sale; by article

oprodaja - poročila										
Promet po prodajalnicah	rodajalna VSE	•								
Promet za obdobje	d: 19.03. VSE	Hala A	2016.		P	otrdi				
Promet po izdelkih	02-Novo mesto									
Promet po skupinah izdelkov	Promet po izdelki	h								
Promet po kategorijah										
Promet po mesecih Promet po dnevih	BARCODE (Sifra)	NAZIV	EN. M.	NAB. NETO EN.	CENA BREZ POPUSTA	KOL	POPUST (%)	MARŽA (%)	ZASLUŽEK NETO	SKUPAJ Z DDV-jem
Promet po strankah	11003111510399	ESPRIT BLUZA	kom	7,34	19,99	1,00	40	33,82%	2,48	11,9
DBAdmin	11004052015218299	ESPRIT ČEVLJI	kom	3,60	39,99	1,00	50	355,43%	12,79	20,0
	110070915100149	ESPRIT Ž. HLAČE	kom	4,81	19,99	1,00	70	2,26%	0,11	6,0
	110070915853149	ESPRIT MIX OBUĆA	kom	3,61	22,99	1,00	10	370,29%	13,35	20,6
	11009101510239	ESPRIT Ž.MAJICA	kom	3,60	7,99	1,00	10	63,71%	2,29	7,1
	11011081510259	ESPRIT Ž.MAJICA	kom	3,60	7,99	1,00	10	63,73%	2,29	7,1
	110201015100129	ESPRIT Ž.HLAČE	kom	3,71	19,99	2,00	50	121,03%	8,98	20,0
	110201015120199	ESPRIT Ž.SUKNJIČ	kom	3,60	26,99	1,00	30	330,10%	11,88	18,8
		FSPRIT								
					•••					
	TT9998	TOM TAILOR MAJICA	kos	2,32	9,99	1,00	40	111,95%	2,59	5,9
	TT999916	Tom Tailor majica	kos	0,00	9,99	1,00	0	0,00%	8,19	9,9
	TT999916	Tom Tailor majica	kos	0,00	9,99	1,00	10	0,00%	7,37	8,9
						Sum=61.00			Sum=476 79	Sum=774 8

Source: Ješarević (2016)

Figure 34 shows the view of revenue/sales by loyal customer. With this information, it is possible to measure the effect of campaigns that are communicated via e-mail. For this matter, the company is using the MailChimp as a tool to communicate campaigns to the loyal customer and other subscribers to newsletters.

Figure 34: Possibilities for displaying information of point of sale; by customer

.03.2016.	Do: 19.03.2	2016.	Potrdi		
Promet po karti	cami kupcev				
NAZIV/IME STRANKE	OZNAKA KARTICE	ŠT. PRODAJALNE	SKUPAJ Z DDV-jem brez popusta	POPUST	SKUPAJ Z DDV-jer
	101000186	1	7,99	10	7,1
Anita Š.	101000236	1	33,99	10	30,5
Majda Č.	101000239	1	67,95	10	61,1
Majda Č.	101000239	1	36,96	40	22,1
Majda Č.	101000239	1	22,99	50	11,5
Petra Tobias	101000238	1	19,99	40	11,9
JANEZ NOVAK	101000110	1	9,99	10	8,9
JANEZ NOVAK	101000110	1	24,99	50	12,5
NUŠA M.	101000059	1	33,98	10	30,5
					Sum=196,6
Export					

Source: Ješarević (2016)

Figure 35 shows a list of subscribers that have opened the newsletter, which can be used as the primary key to connect to the database of our loyal customers and in that way get insight into whether the customer has made a purchase in the store in that discount period.

Subscriber Opened Report X							– a ×
← → ♂ ● Varno https://us9.admin.mailchir	np.com/reports/activity/ope	ned?i	d=2789629	9#p:1-s:25			Q # 1
www.pos-kase.info							Drugi zaznamki
Campaigns Templates Lists Reports							Creater Couliet + Help Q
-	wrather many - and	~~~	and a sector	NUM SHITS	annera renegosaree		
	Opened						
	Export As CSV					1 - 25 of 180 >	
	Email Address		Opens N	Member Rating	Last Changed		
	alina.neculcea@gmail.com	>	1 7	**okoko*	2/19/16 10:57AM		
	katarinaprevec@gmail.com	>	1 7	*****	1/18/18.2:11AM		
	pavlovic.brigita@gmail.com	>	1 7	****	9/22/15 4:56AM		
	kastelic.andreja@gmail.com	>	1 7	****	3/17/17 1:SAPM		
	mojca.omahne@gmail.com	>	1 7	****	10/31/15 6/21AM		
	1zvezdika (§gmail.com	>	1 7	****	2/6/16 3:20AM		
	ines.ribaric@gmail.com	>	1 7	****	1/13/15 1:05PM		
	ariacinaxyiğgmail.com	>	3 7	****	9/4/17 2:02PM		
	1iea.vidmar@gmail.com	>	1 7	****	12/3/17 5:00AM		
	nadia.podobnik@gmail.com	>	1 7	****	3/9/17 1:00PM		
	zderika glavac@triera.net	>	1 7	****	3/13/17 5:35PM		
	boro_saska@hotmail.com	>	1 7	****	7/12/16 3:30AM		
	santazija@gmail.com	>	1 7	****	9/25/14 9:53AM		
	blanka.dornik@gmail.com	>	1 7	****	9/25/14 9:46AM		
	vetic.monike@gmail.com	>	1 7	****	7/17/17 5:40AM		
	matejak.plesac@gmail.com	>	1 7	*****	1/13/15 1:34PM		
	bojana.struna@bayer.com	>	2 7	****	2/22/17 1:10AM		
		_					*

Figure 35: Report on the campaign on MailChimp

Source: Own work.

