Masaryk University

Faculty of Economics and Administration

**Field of study: Business Informatics**



ANALYSIS OF THE IMPLEMENTATION AND USE OF PLANNING aps sw TO THE EXISTING erp SYSTEM

Bachelor's thesis

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Anotace

Předmětem diplomové práce „Ekonomické důsledky sjednocení Německa“ je rozbor dopadů změn, které proběhly v hospodářské struktuře východního Německa po roce 1990. První část je zaměřena na popis výchozí situace před sjednocením v obou německých státech. V druhé části charakterizuji hlavní hospodářské reformy, které byly provedeny v období mezi léty 1990–1994. V poslední části je pak analyzováno, jak se vládě podařilo dosáhnout ekonomického rozvoje v obou částech sjednoceného Německa. [max. 10 řádků]

Annotation

The goal of the submitted thesis: “Economic consequences of German reunification” is to analyze changes that happened it the economy of Eastern Germany after 1990. The first part is concentrated on describing the situation before reunification in both of the parts of Germany. In the second part I characterize the main reforms that were performed during the period between 1990 till 1994. And in the final part is analyzed how the government achieved its targets and economic development of both parts of unified Germany. [max. 10 řádků]

Klíčová slova

Německo, hospodářská reforma, ekonomický rozvoj [5 až 10 slov]

Keywords

Germany, economic reform, economic development [5 až 10 slov]

Prohlášení

Prohlašuji, že jsem diplomovou práci *Ekonomické důsledky sjednocení Německa* vypracovala samostatně pod vedením doc. Ing. Maxmiliána Slabozrakého, Ph.D. a uvedla v ní všechny použité literární a jiné odborné zdroje v souladu s právními předpisy, vnitřními předpisy Masarykovy univerzity a vnitřními akty řízení Masarykovy univerzity a Ekonomicko-správní fakulty MU.

V Brně dne 29. dubna 201?

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Poděkování [není povinné]

Na tomto místě bych ráda poděkovala doc. Ing. Maxmiliánu Slabozrakému, Ph.D. za cenné připomínky a odborné rady, kterými přispěl k vypracování této diplomové práce. Dále děkuji firmě XYZ za poskytnuté informace a konzultace ...

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# introduction

# THEORETICAL PART

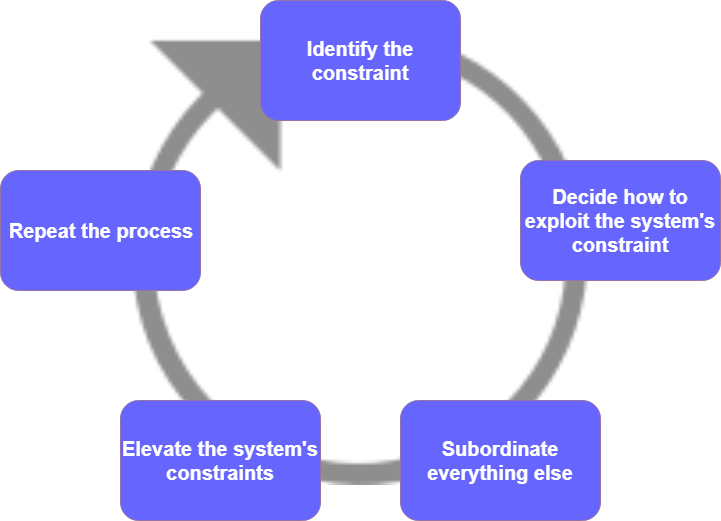
## Theory of Constraints

Theory of Constraints is popular management philosophy first introduced by Israeli businessman Eliyahu Moshe Goldratt in 1984 in his book coauthored by Jeff Cox, The Goal: A Process of Ongoing Improvement. (Goldratt, 1984). Despite its name, it's not theoretical at all. Rather, it represents potentially big help with identifying problems and offering effective solutions. What better person to describe it than the author himself. Goldratt writes that it's not about bottlenecks, cutting batches or arranging the activities on the factory floor. His message is „We grossly underestimate our intuition. Intuitively we do know the real problems, we even know the solutions. What is unfortunately not emphasized enough, is the vast importance of verbalizing our own intuition.”. (Goldratt, 1990)

Systems usually consist of many different parts. The key lies in recognition of the important role of the system's constraints. It's quite straightforward what could be considered as a constraint - anything that limits the system from achieving higher performance. Obviously, every system does have at least one constraint, making this philosophy **universally applicable**.

Path to improvement is divided into five steps:

1. Identify the system's constraint
2. Decide how to exploit the system's constraint
3. Subordinate everything else to the above decision
4. Elevate the system's constraints
5. If in the previous steps a constraint has been broken, go back to step 1.



As Goldratt earlier suggests, these steps can oftentimes be followed by intuition and common sense.

### TOC Thinking Processes Tools

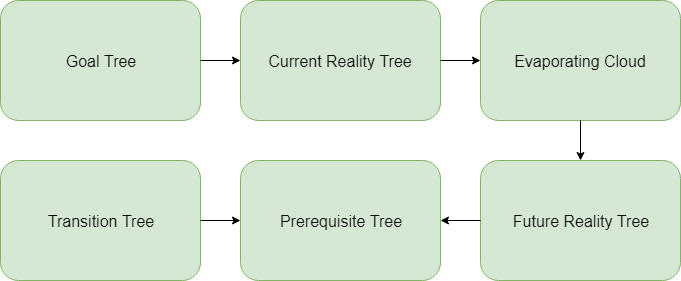
To find the root cause constraining the throughput, collection of logical tools was estabilished for easier analysis and picturing abstract constraints. According to Goldratt, TOC initially lacked „way which does not rely on examples or references but on the intrinsic logic of the situation itself, which is by far more convincing than the usual methods. This method of proof is called Effect-Cause-Effect and it is used extensively in all of the hard sciences.” (Goldratt, 1990). The effect-cause-effect approach was the cornerstone for creating the five basic Thinking Processes Tools (TP Tools):

* Current Reality Tree
* Evaporating Cloud
* Future Reality Tree
* Prerequisite Tree
* Transition Tree

Each of them is based on sufficient cause (if A exists then B exists) or necessary condition (in order for B to exist, A must exist), thus the adjective „logical”.

#### The Logical Thinking Process

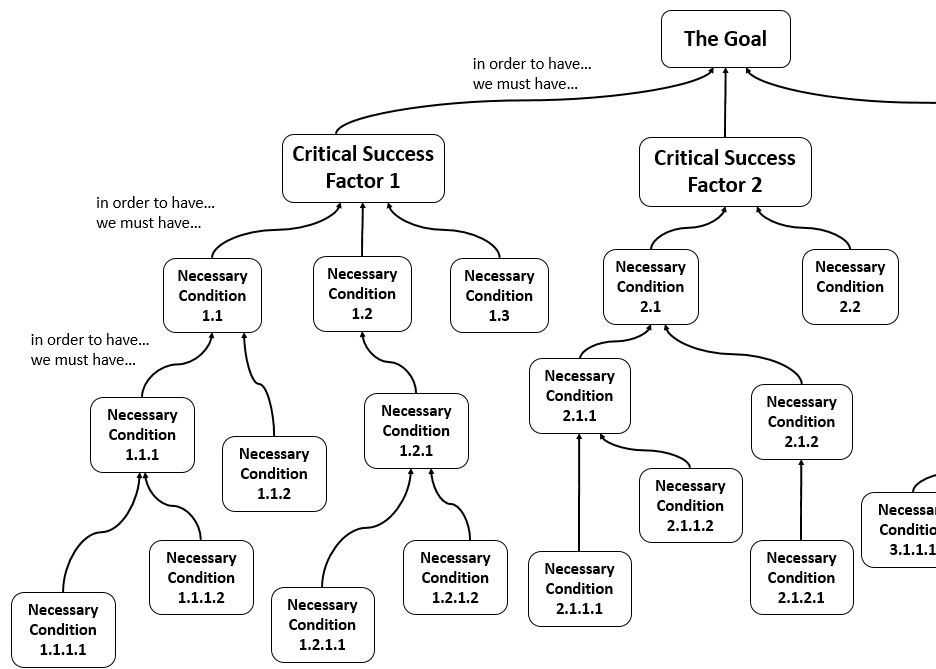
The Logical Thinking Process (LTP) is a concept based on TOC introduced by William Dettmer to provide system managers and executives effective technique for designing organizational strategy, planning its deployment, evaluating its effectiveness, and making corrections as needed in the shortest possible time. (Dettmer, 2007). It can be devided into one to six steps, varying by necessity, choice or experience of the practitioners. Difference from the Thinking processes is fairly subtle. In addition to the five basic TP Tools, Dettmer added Goal Tree as the first step. Secondly, Dettmer considers all the tools as a single process, in contrast to the Goldratt's interpretation of each tree/cloud as a separate process.