5.2 Main pitfalls resulting from no correlation between analytical needs and business processes

Figure 32 shows some articles that have unmeaningful barcodes. This was the case two years ago, when there was still no system of entering items. The barcode was therefore randomly generated, without any meaning behind it. Similarly, there was no categorisation of items by type, by time the item was received or by supplier. The only information used to describe the item was name, price and quantity. For the employees and the owner, it was hard to follow and track the sales in general and to connect the pace and profitability with a supplier or a type of item.

During the sale period, there was the practice of discounting all previous collections, while the new collection was sold without any discounts. For a salesperson, it was hard to say which article was from the previous and which was from the new collection. There was nothing that would help differentiate a new article from an older collection article. It was also impossible to connect data and tables on the server. It took a lot of time to link an item to a delivery document.

After realising this problem, and what a huge effect it had on processes, performance and decision-making, it was decided that some immediate action needed to be taken. So, the first step was to define the entities, then the attributes and the relationships. Everything else came after. With having the clear picture of what the entity was for the employees and the system, developing the system and defining the processes so that analyses could

be conducted went on naturally. When these correlations were created, the information was accessible and deeper insights into sales were finally possible.

From there on it was easier to read data and transform it into useful information. Finally, the tag with the barcode attached to an item now tells a lot about the item to a salesperson. Moreover, by adding attributes to entities, such as type of clothing, category, date of delivery, supplier, quantity of sold item and price of goods, gives a lot of insight to the owner so he can make a good decision. It is also possible to quickly check for how long particular items are on stock and whether they should be discounted and by how much.

It is important that the employee understands how entities are created. When entering an item into the system, it is also important to understand the rules on how a barcode and category are created, as well as the names that are used. If any of this is not done in the way it has been predefined, this can affect the results of analytics. For example, a relationship can be reversed and a specific entity cannot be monitored in a way it should be, there is no information on when the article arrived, how much it cost, what type of article it was, from which supplier, etc. To sum up, it is important for the employee to understand the instructions and to adhere to them. The human factor plays the most influential factor.

There is another factor that affects and limits the possibilities of analytics and that is the technology. It would be useful to be able to measure the number of customers that entered the store and to see the rate of customers that made an actual purchase. This technology is available; however, it is something that is not of vital importance to the business.

What is especially interesting in retail is the psychology of prices. There is a certain price that each person would pay for an article, but the best price is the one that covers your costs, brings your margin and which a certain number of people is ready to pay for. There is a thin demarcation line between the ideal price and a price that is too low or too high. If you increase the ideal price by no more than 0.5 cents, you reduce the number of people that are ready to pay for that particular article in half. However, having too low prices can affect customers' confidence and certainty that you sell high-quality goods. Also, you lower your opportunity to earn more.

Another useful insight is that you are always able to review your pricing policy. If 2/3 of the same item have been sold at regular price, without discount, then that is the ideal price. If 2/3 of the item have been sold with the discount of 30% or more, it means that the item is staying in the store for too long and the price might be set lower to push the sales of that item. Discounting is not always a good idea. Items must be sold at their regular prices.

One of the biggest goals of the management is to enable automatic discounting of items. The idea is to be able to programme the job for the app to discount certain items based on the date when the item has touched the shelf. First, 4 characters from the barcode from no. 6 to no. 11 are subtracted. The four characters that have been subtracted should be formatted as date. Then we can choose that all items with dates between 01.01.2018 and 31.03.2108 are discounted by 30%. What should happen then is that whenever an item that has reached the shelf (entered into the system) between 01.01.2018 and 31.03.2018 is scanned by a salesperson to issue a receipt, the application discounts that item automatically by 30%. It is a great solution for turnover of the items and a faster in-flow.

There is also a problem regarding auto discounting of items. To the system it is easy to communicate which items are discounted. On the other hand, it is almost impossible to communicate the discount to the employees and customers. With the customer, we can communicate via discount tags that are attached to the items by a salesperson. Finally, we come to the crucial intermediary in the process – the employee. It is impossible to ask the employees to attach price tags with the sign "30% discount" on all items that arrived at the store from 01.01.2018 to 31.03.2018. They will not know from where to start and it will for sure be a waste of time to check all the barcodes and look for the 4 characters that represent the date from that particular period.

Of course, when thinking about the need for analytics, one should have good background in informatics and information technology. Otherwise, it will cost a lot more, even if the system is simple. When lowering the price, for example, the flexibility of the system is lower. Due to this, a company needs to have an owner with the vision and understanding of the matter. If this is not the case, a person specialised in that should be employed. It is important to establish informational processes in a way that they are integrated, functional and, last but not least, in line with business processes. Most of the time this is not the case, given that for a company going in the direction of such an integration of the system and informational processes without any of the members in the company having any knowledge on that, is hard and costly.

5.3 Overview of all future possible improvements in order to improve correlation between the needs for analytics and the business process

It is important that business processes are correlated with the business needs and analytical needs. In the correlation between the analytics and the business process, the main role is played by human or, to be more specific, the employee.