Chris Hohmann, senior manager and author of few books on the topic of lean management, productivity techniques and others, explains LPT in more detain on his website.

***Goal Tree***

A Goal Tree is built on a necessity logic-based relationship. At the top is a single goal, dependent on, ideally, three to five critical success factors (CSF). More of these factors would indicate badly-stated goal making the whole effort much more likely to fail.Under each CSF are several necessary conditions (NC). The goal can only be accomplished after all NCs are met. (Dettmer, 2007)



*(Hohmann, 2014)*

***Current Reality Tree***

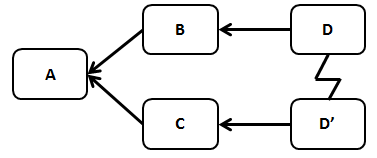
The Current Reality Tree (CRT) is the first of TP Tools. As the name suggests, diagram depicts current state with focus on negative cause-and-effect relationships which end up obstructing the final goal(s) at the top. At the bottom lie root causes starting the chain reaction made from intermediary, typically undesirable effects. (Hohnmann, 2014)

***Evaporating Cloud***

Next tool is the Evaporating Cloud (EC), also known as Conflict Resolution Diagram. According to Hohmann, it's based on two assumptions:

* Conflicts (opposition about objectives or opposite points of view, for instance) tend to be settled by compromise. Yet compromising requires making concessions that lead to a solution which isn’t satisfactory for neither side, hence a win-lose or lose-lose situation.
* Conflicts are often the result of false assumptions, beliefs or myths which constrain needlessly the organization. As two opposite things cannot be true at the same time, one is necessarily false. If the falseness can be debunked, the conflict disappears (evaporates) and a no-compromise, win-win solution is found

Typically, EC consists of five entities, where A represents the objective trying to achieve. B and C are *both* necessary to reach it. D is a prerequisite to B, D' is a prerequisite to C, however D and D' cannot coexist simmultaneously, therefore a conflict emerges. Cloud is then resolved by either invalidating one of the assumptions of the diagram or providing an injection which changes the situation. (Hohmann, 2014)



*(Hohmann, 2014)*

***Future Reality Tree***

Future Reality Tree (FRT) visualises the causality behind desired change in the future, similarily to CRT, in cause-and-effect relationships. Undesirable effects from CRT are turned into desirable effects with initial injections and cascade reaction of mentioned cause-and-effect relationships, eventually resulting into the final goal. FRT represents could-be future, but doesn't necesserily show how to reach it. (Hohmann, 2015)

***Prerequisite Tree***

Prerequisite Tree (PRT) is used to surface and overcome obstacles arising during achieving the intermediary goals. Related intermediary goals subsequently prove that these obstacles can indeed be neutralized. These goals form a graph of steps needed for meeting the final objective. PRT is the preparatory work for the coming implementation action plan as well as a useful communication tool and a means to overcome fear and/or resistance to change. (Hohmann, 2015)

***Transition Tree***

Transition Tree (TT) is the last of both TP tools and LTP. It illustrates a step-by-step transition from the original to desired state. Basically, the TT combines an entity of current reality, a statement of need and an action (injection) to create a new reality. This basic structure is repeated from the lowest or farthest condition to change up to the closest to the objective on top of the Transition Tree. (Hohmann, 2015)

## Lean Manucfaturing

## ERP

## APS

## SW Engineering

### Extreme Programming

### Unified Modeling Language

# PRACTICAL PART

## Mincovňa Kremnica, š.p.

### History

Mint was estabilished in 1328 by King Charles Robert of Anjou and has been continuously producing mint articles ever since, making it one of the oldest manufacturers worldwide. Historically speaking, it's relevancy was influenced strongly by nearby deposits of gold and silver as these two precious metals constituted the focal point of production. However, over the course of time, it was necessary to expand the area of expertise and, especially in past decades, adapt to modern version of this very specific market.

### Current situation

The company currently has over 200 employees and over the year 2017, its revenues reached over €23 million, ending the year in profit of nearly 700 000€. The customers form a very diverse portfolio of requested work, ranging from small, relatively low-priced orders of trinkets and such, through limited but very expensive series of collector articles, to huge quantities of currency coins for countries such as Guatemala or Sri Lanka.

Current production of the mint can be divided into these categories:

* artwork
* engraving
* coining
* precious metals
* stamp printing
* medal-making and others

**artwork -** In case the design of the final product isn't given at all or its form isn't compatible, artists need to make it themselves. Result of this is only internal for further as a template for manufacturing actual product.

**engraving** - Dies for all of the further metalworking operations are made here, making this fairly obvious bottleneck of the whole production.

**coining** - Typically production of circulating currency coins for goverments in huge quantities for a relatively long periods of time (weeks, sometimes even months).

**precious metals** - Typically working with gold, silver, platinum, etd. Could be considered as a logical part of medal-making segment, but considering more sensitive nature of this work, it's represented as a separate workcenter in the ERP.

**stamp printing** - Indifferent from the other parts of production as it doesn't have anything to do with metalworking at all.

**medal-making and others** - In a way opposite of coining - small quantities of many different products. Very diverse and more complicated than coining in regards of operations potentially needed for completion of the product. Includes plaques, tokens, badges, pendants, tie pins, stamps, labels, awards, etc.

Mints, including Kremnica one, are often times state owned companies, therefore the conditions difference between competitors is even bigger than in other globalized lines of business.

## research topic

The research topic at Kremnica Mint was focused on their imperfections in regards to production planning. This concerned only metalworking segments of productions, as other parts are either easy enough to plan without using APS (stamp printing) or just not suitable for attempting to include them in the APS given the bigger role of human factor and unpredictability of the work itself (artwork). So, in this context, it's safe to say that every product is manufactured accordingly to the assembly procedure. Operations represent one process necessary, to assemble the whole product. Some product require only few operations, others, more complex, even more than 100. In the context of this thesis, combination **order + operation** (in other words, specific operation of the specific order)represents a basic unit of production planning. For simplicity, I will call this conjunction only operation.

Currently, mint uses ERP MAX which tools for production planning weren't sufficient for the requirements. 8 years ago has been acquired APS software AHP Leitstand for this purpose.

### AHP-Leitstand

This software was created in 1985 by German company Factory Solutions GmbH and is being redistributed by other companies worldwide, in this case by Czech company AXIOM PROVIS Int. s.r.o..

„The AHP-Leitstand handles resources and their allocation for production. The detailed representation of the cost locations in terms of constructions, machines and workstations shows the structure of the production. As special resources employees or tools could be included in the planning. The resources will be administrated and monitored at the AHP-Leitstand. This capacity offer is opposed to capacity demand.

Optimal sequences, maximum usage rate and the compliance to the delivery dates could be planned and monitored on the time axis. A reaction to short term changes of the capacity or order reality could be done very fast and practically by a mouse-click. The actual planning and it´s progress will be visible at any time currently even over system limits.” (Factory Solutions, 2018)

Althought AHP has been refined continuously, latest release being version 8.0 for Windows 10 in 2018, and the planning itself offers many options, naturally, it's obsolete at least in aspects such as interconnectivity with other systems or UI clarity. These were the biggest issues according to the IT department, master planner and workshop planners. What is very important to mention in this case is that AHP is purely planning software and as soon as the production of certain product is finished, it disappears from the database. Alternatively, ERP system MAX only keeps track of the order descriptions, properties and, once production starts, manufactured quantities. However, its connection with AHP is only one way. The import scripts from MAX even had to be written by the mint's IT department, making the connection two way unfortunately wasn't possible. AHP imports orders, quantities, dates and other necessary information, but after the plan is created, it's not in any way communicated back to MAX or any other system. Because of this, there's no way to retrospectively find out whether some order was finished accordingly to the plan or not, thus making it impossible to draw any consequences.

## Definition of the previous state

Initiative which started this thesis came from the top management of the company, more specifically its director. Even thought he, obviously, isn't directly involved in the production planning and organising, the issues rooting in these activities were repeatedly resulting into bigger, more severe problems. In a better case „only” work innefficiency, which, apart from obvious fiscal reasons, in worse cases would result into late deliveries. These can be especially sensitive in this line of business - smaller orders such as plaques, tokens, badges, etc. are often ordered for a specific event and not beaing able to deliver them on time would be a big blunder. On the other hand, huge orders of currency coins from governments tend to have very strict contract conditions and violating them can get very expensive, not mentioning the reputation hit that would cause on the international scene.

In the past, information regarding production planning that AHP doesn't include were communicated through shared excel document in the company network, phone calls, messages or personal conversations. However, in modern manufacturing company where lean manufacturing is one of main goals, this system isn't effective at all. Not only is it too human-dependent and unnecesserily time-consuming, it also misses essential part for long-term improvement - hard data. With this system in place, upper management didn't have any data based on which it could initiate necessary changes.

### LPT

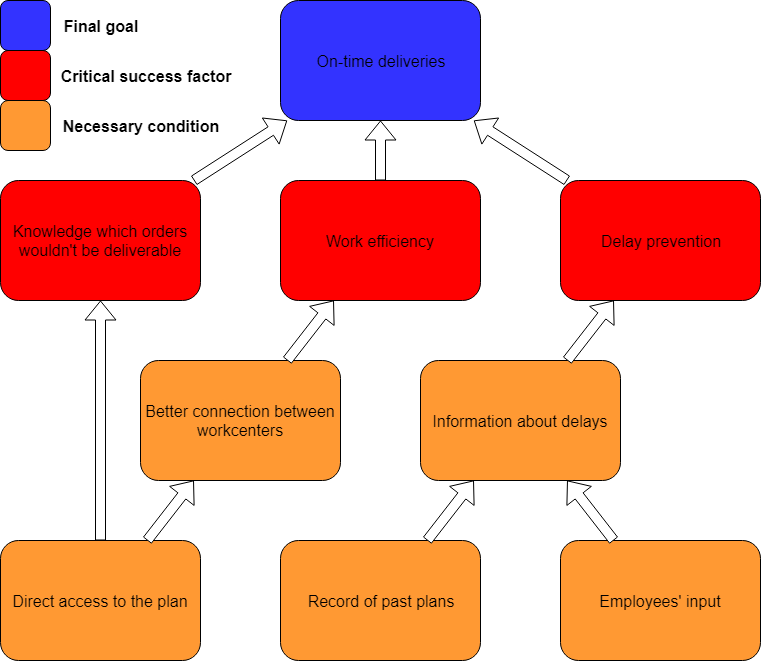
By applying Thinking Process Tools, issues mentioned before can be analysed more deeply and presented in clear, understandable way. Additionally, some of them also represent very simplified description of integration of me and my work to the company. All the necessary information for creating these diagrams were collected through conversations with the director, employees of IT department and master planner. Second-handedly, they also interpreted to me input from technological deputy, workshop planners and sales department.

#### Goal Tree

As shown in the figure XX, the final goal is considered ensuring on-time deliveries. To achieve this, three critical success factors have to be present:

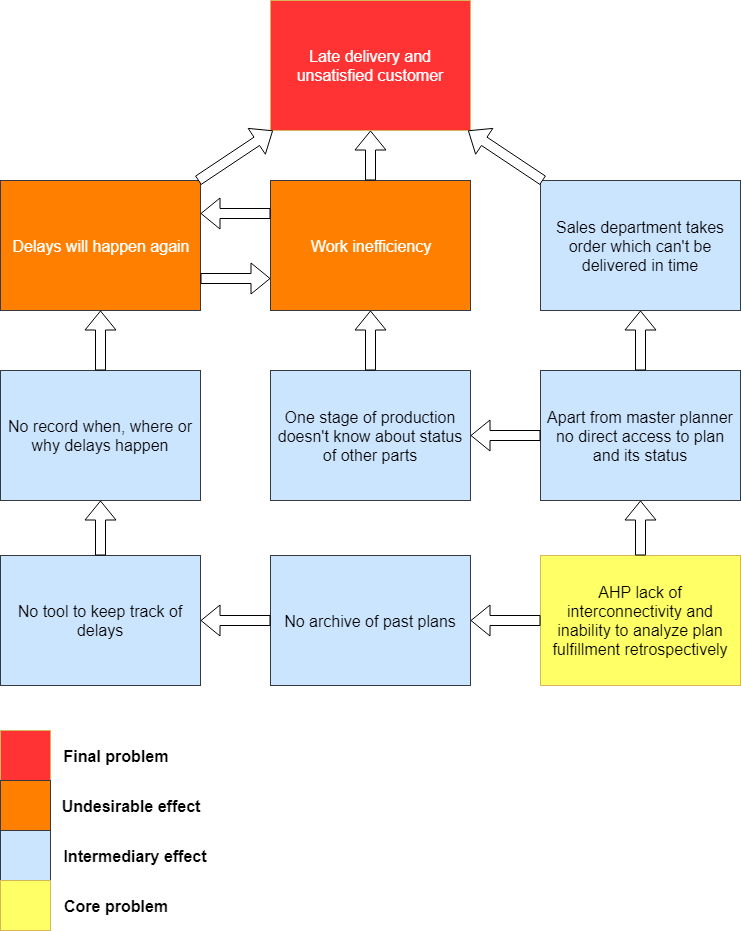
1. Sales department has to have knowledge which orders wouldn't be deliverable in regard to current state of production.
2. Work efficiency is, naturally, fundamental in any manufaturing company and therefore also big factor for achieving the final goal.
3. Delays themselves are very undesirable effect, however they constitute also one of main reasons for work inefficiency, frustration and make people more prone to further mistakes.

To bring these factors, couple of necessary conditions have to be met. To increase work efficiency, the information flow between workcenters needs to be improved. This can be achieved by making the plan available directly, which would also prevent sales department from making undeliverable sales. For the last factor of delay prevention, company first needs to know the nature of the delays and act upon this information. Gathering the details can be accomplished by union of having data about past plans and input from involved employee.