When we made the step forward by defining the rules how the entity is defined and what the attributes that belong to the entity are, we forgot to include one crucial feature. As an outlet store, it often happens that after a certain time, the items can be repeated, in other words, the same items can be delivered by the supplier during a different period the same year. If, for example an item was sold out, and the same item was then supplied again, it was hard to connect that item with the previous one to assign the same price. There was a high probability that the same articles would be tagged with different prices. It is possible to control the price policy and to ease the way and reduce the time that is now used in the process of assigning the price and entering items into the system. Each delivered article has its own label; Figure 36 below shows two labels of different articles and trademark. For your convenience, I circled the codes on the labels. These codes are used in a regular store to describe or identify an article. If you type these codes into your browser, you will be able to get the picture of that article.



Figure 36: Two labels of two different articles from two different trademarks

Source: Own work.

Articles htat are the same also have the same codes. Thus, when the items are delivered, there should be a database of items with the original code from labels that belong to the price range and the barcode range. Let us consider the example in Table 4 that demonstrates the logic behind this. Each code from a label belongs to a certain barcode. It is possible to make this list by scanning the barcode and the item code from the label. When the database is made, it is then possible to automatically generate the barcode of that delivered item in case it was delivered before and was already in the system.

If the item is delivered by the supplier for the first time, the regular process for assigning the barcode, the price and the category is carried out.

BARECODE	SO39990518171	CO244990817121	CO52990318220	TT13990518121	BTT25990917111
1	11.505.76.4621	81.705.32.5946	81.806.82.4450	CA 57587	B06Y12KVW5
2	04.899.73.3179	81.604.13.2897			
3	81.701.33.8727				
4					

Table 4: List of codes from labels of items in stock by barcode

Source: Own work.

Figure 37 represents the to-be business process model of entering items into the inventory system, whereby the difference from the previous as-is model shown in Figure 14 is in the additional step. Earlier (Figure 17), entering an item into the system was done by simply searching through the category price list. In such a case, as already mentioned, a problem arises if for the same item a different price is assigned. Automatically, therefore, the same item is not the same entity, which then affects the results of analytics. To avoid this problem labels for a list of all items that are currently in stock are stored and to each label attributes are assigned to defines them and make each group of items unique. Entering items piece by piece is waste of time for this kind of store. Thus, the code from the label is entered into the database which is like an archive of all codes that are distributed by their respective barcodes. A single barcode can be used for several items, but what they have in common is the brand they all belong to, the price, the date of delivery and the type of clothing.

When the item is scanned during preparations for entering it into the inventory system, it can also be on the list. In this case, the only thing that is taken is the part of the barcode that represents the brand, the price and the type of clothing. The date, of course, varies depending on the date of delivery. Adding this additional step, requires additional time, especially at the beginning when preparing the list of labels. However, it improves the results of the analytics, since in this type of a store, items are often repeated. Also, this improves the relationship with the customers. It is not advisable to be caught in changing the prices all the time, especially not in the case when a customer has bought it for the higher price than it was assigned afterwards.



Figure 37: To-be business process model of entering items into the inventory system

Source: Own work.

This will help analytics as we are able to see that the same products are sold for the same price. That way it is always possible to gain better insight into the diversity of the items

that are delivered by the supplier. This gives the answer to the question "Are we constantly receiving the same items?", because for a manager it is difficult to go through all the items to see if they are the same. In the same way, we can check if the quantities of items that we receive are each time the same. That way, it is possible to have a real picture of both the items that repeat and the times they repeat.

The best idea would be to not print the tags but to have them as plates that can be communicated wirelessly. So, when the article needs to be discounted, it would be coloured in green, when it is discounted by 50% it becomes yellow and, finally, red for a 70% discount. That way we would be able to communicate with the employees and customers on the spot, in a simple and easy way. What is more, this makes the process of pricing the item more efficient.

Regarding this idea, the digital price tags, there are products that already offer such solutions. One of the many solutions I found online is the EllaFashion Solution that offers digital price tags based on the e-paper technology (MariElla Labels, 2018). However, the integration of this system requires a lot of investment and IT support, which is at this stage of the business not that necessary and not as affordable.

Table 5 represents the complete overview of the segments where changes are required, the needs that cause these changes, the proposition, the benefits of these changes and the possible barriers for not implementing them successfully
Table 5: Overview table of needs, propositions, benefits and pitfalls

Changes required	Needs	Proposition	What are the benefits	What are the barriers
in				
Defining the data (Data Management) and employees' behaviour	Defining the Entity	Clear rules how to define Entity. Integration of Domain to lower the possibilities of incorrect Entities.	Correlation between processes and analytics is possible.	Human behaviour may affect the definition of Entities, since it might or might not stick to the rules.
Business processes and information processes	Defining the Pricing Policy	Archiving the code from the label of each item under price, clothing category and barcode.	The same item is defined as the same Entity, so when conducting the statistics, we know that it is the same item, otherwise it will be recognised as a new item and defined as a unit. This way history and statistics are not lost for that item, segment, etc.	A separate database needs to be created as well as a relationship with other tables and entities. It requires investments into the application and the human resources to create the database.
Business processes and information processes	Defining the Discount Policy	Rely on the part in the barcode that defines when the item is entered into the system to make automotive discount. When item is scanned, it should be automatically discounted by the pre-defined amount depending on the date it has been entered into the system.	It is easier to track how long items stay in the store, easier and more precise information on turnover and better sales.	It is easy to implement rules into the system. However, it is hard to communicate the discount to the employees and the customers.