#### Current Reality Tree

As the tree shows (figure XX), mint considers late delivery, unsatisfied customers the final problem as these two usually imply various, more severe consequences. The root of problems can be summarized as AHP lack of interconnectivity and inability to analyze plan fulfillment retrospectively. This leads to having no archives of past plans, therefore, for example, it's not possible to determine if operation in current plan is newly scheduled or it was for some reason rescheduled and is already in delay. Because of this, it's effectively impossible to keep track of delays, eventually leaving no record when, where, why or during production of which product the delay occured. Any of these information could be used to prevent the same situation from happening again, but without these data, delays will happen again. This is certainly considered as a serious undiserable effect. The other branch of CRT illustrates implications of poor interconnectivity of AHP. After master planner creates plan, usually for about a week ahead, others recieve only its exported version. It's fairly obvious that even though initially plan is on point, at first deviation from it, chain reaction begins. For instance, in case of delay in the coining center, medal-making center can already be waiting for engraving center to produce dies, while they are accordingly to their original plan manufacturing dies for coining center, which at the moment doesn't even need them. To find out about the whole situation would take at least a few calls. This approach just isn't in alignment with principles of lean manufacturing and causes another undesired effect in form of significant work inefficiency. And what could potentially be even worse is if sales department makes a sale which would be originally possible, but isn't in the current, real situation, thus possibly resulting into the final problem, late delivery. Additionally, the two undesired effects form a vicious circle where with more delays, deviations from plan grow and cause bigger work inefficiency, causing further delays and so on. Both of these are the one of the most common reasons of the final problem, late deliveries.

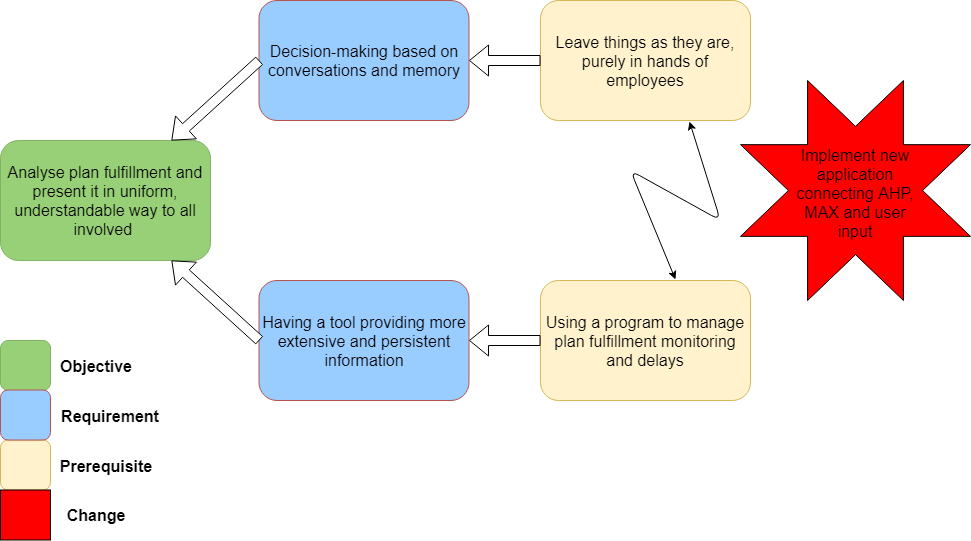


#### Evaporating Cloud

During the analysis of the situation, it was agreen upon that it's necessary to add some kind of tool to compensate what AHP lacks. Given the most common feedback, that meant a way to present real-time plan fulfillment to wider spectrum of users in an understandable fashion. After further discussion, we determined that making a new, custom application should be feasible and well-rounded solution for a few problems.

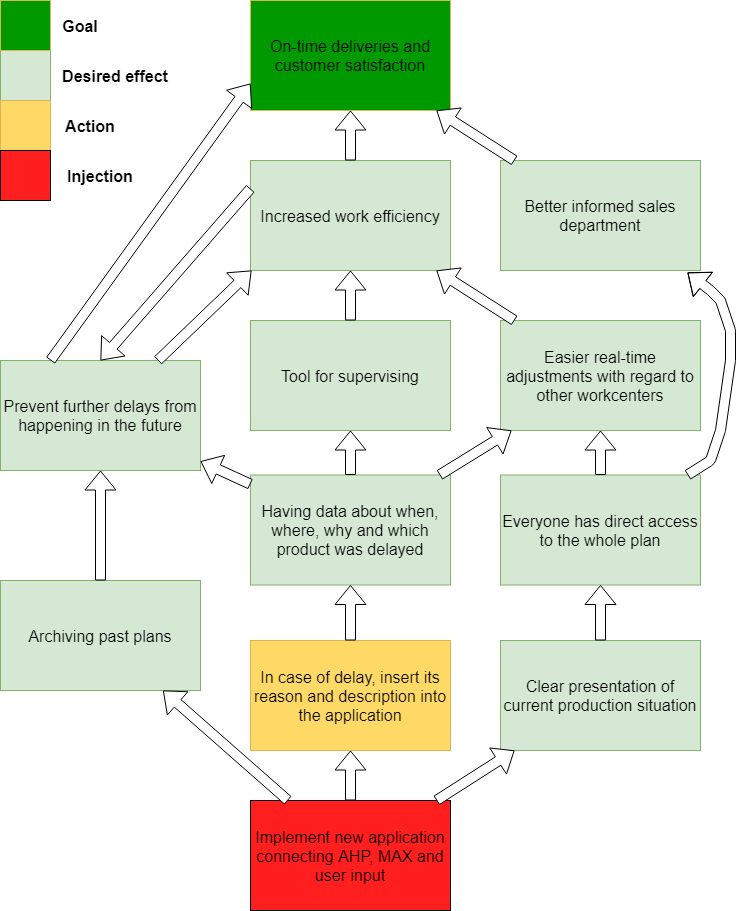
As pictured in figure XX, the previous state would rely purely on employees finding things out on their own initiative by contacting someone who assumably should have more information about the given matter. To meet the objective of plan fulfillment analysis and its presentation, employees would have to base their decisions solely on coversations and their memory.

As opposed to that, using a new program for this purpose is definitely a preferable alternative. With the software assistance, decision-making can not only consider actual current situation, but also take into account data collected throughout the past experiences. With this new tool, relevancy of the human factor would be greatly reduced thus making the final goal more systematically achievable.