Source: Own work.

CONCLUSION

In this thesis, the importance of standardisation of processes is emphasised. Regardless of how big a business is, it ensures efficiency and effectiveness in each part of the business. With standardised processes it is easier to coordinate business in a way that it provides necessary information for analytics. It is also easier to model and improve the business. Standardisation can also be applied to how some of the processes are carried out, who is responsible for what, how things are defined, etc. Besides ensuring efficiency, it also improves clarity and simplicity, which is crucial for small- and medium-sized businesses.

Small- and medium-sized enterprises represent a competitive and dynamic sector. There is a constant struggle with highly competitive pressure, so every decision they make needs to be well backed up by a good reason, since slack of resources are often scarce or nil. Due to their usually unique and unstructured style in management, it allows them to be flexible to every change on the market and within their business, bringing them closer to their markets and customers. Regarding IT investment, decisions to adopt a specific technology, regardless of whether it is hardware or software, are in many cases driven by personal attitudes or perceptions of the firm's owner, based on its own cost-benefit or strategic analysis.

In my thesis, I have placed data management and data modelling at the centre of attention due to the importance and the impact they have on the correlation between business processes and because they enable providing information to the business owner in the decision-making process.

From Figure 31 above it is evident that the information system supports the information process, which in turn provides all the information necessary for analytics. Within that kind of business system there are business processes that are integrated with the information processes and have a huge influence on the performance and quality of information processes. However, if we go back to the beginning of the problem, in order to satisfy the needs for analytics, as already mentioned above, we have to focus on data management and data modelling.

When modelling data, it is important to keep in mind the needs for analytics, so that the data which provided via the system is useful, up to date and valid. Also, we need to take into account the capabilities and limitations of the system. If we are aware of the capabilities, it is possible to get the best from it, while knowing the limitations makes it possible to find other solutions by replacing or adjusting it. By having an aim, we are correlating business processes with the information processes to satisfy the needs for providing a database containing high-quality data.

In data modelling, data management plays the main role. It is important to keep the simplicity while structuring your data, especially when we are defining the entities. It is important to define entities, because attributes are closely related to them, as well as the predicates and, finally, relationships. When defining entities, we need to understand the business and look at the situation from its point of view, since it keeps our data relevant for the business.

An employee's behaviour and acting has a great impact on the quality of the data and, hence, the results of the analysis. In small- and medium-sized companies, it is important to have an overview of the business situation. If the company is not so small as to have the owner as its only employee, there must be other ways to maintain control over the business and to always be up to date with all the trends and happenings. The best way to accomplish this is to have a system that provides them with all the necessary information. Even small companies can be harmed by the poor-quality data.

The example discussed in this thesis suggests that the system needs to be simple and clear. It was easier to demonstrate this on a less developed business. However, it was the best example for reminding us on the basic principles and how the business should be developed from the very beginning. Today's best examples are the Fintech companies. If a company wants to grow quickly and in a healthy way, it needs to be tech-oriented and in constant contact with the market and its customers. With a simple system, it is easier to grow and to improve, in pace with the growth of the business.

During the interview, the owner of the business from our example talks about a crucial point. He states that humans are often led by their emotions. The human memory is limited and the information we receive can be understood differently, which then has a great impact on our decision-making. That is why he sees a lot of benefits from having well-structured and high-quality data that is always accessible for conducting analyses which play a crucial role in his decision-making process. With this, he is confident that he can make the right decision or improve the previous ones.

The company in question, Ascara, demonstrates good coordination between the sales, the inventory and the transaction system. That helps the business to improve operations and reduce costs by preventing duplication of entries. It enables the business owner to track inventory effectively, in which way it enables quick response to customer requests, with no need for double-checking weather this information matches the sales database and the transaction. Accessing data easily allows the business to be able to identify opportunities to improve the current situation or create something new. In other word, it enables the possibility of conducting the analysis with high-quality data, regardless of the size of the business.

It is always good to see opportunities for improvements, even though sometimes the solutions seem unrealistic to be achieved and not affordable. However, it is important to

strive for the best and maybe there will be an option for an alternative to the original solution. Alternative solutions can be as beneficial as the original solutions and cost less. This type of strategy and mind-set of the owner enables having a profitable business and its future growth.

Given that the real-life example used in this thesis is an SME, belonging to the category of a micro business, the company in question was very limited in terms of technology and possible future innovation. Regardless of that, my thesis demonstrates the importance of implementing the basics of data management and data modelling from the very beginning. The results in the revenue and turnover segment of the researched company show that the implementation of the principles of data management and data modelling at the beginning to support and satisfy the needs for analytics, when things are not yet so complex, is important for the future development and growth of the business. There is one more limitation that I was faced with when I was conducting the research and monitoring the influence of the practice demonstrated in my thesis: the duration of the business. The lack of history archived in a way that it would be possible to conduct proper analysis and compare the effects before and after the implementation makes the whole thing difficult. The archives exist for the last 3 years, but only during the last year and a half was the data structured in a way that would make this possible. Thus, the effects of the implementation of the basic principles of data management and data modelling could only be checked for the period starting in 2017.

The aim of my thesis is to demonstrate on the real-life example the general rules and importance of satisfying the needs for analytics by adapting the business processes and information systems in such a way that they enable the conducting of analysis. This analysis has a positive impact on the better understanding of the business, opportunities for improvements and better decision-making. Regardless of the size of a business, data management and data modelling, together with discipline among employees regarding the data hygiene and understanding the business, plays the most important role in existence of a business in nowadays world and close future.