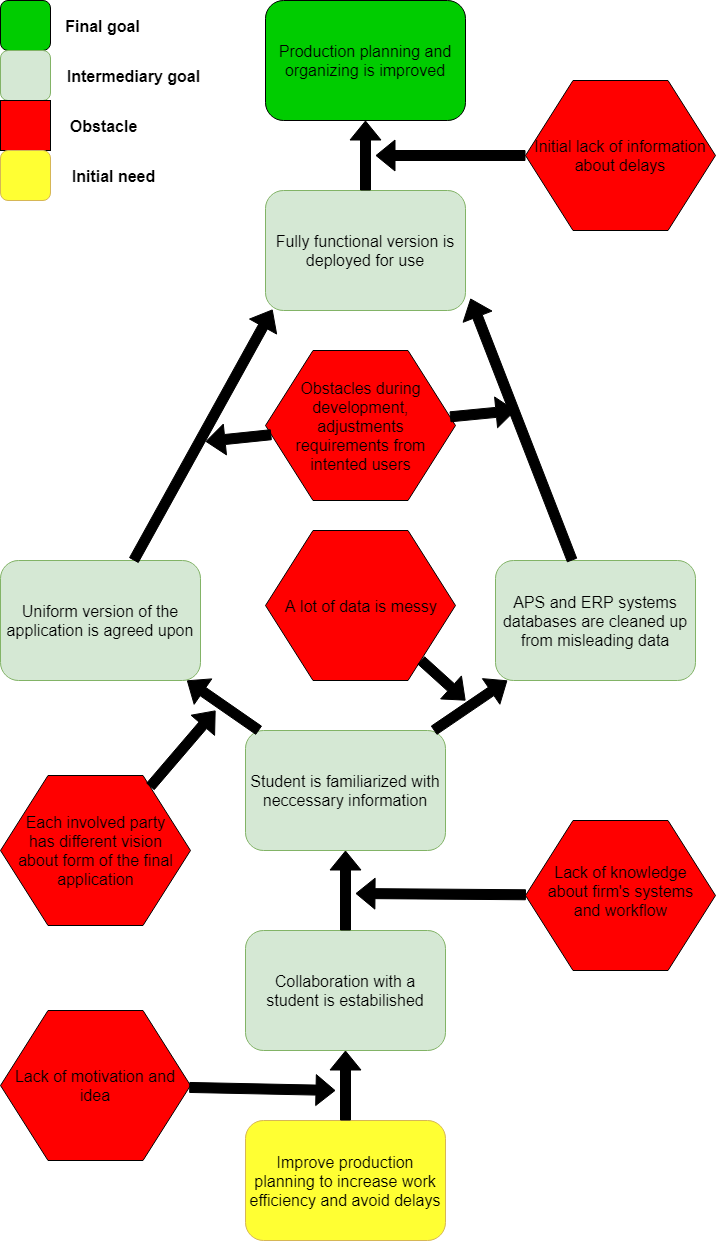
#### Future Reality Tree

As depicted in the figure XX, single injection in form of new application which would connect three pillars of production - AHP, MAX and users. Of course, the users need to provide application with the details about delay in case one occurs. Provided both of these conditions are met, company will start gathering crucial data about nature of delays. This is the corner-stone of the whole process of improvement as it brings essential information for various purposes. With knowledge of the past plans, it opens the door towards diagnostics of the whole reasoning behind occurances of the delays and with proper analysis, it should be possible to at least in some cases prevent the same causes from inflicting further damage. On the other hand, assuming the application is available to all parties involved, this data makes a lot easier real-time adjustments of production with the information needed for it being available instantly without having to waste time with contacting other people. Details about delays are also very valueable data even by itself, because they present another channel for supervising each part of production. Additionally, availability of the plan is a welcomed feature for the sales department for taking the current situation in production into account. All of these desired effects are in perfect alignment with the principles of lean manufacturing and contribute to increased work efficiency. That furhermore helps to prevent more delays from happening in the future, forming a ,virtuous circle and together resulting into the final goal of on-time deliveries and customer satisfaction.



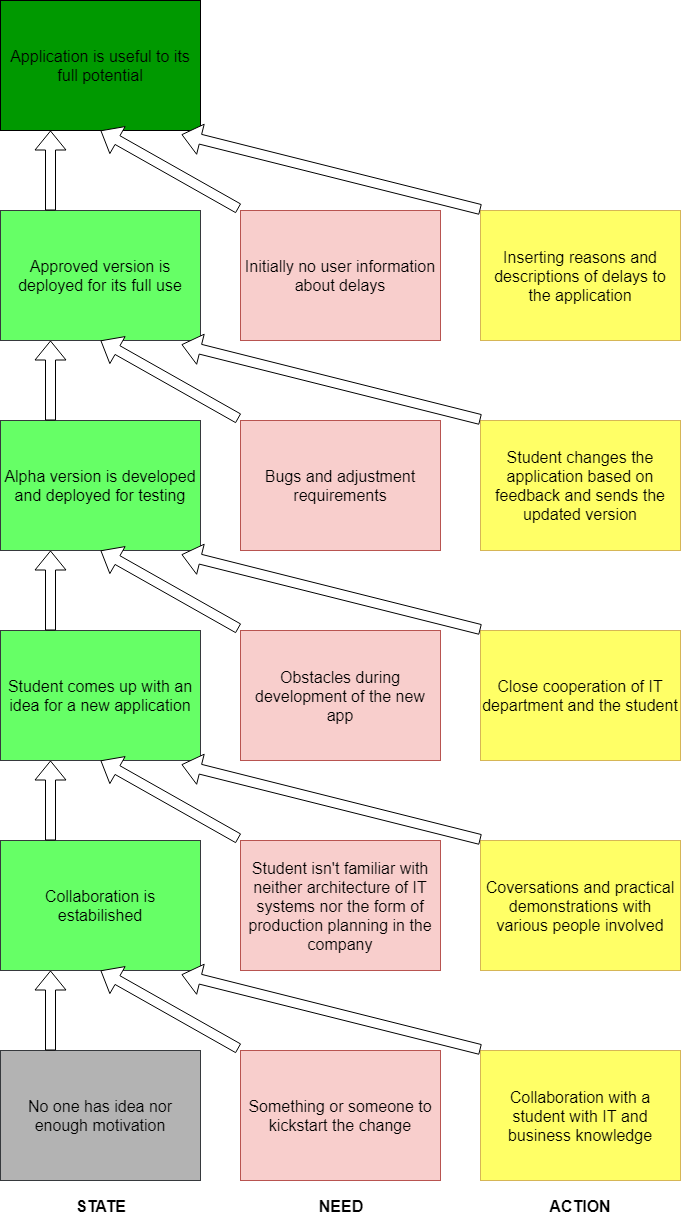
#### Prerequisite Tree

Ignition spark for initiating changes was desire to improve work efficinecy and avoid delays by changes in production planning and organizing. After initial, not so difficult, obstacles were overcome and I was ready to begin working on the matter at hand, more serious ones occured. On the human side of things, every involved party had different point of view and therefore also vision of the application. After extensive conversations on this sensitive topic, an uniform version was approved. On the backend side, it was found that significant portion of MAX database is filled with bad data. I will further elaborate on this topic in later chapter, but in cooperation with IT department, databases were prepared to suitable state for purposes of the application. Naturally, during any software development arise various issues and new ideas for minor modifications of the original design. After several iterations of debugging, adjustments and gathering feedback, the final version of application was ready. In the early stage, its helpfulness is only limited by lack of user input about delays. However, throughout the time, its benefits should grow enough to use gathered data to draw consequences from any occured delays thus achieve the final goal - improve planning and organization of the work.



#### Transition Tree

The final Thinking Process Tool is shown in figure XX. Original state was static for a relatively long time. It's part of human nature to rather stay content with the known, even though imperfect, system than try to initiate change. What was needed was a spark that would start the transformation. One way how to accomplish this was by collaboration with a student with both IT and business knowledge. After this step, it was needed to familiarize me with the situation and systems architecture. Few days of conversations, excursions and practical demostrations successfully achieved this. With gained knowledge, I came up with an approximate design for application, but came into contact with various abstacles during its development. Fortunately, with help from the IT department, it was feasible to create prototype of the application. Next stage was debugging and consulting with the primary intented users. Based on their feedback, necessary adujstments were made to make the application in accordance with desired functionality. After that was the case, it still lacked fundamental part needed for the final goal - user input. But over time that change and make the application useful to its full potential.



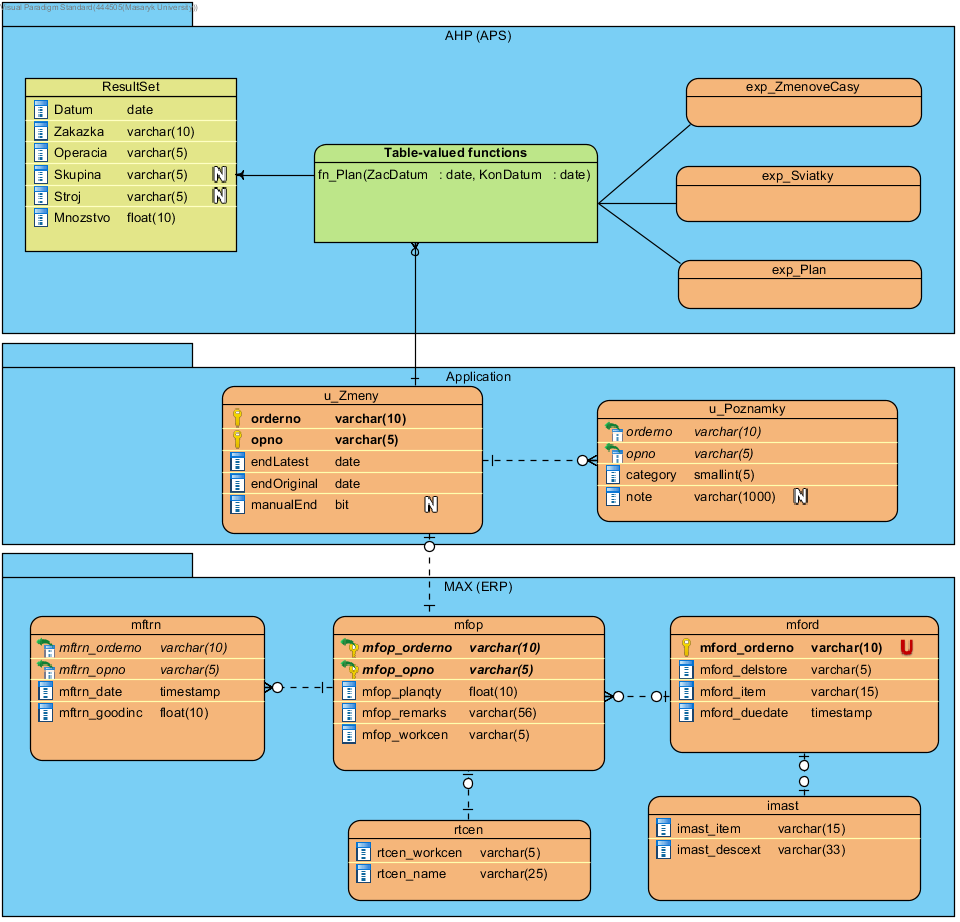
## development and deployment of the application

The focus of this part of my thesis is on the events since discussions about the form of the application. Due to the fact that my expertise in programming, software engineering and databases was limited to several university courses mainly focused on Java, the original ambitions were fairly cautious. No one from the IT department was familiar with neither Java nor OOP in general. They attempted to make a web application coded in PHP for this exact issue before, but eventually abandonded the efforts as they didn't seem to be nowhere close to the desired result. Therefore, it was clear from the beggining that if we choose to pursue the path of desktop Java application, I would have to do all the programming by myself from scratch. They offered assitance with managing databases and, the most important part, application logic. No better alternative was suggested, so it was decided.

### Early stage of development

I recieved instructions on how to install database server and its requisites used in the company, Microsoft SQL Server 2013. With dump file, using Microsoft SQL Server Management Studio I restored databases with sample data on my own computer. At this point, just after brief browsing of new data, I started to notice a few cases, where the data didn't seem to make sense, looked redundant or just simply mistakes. I adressed the IT department with this issue and after further inspection, they agreed that in fair share is bad data. As McCallum mentiones, there's no precise definition for this term. Some people interpret it as purely technical phenomenon like missing values, or malformed records. He, however, considers it as a more contextual term and calls it in short, plain language „data that gets in the way“. (Q. Ethan McCallum, 2012). In case of mint's data, this seems like a more fitting interpretation. To name just a few examples of bad data in this case: typos, duplicates, empty or nonsense values, old and redundant records, etc. Reason for this to happen was that with most of the data, they didn't work at all until this point. After noticing it, they were able to identify which of them are, ideed, wrong and deleted them. Furthermore, they discovered and fixed one minor bug in import script.

First necessary step was to implement a feature which would somehow enable to archive dates of completion on their first time of scheduling. If this information is stored, after change of plan, operations that appear in both plans can potentially be identified as rescheduled and basically already in at least certain kind of delay. With regard to this and other objectives, two new tables were created in the database. In figure XX you can see current Entity-Relationship diagram rid of tables and columns irrelevant for this application.

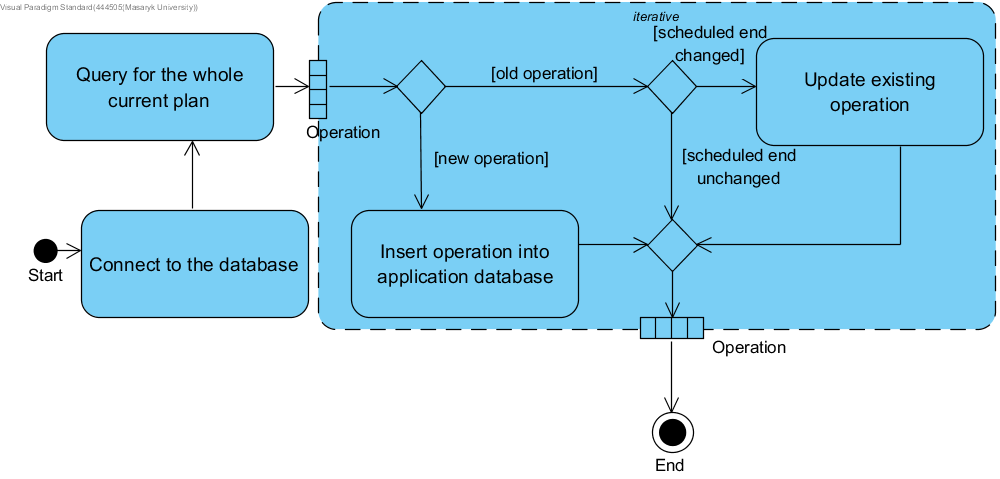


As you can see, application creates, in the past missing, bridge between AHP and MAX. On the AHP side, IT department programmed an SQL table-valued funcion which takes into account plan, holidays and shift times and returns a table with listed columns (see ResultSet). This function splits the plans to operations and further splits them to days. On the other hand, MAX provides details about each operation such as description of the final product, workcenter where the operation is taking place or quantity already manufactured.