In the future, it would be very useful to compare the way data management and data modelling is used and implemented in this example, comparing it with other businesses, regardless of their size, within the same industry. It would help us to have better understanding of the importance of proper data management and to also find better and more innovative solutions and practice.

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APPENDICES

Appendix 1: Povzetek (Summary in the Slovene language)

Poslovna analitika danes ni več nobena novost, lahko pa trdimo, da nove tehnologije in tehnološke zmogljivosti, ki se ves čas nadgrajujejo in razvijajo, omogočajo poslovnim uporabnikom s povprečnim poznavanjem tehnologije, opravljati zelo natančne analize in hkrati podajajo podatke uporabnikom na razumljiv način. Gre za napredno samopostrežno analitiko, ki poslovnim uporabnikom omogoča manipulacijo s podatki brez potrebnega znanja v visoki statistiki ali informacijski tehnologiji (IT) (Rouse, 2014).

Večina gospodarskih dejavnosti poskuša optimalno izkoristiti obseg informacij ter podatkov z namenom večanja povpraševanja po njihovih izdelkih ali storitvah in hkratnega zmanjševanja stroškov. Poslovna analitika zahteva pametno uporabo podatkov in informacij, ki jih imajo gospodarski subjekti na voljo in na ta način spodbuja inovativne rešitve ter ideje, s katerimi lahko podjetja presežejo druga podjetja ter pridobijo konkurenčno prednost. Je pa potrebno poudariti, da ogromna količina poslovnih informacij, ki prihajajo v različnih oblikah, ustvarja nemalo izzivov, še posebej v maloprodajnem segmentu. Nova tehnologija namreč omogoča, da se tudi potrošniki povezujejo, imajo večjo moč in so bolj zahtevni kot kupci. Sami izbirajo, kje, kako in kdaj bodo nakupovali. To je dejansko trg potrošnikov (LeClaire, Dahlstorm, & Braun, 2014, str.5).

Pogosto vprašanje, ki si ga danes zastavljajo podjetja je: kdo je naša stranka? Kako pogosto kupi naše izdelke ali uporablja naše storitve? Kupci danes pustijo svoje sledi skoraj povsod. Tudi takrat, ko ne kupijo ničesar, lahko podjetja zberejo podatke o njih. Preprosto brskanje pa spletnih straneh podjetja, mobilno iskanje, odgovarjanje na anketo, informacije s strani zaposlenih, komunikacija s klicnimi centri in navsezadnje nakupi produktov, so kanali preko katerih lahko najdemo informacije o naših aktivnih ali potencialnih kupcih. Odtisi, ki jih puščajo kupci, so sledi, ki povedo, kdo so naši potrošniki, kaj, kje in kako pogosto nakupujejo, kdo vpliva na njihove nakupne odločitve in še veliko več (LeClaire, Dahlstorm, & Braun, 2014).

Poslovna analitika ima danes na voljo napredne tehnologije in aplikacije, ki podjetjem ter organizacijam omogočajo zelo podrobne vpoglede v svoje podatke ter informacije, ki posledično olajšajo in ponudijo optimalne poslovne odločitve. Ko ima podjetje jasno sliko o tem, kdo so njihove stranke, lahko oblikuje prilagojene ponudbe ali ponudi popolnoma butične uporabniške izkušnje posamičnim skupinam kupcev. Spletne ocene produktov ali storitev ter priporočila strank danes nadomeščajo tradicionalna ustna izročila, ki imajo močan vpliv na nakupne odločitve, hkrati pa omogočajo velik doseg.

Novi kanali nakupovanja so ves čas v porasti. Mobilni telefon je danes osnovni pripomoček, ki strankam omogoča stalno seznanjenost, povezanost, dostopnost in interaktivnost, kar pomeni, da se je kompleksnonst kateregakoli segmenta v industriji, ki želi razumeti tako vedenje svojih kupcev kot tudi njihove nakupovalne vzorce, v zadnjih

letih precej povečala. Poznavanje in razumevanje svojega kupca je zahtevno, kompleksno in drago, a le tako lahko podjetja varujejo svoj položaj na trgu.

Po drugi strani se moramo zavedati, da je poslovna analitika lahko tudi neuporabna ali celo škodljiva za podjetja, ki nimajo strokovnega znanja s področja upravljanja s podatki. V informacijski tehnologiji je že dolgo znano, da kakovost vhodne informacije vpliva na kakovost rezultata ("garbage in, garbage out") (Sharpened Productions, 2015). Da preprečimo slab ali celo škodljiv rezultat poslovne analitike, je strokovno poznavanje upravljanja s podatki prvi korak, ki nas vodi v stukturirano obdelovanje podatkov po principu veljavnosti, zanesljivosti in uporabnosti. Le tako bomo lahko z analizo dobili zanesljive in "dobre" rezultate. Cilj upravljanja s podatki je izboljšati kakovost podatkov in povečati korelacijo med poslovnimi procesi tako, da se med seboj podpirajo. Eden izmed načinov je modeliranje podatkov (Gordon, 2007). Modeliranje podatkov poudarja pomembnost modrega tiska in procesa dokumentiranja za namene doseganja visoke kakovosti podatkov in korelacije med poslovnimi ter informacijskimi procesi, hkrati pa na ta način lahko lažje vzdržujemo naše poslovne sisteme in jim tako podaljšamo življenjsko dobo.