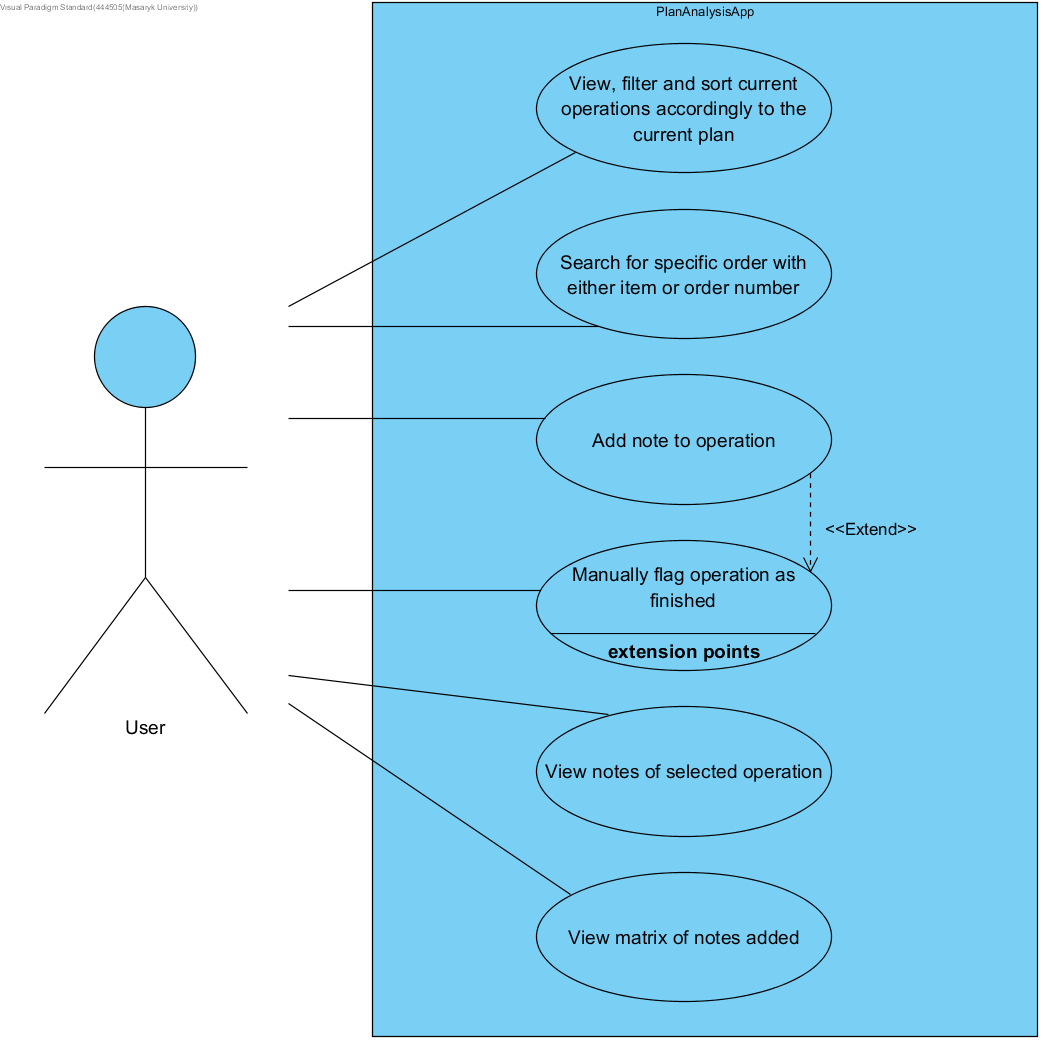
### Programming stage

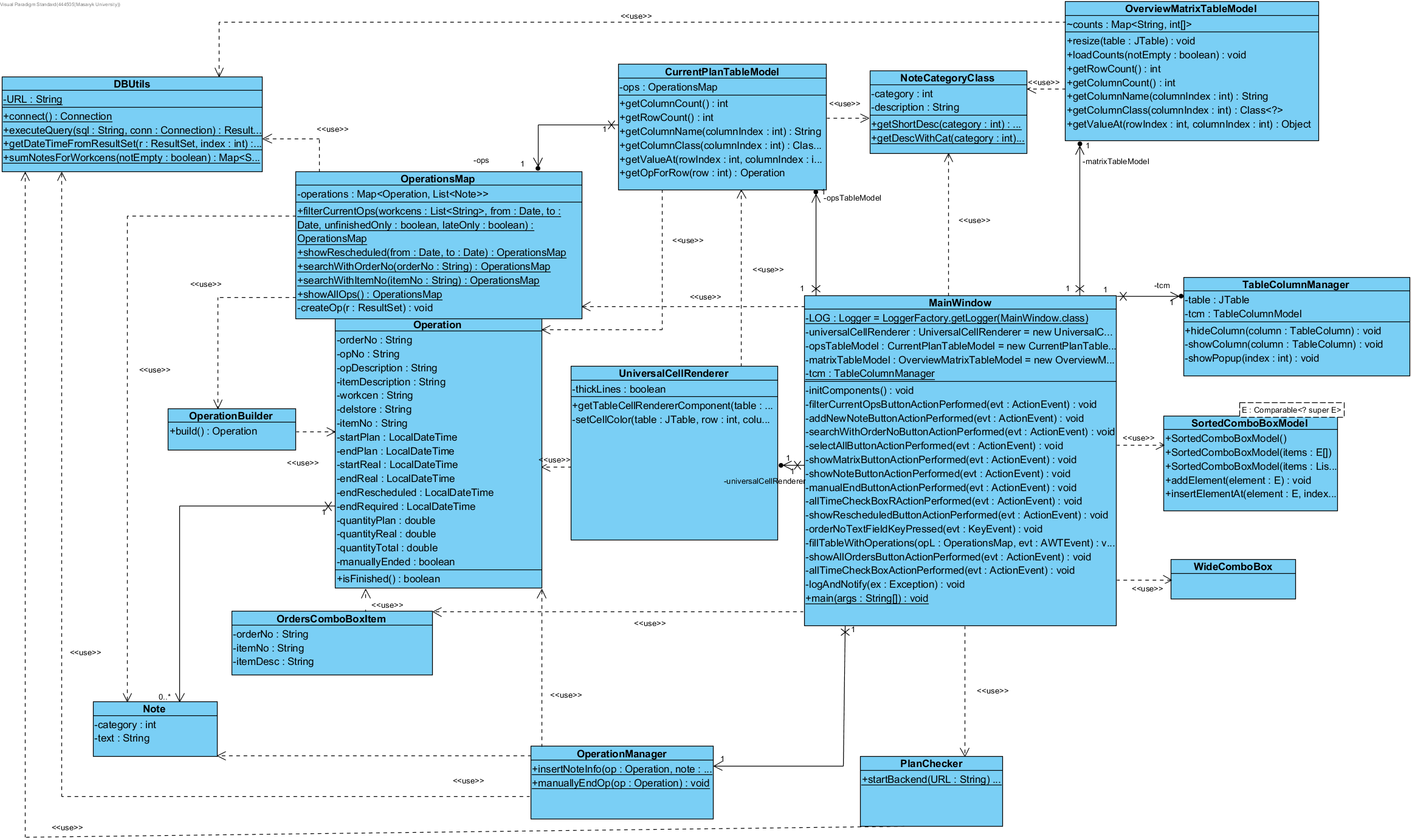
When the databases were ready, the main part of development followed. The first logical step was to write SQL statements for earlier mentioned data archiving. In figure XX is depicted activity diagram of this process. After estabilishing connection, application queries for the whole plan from AHP. This result is compared with current database of the application and one of three cases happens for every operation:

* if operation is new, it's simply inserted in its current state into the application database
* if operation already exists in both databases and its scheduled end has changed, this new date is updated in the endLatest column, while endOriginal remains the same
* operation's end date hasn't changed therefore nothing happens