Zelo pomembno vlogo modeliranja podatkov ima podatkovna struktura, ki predstavlja temelj oziroma naše jedro, saj smo dnevno soočeni z obilico podatkov in informacij, za katere želimo, da so za nas uporabni, produktivni in kakovostni, kar je osnovni namen poslovne analitike. Da nazorneje pokažemo pomen modeliranja podatkov, lahko uporabimo primerjavo turistične karte in klasičnega zemljevida nekega mesta. Če bomo turistu ponudili klasičen zemljevid, ki sicer vsebuje vse podrobnosti mesta, bo lahko zamudil najbolj pomembne znamenitosti ali točke, morda se bo lahko celo izgubil, saj zemljevid vsebuje veliko preveč podatkov na enem mestu. Če pa mu ponudimo prilagojeno turistično karto, obstaja večja verjetnost, da bo obiskal glavne znamenitosti in predele mesta (Schmidt in Warren, 1998).

Namen obstoječe magistrske naloge je preučitev pomembnosti korelacije med poslovnimi procesi, informacijskimi procesi ter poslovno analitiko s pomočjo modeliranja in upravljanja podatkov v samem jedru korelacije, ki hkrati omogoča to povezavo.

Najprej sem se osredotočila na osnove, ki morajo zadostiti teoretičnemu konceptu za vzpostavitev pravega informacijskega sistema. Ugotavljala sem na kakšen način je potrebno strukturirati podatke in kako oblikovati bazo podatkov, pri čemer sem prikazala najboljše prakse oblikovanja podatkovnih baz in tudi možne negativne posledice, če si za ta proces ne vzamemo dovolj časa. Z nalogo želim prikazati vzajemne povezave med poslovnimi ter informacijskimi procesi ter pokazati, kako potrebe poslovne politike vplivajo na poslovne in informacijske procese podjetja. Podatkovna struktura ima ključno vlogo pri podpiranju poslovnih procesov in omogoča izvajanje poslovnih analiz,

korelacija med sistemi pa omogoča poslovnim analizam pravilne, veljavne, ustrezne in pravočasne rezultate.

Cilj obstoječega magistrskega dela je pojasniti, kako potrebe analitike vplivajo na poslovne procese in na kakšen način. Raziskovalno vprašanje se nanaša na doseganje sinergije med poslovno analitiko ter poslovnimi procesi in na opredelitev najbolj pogostih napak, ki nam preprečujejo doseči to sinergijo.

Raziskovalna metoda teze vsebuje teoretični in empirični del.

Teoretični del izhaja iz literature, ki vsebuje pregled knjižnega gradiva, znanstvenih člankov, študij primerov, akademskih revij, spletnih in naslovnih strani. Prav tako sem v raziskavi uporabila primere resničnih dobrih poslovnih praks, ki nam lepo pokažejo, kaj storiti, da izboljšamo poslovno analitiko in s tem posledično poslovno uspešnost.

V empiričnem delu sem za raziskovalno metodo uporabila primer iz realne poslovne prakse. Znanje, ki sem ga pridobila pri raziskavi teoretičnega dela, mi je precej olajšalo razumevanje problematike, ki jih lahko povzroči neusklajenost med podatki, informacijskimi procesi, poslovnimi procesi in nameni analitike. To znanje sem uporabila pri analizi primera v podjetju, kjer sem delala. Poslovni procesi so modelirani s pomočjo aplikacije Visual Paradigm. Predstavila sem tudi, katero programsko opremo uporabljajo za upravljanje z zalogami in oddajo naročil z namenom upravljanja odnosov s strankami. Tekom celotne raziskave, tako v teoretičnem kot tudi v empiričnem delu, pa je poudarjena pomembnost podatkovne strukture in njeno upravljanje ter modeliranje, ki je ključnega pomena tudi pri izvajanju rednih poslovnih procesov.

VZ Skupina d.o.o. je lastnik maloprodajne trgovine Ascara Outlet, ki je hkrati tudi njihova glavna gospodarska dejavnost. Vizija podjetja je ponujati kakovostna oblačila svetovno znanih blagovnih znamk po nižji ceni in hkrati strankam zagotavljati vrhunsko uporabniško izkušnjo.

Trgovina Ascara Outlet je prodajalna, ki ponuja blago preteklih sezon in blago iz tistih trgovin, ki imajo previsoko zalogo. V trgovini prodajajo oblačila, čevlje ter dodatke za moške, ženske in otroke. Ima dve prodajni mesti, eno se nahaja v najbolj znani slovenski industrijski coni BTC Ljubljana, drugo pa v BTC Novo mesto.

V podjetju sem bila zaposlena nekaj let. Odgovorna sem bila za neposredno prodajo in strateško načrtovanje, hkrati pa sem lastniku pomagala pri izboljšavi poslovnih procesov, ki naj bi podjetju omogočili slediti, pridobiti in analizirati potrebne informacije ter posledično izboljšati svoje poslovanje.

Ker gre za majhno lokalno podjetje, je nekaj ključnih kazalnikov uspešnosti, ki igrajo glavno vlogo pri odločanju. Ključni dejavniki so sledeči:

- marža
- obračanje zaloge
- povračilo bruto marže
- število nakupov
- povprečna vrednost transakcije
- število vrnjenih izdelkov
- vedenje kupcev in sezonski trendi.

Na podlagi gornjih kazalnikov družba sprejema vse poslovne odločitve, kar pomeni, da je izredno pomembno, da razpolaga s pravilnimi, dostopnimi in posodobljenimi podatki.

Struktura podjetja je enostavna. V podjetju je pet zaposlenih, lastnik podjetja je hkrati tudi njegov direktor in sprejema vse pomembne strateške ter finančne poslovne odločitve. Ostali zaposleni so prodajniki, med njimi sem bila tudi sama. Poleg direktne prodaje sem bila odgovorna tudi za strateško načrtovanje, saj smo poskušali vzpostaviti sistem, ki bi izboljšal pregled nad zalogami ter vplival na povišanje prodaje. Zaradi majhnosti podjetja je medsebojna komunikacija enostavna, sprejemanje odločitev pa hitro in učinkovito. Vse glavne dejavnosti podjetja se izvajajo v Ljubljani, v nakupovalnem središču BTC, kjer se nahaja tudi prva trgovina. Odločitve, ki se sprejemajo v Ljubljani, se prenesejo tudi v drugo trgovino v Novem mestu, glavno vlogo pri posredovanju teh informacij sem imela jaz.

V podjetju sem delala tri leta. Dnevno sem komunicirala z lastnikom podjetja. Sodelovala sem pri določanju prodajnih akcij, znižanju cen glede na stanje zalog, hkrati pa sem operativno pokrivala tudi področje vnosa podatkov v sistem, razvijanja črtnih kod in pri direktni prodaji.

Marca 2018 sem v podjetju izvedla intervju, na podlagi katerega sem skupaj z izkušnjami ter znanjem, ki sem ga pridobila tam, lahko opredelila poslovni model podjetja in njegov način delovanja. Prav tako sem izvedla pogovor z lastnikom podjetja z namenom pridobitve podrobnejših informacij, kako podjetje deluje kot poslovni subjekt, kakšne so potrebe, ki izhajajo iz poslovne analitike in konec koncev, kakšna je vloga direktorja, ki je hkrati tudi lastnik podjetja. Intervju je trajal eno uro, vprašalnik, sestavljen iz 14. vprašanj se nahaja v Prilogi 2.

Z lastnikom sva se strinjala, da se v najinem pogovoru osredotočiva na poslovni proces in njegove komponente, hkrati pa analizirava lastnikove želje glede izboljšanja poslovnega modela. Slednje seveda terja razumevanje celotnega obstoječega poslovnega modela.

V nalogi sem izpostavila tudi pomembnost standardizacije procesov, ki ne glede na velikost podjetja, doprinese k učinkovitosti podjetja. Standardizirani procesi omogočajo

lažjo koordinacijo potrebnih informacij za namene poslovne analitike, hkrati pa olajšajo modeliranje podatkov. Standardizacija se lahko nanaša na način izvajanja nekaterih postopkov, na jasno razmejitev delovnih nalog, poleg učinkovitosti pa s standardizacijo izboljšujemo tudi enostavnost ter preglednost, kar je za mala in srednje velika podjetja ključnega pomena.

Mala in srednje velika podjetja na trgu predstavljajo dinamiko in konkurenčnost. Prav slednje je razlog, da je potrebno vsako poslovno odločitev, ki jo v podjetju sprejmejo, ustrezno argumentirati. Tovrstna podjetja imajo dostikrat edinstveni slog upravljanja, kar jim omogoča, da se lahko hitro prilagajajo spremembam na trgu v okviru poslovnega modela, ki ga imajo. Naložbe v informacijsko tehnologijo, bodisi strojno ali programsko opremo so pogosto posledica osebnih odločitev lastnika podjetja na podlagi ocene stroškov in koristi.

V svoji tezi sem se osredotočila na upravljanje in modeliranje podatkov zaradi pomembne funkcije, ki jo ima; medsebojni vpliv med poslovnimi procesi in zagotavljanje pomembnih informacij, ki vplivajo na poslovne odločitve lastnikov podjetij. Prav tako pomembno funkcijo pa nosi tudi standardizacija, ki je precej odvisna od osebnih pogledov posameznikov.

Informacijski sistem podpira informacijski proces, ki zagotavlja pridobitev vseh podatkov, ki so potrebni za nadaljnje analize. Poslovni procesi, ki so integrirani z informacijskimi procesi imajo velik vpliv na uspešnost in kakovost informacijskih procesov. Pri modeliranju podatkov za potrebe analitike moramo paziti, da so podatki, ki so posredovani preko sistemov, koristni, posodobljeni in veljavni. Upoštevati moramo tudi sistemske zmogljivosti ter omejitve, saj lahko le tako dobimo najboljše rezultate oziroma iščemo druge rešitve. Cilj povezovanja poslovnih procesov z informacijskimi procesi je zagotoviti ustrezne podatkovne baze s kakovostnimi podatki.

Ključno vlogo pri modeliranju podatkov ima upravljanje s podatki (data management). Pomembno je, da ob strukturiranju podatkov ohranimo preprostost, še posebej, ko definiramo entitete. Definiranje entitet vključuje tudi opredelitev njihovih atributov in predikatov z namenom vzpostavitve medsebojnih povezav. V tem procesu moramo razumeti celotno poslovanje subjekta, saj mora podatkovna struktura izhajati in podpirati poslovanje podjetja.