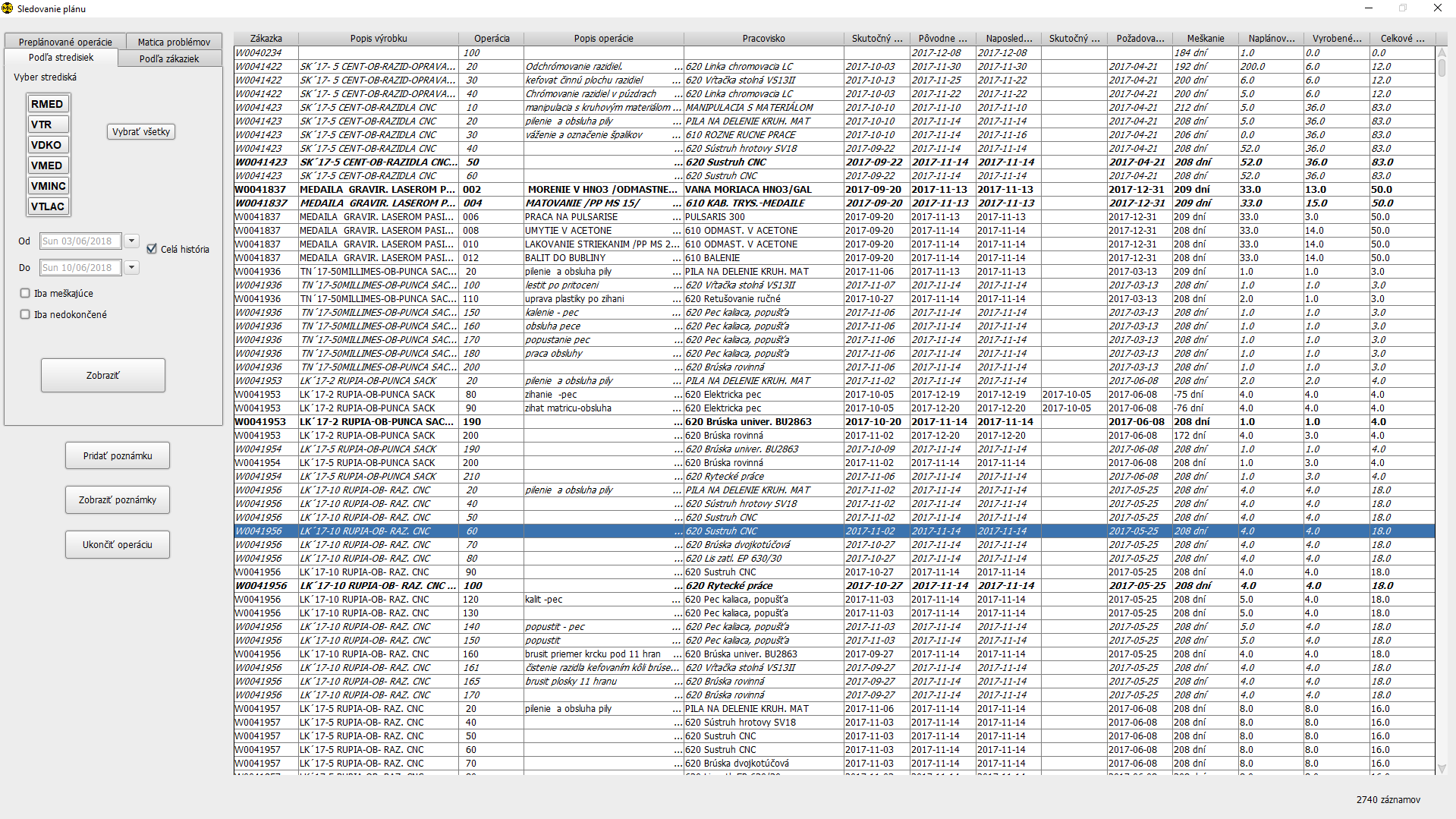


With this purely backend mechanic in place, it was time to start building Graphical User Interface (GUI) and related backend. With regard to my capabilities, the fact that I would be the sole programmer and low aesthetic requirements, I used Swing framework with couple of open-source libraries to improve looks, clarity and controllability. For easier debugging especially remotely in later stages of development, logging is practically a necessity. I used popular log4j's more modern successor, Logback framework. Initially, I only cooperated with the master planner as a tester in practice. After several iterations of adjustments and getting feedback, the application reached desired quality and functionality and was subsequentially introduced to other users. Below are use case diagram, class diagram and finally a sample screenshot of the application in practice.



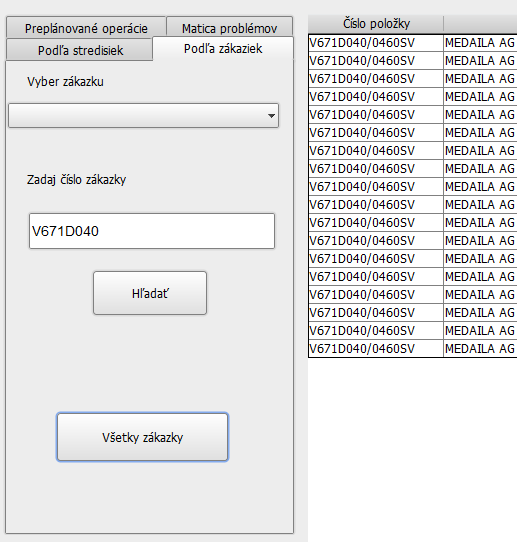


### Full version of the application

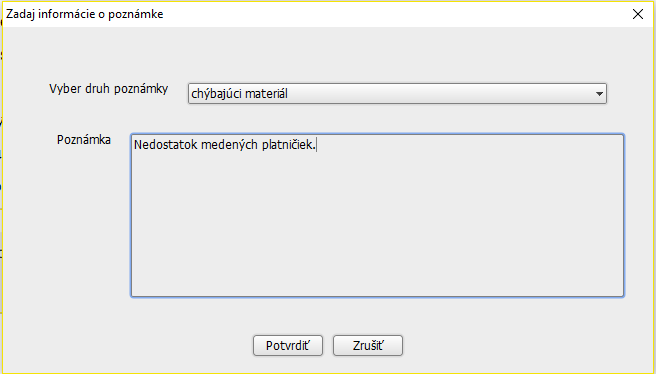


To further elaborate on the funcionality currently provided by the application, it's best to describe the use case particular use cases from figure XX.

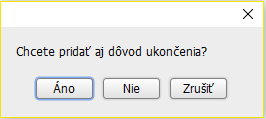
1. View, filter and sort opperations is the most basic tool for widest spectrum of users. It's possible to filter queries based on workcenters, dates, delays and completion. Sorting works intuitively by clicking on table headers.
2. Searching for a specific order was specially requested by sales department. User can either browse the combobox filled with all orders or type at least the beggining of its number into textfield.



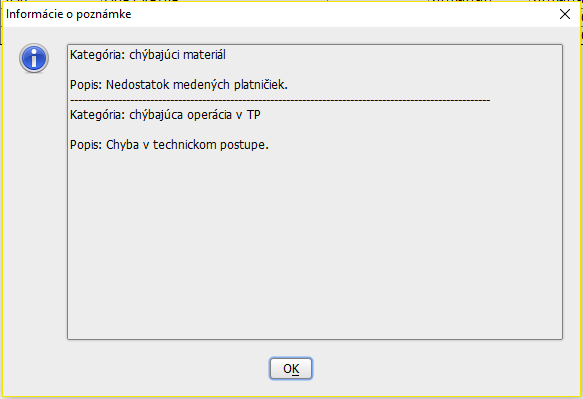
1. Adding information about delays was mentioned in this thesis multiple times. In the application, it's represented by notes. With operation selected in the table, after clicking button to add note, dialog window pops out and user can select category and describe the problem.



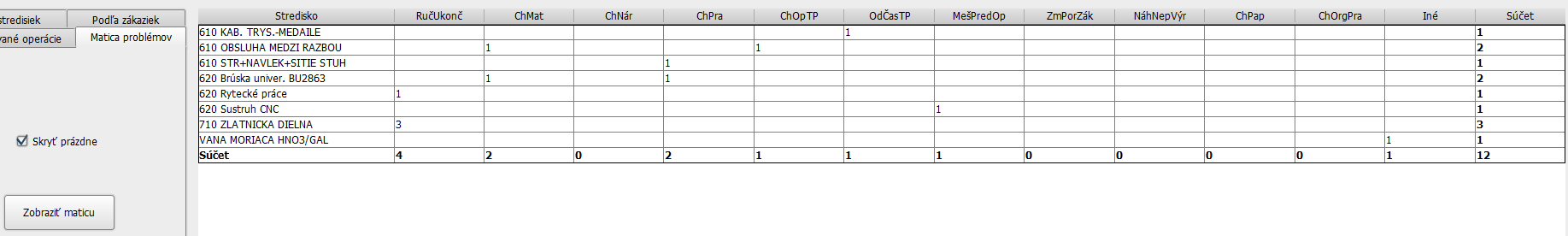
1. By default, operations are flagged as finished automatically after quantity produced >= quantity scheduled. If for some reason this doesn't happen, but the user wants the operation to be considered as finished anyway, he can use another button. He is then offered an option to also add a note to describe why is the operation being ended manually. This operation will later be shown in the table in *italics* for better clarity.



1. Logical follow-up for adding notes is the option to view them. Operations with notes are indicated by **bold** rows in the table and after clicking button for showing the notes, following dialog window will pop up listing all of the notes for selected operation.



1. Last part of functionality was requested by management. Table changes from operations to a matrix where rows represent workshops and columns represent categories of delays. With an increasing number of delays uploaded, repeating mistakes will make themselves clear and easy to spot here.



This is the current version of the application. All involved parties in the mint including master planner, workshop planners, sales department and top management have expressed their satisfaction with it and right now have no further suggestions for any modifications.

# Conclusion

At the time of writing this thesis planners, sales department and top management all expressed their satisfaction with the application

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[atd.]

# Seznam grafů

[vložit seznam grafů]

# Seznam tabulek

Tabulka č. 1: Příklad tabulky 8

# List of figures

# Seznam obrázků

# Seznam použitých zkratek

# Seznam příloh

Příloha A – vzor dotazníku

Příloha A – vzor dotazníku

[atd]