Vedenje in delovanje zaposlenih imajo ogromen vpliv na kakovost podatkov in rezultate analiz, zato je v malih in srednje velikih podjetjih pomembno imeti splošen pregled stanja v celotnem poslovanju. Če družba ni tako majhna, da je lastnik tudi edini zaposleni, mora podjetje poiskati način, da ima nadzor nad poslovanjem in hkrati dostopati do informacij o trendih in dogajanju na trgu. Najboljši način za to je ustrezen sistem, ki zagotavlja tovrstne informacije, saj lahko tudi v zelo majhnem podjetju slabi podatki škodujejo njegovemu poslovanju.

V našem poslovnem primeru je dokazano, da mora biti ustrezen poslovni sistem enostaven in jasen, kar je lažje vzpostaviti takrat, ko podjetje še ni dokončno razvito. Osnovna načela ustreznega podatkovnega sistema je najbolje postaviti v začetnih razvojnih fazah podjetja. Dober primer take poslovne prakse so Fintech podjetja, ki se zavedajo, da je za stabilno in dolgoročno rast pomembna tehnološka usmerjenost in stalen stik s strankami ter trgom. Enostavne sisteme je lažje nadgrajevati in razvijati ter tako usklajevati z rastjo podjetja.

Pomembno dejstvo, ki ga je izpostavil lastnik podjetja med najinim pogovorom, je človeška lastnost, da ljudje delujemo na podlagi naših čustev. Ker lahko naši možgani prejmejo omejeno količino informacij v nekem času, jih zaradi potrebe po smiselnosti, lahko različno dojemamo, kar vpliva na naše nadaljnje odločanje. Po njegovem mnenju lahko poslovni sistemi, ki omogočajo strukturirano podatkovno bazo in kakovostne analize tako precej vplivajo na sprejemanje pravih poslovnih odločitev.

V našem poslovnem primeru trgovine Ascara ima podjetje dobro integracijo med sistemimi za prodajno, vodenje zaloge ter transakcijskim sistemom. Dobra korelacija teh sistemov in preprečevanje podvajanja vnosov podatkov podjetju pomaga izboljševati poslovanje in hkrati zmanjševati stroške. Lastnik podjetja lahko učinkovito spremlja stanje zalog in se hitro odziva na povpraševanje strank brez dodatnega preverjanja ali kontrole. Dostopnost podatkov lahko podjetju omogoča identifikacijo poslovnih priložnosti ali izboljšanje obstoječe ponudbe, ne glede na velikost samega podjetja.

Iskanje priložnosti za izboljšave je vedno na mestu, tudi če se včasih zdi, da so rešitve nerealne in jih ni možno doseči. Dobro se je zavedati, da so alternative lahko boljše od obstoječih in omogočajo nižje stroške, donosnejše poslovanje in stabilno rast.

Obstoječe podjetje, ki sem ga uporabila v nalogi, spada v kategorijo malih in srednjih podjetij, v skupino mikro podjetij. Zaradi svoje velikosti je zelo omejeno z investicijami v napredno tehnologijo, vendar je bilo kljub temu s tezo dokazano, kako pomembna je postavitev osnov za upravljanje in modeliranje podatkov že na začetku postavitve podjetja. Z izvajanjem načel upravljanja in modeliranja podatkov od začetka poslovanja in na način, ki podpira potrebe poslovne analitike, je podjetje dosegalo rast prihodkov.

Med izvajanjem raziskave sem se soočila še z eno omejitvijo, ki se nanaša na čas obstoja poslovnega subjekta. Zgodovina poslovanja namreč ni arhivirana na način, da bi lahko ustrezno primerjali učinke pred in po izvedbi učinkovitega upravljanja s podatki. Podatki, s katerimi bi lahko izvedli ustrezno primerjavo, so bili namreč pravilno strukturirani šele od leta 2017 naprej.

Cilj moje magistrske naloge je pokazati pomen, pravila in primere poslovne analitike s prilagajanjem poslovnih in informacijskih sistemov na način, da omogoča poslovno analizo. Ustrezna poslovna analiza omogoča boljše razumevanje poslovanja podjetja, ponuja priložnosti za izboljšave in vpliva na poslovne odločitve. Ne glede na velikost podjetja ima poslovna analitika skupaj s pravim odnosom zaposlenih glede higiene podatkov, najpomembnejšo vlogo pri razvoju, rasti in obstoju slehernega podjetja.

Mogoče bi bilo v prihodnosti smiselno, da bi primerjali način modeliranja in upravljanja s podatki iz našega primera z drugimi podjetji, v isti industriji, ne glede na velikost. Rezultati primerjave bi nam lahko pomagali, da še bolje razumemo pomen pravilnega upravljanja s podatki oz. pomen poslovne analitike.

Appendix 2: Interview questionnaire

Questions for the interview with the owner of the local company VZ Skupina d.o.o.

- 1. When did you open the business?
- 2. Where do you have your stores? In Slovenia and ...? Why did you choose the current locations of your stores?
- 3. How do you deal with logistics?
- 4. How would you describe your business?
- 5. What are the most important indicators or KPI's that help you to direct your business?
- 6. How do you control the inventory and keep your stock at the desired level?
- 7. Does your business follow seasons and trends?
- 8. How often do you order? How long do you wait for your inventory to be delivered?
- 9. How do you communicate with your supplier?
- 10. Who places orders and what does the process look like?
- 11. How do you transfer the inventory to other stores and how often?
- 12. How do you control the inventory in multiple locations? Do you use a specific programme to do that?
- 13. What are the main business segments? Is it the sales only?
- 14. What computer components do you use in your store? What applications do you use?

The interview was conducted on 14 March 2018 with the owner of the company and his employees.