MASARYK UNIVERSITY

FACULTY OF ECONOMICS AND ADMINISTRATION

ESF:MPH_AOMA OPERATIONS MANAGEMENT

SEMINAR WORK

UTILIZATION (APPLICATION) OF THE THEORY OF CONSTRAINTS (TOC) AND CRITICAL CHAIN (CC) AS A PROJECT MANAGEMENT METHODOLOGY BASED ON TOC PRINCIPLES.

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Content

1. How would you apply CC and TOC tools for the planning of your own dissertation (writing the dissertation is in fact a project)? Can you name the project risks? Do you know how to diminish (reduce) these risk factors (to avoid obstacles)?

Before starting applying Theory of Constraints and Critical Chain Management methods to planning of my diploma I would like accumulate to some basic information about these methods that will help me in practice.

First of all *Theory of Constraints* where introduced by Eliyahu M. Goldratt in his book The Goal in 1984. The theory is based on idiom "A chain is no stronger than its weakest link". It means that the rate of goal achievement in organizations and projects is limited at least by one constraint in their process.

This constraint is usually called *Bottleneck*. Bottleneck is an element in system that is more limited than other elements. Therefore as the any process depends on the cooperation of independent elements linked together, this weak point determines the strength of the system and achievement of the process goal.

To increase system efficiency means to deal with problem of bottlenecks. That applies consistent focus on bottleneck and increasing flow through it. That can be made with finding of different links between system elements and changing workload as well.

The application of the Theory of Constraints takes two preparatory and five main steps:

Preparatory steps:

1. Identify the Goal of the System/Organization

2. Establish a way to measure progress to Goal

Main steps:

1. *Identify* the system's constraint.

2. *Exploit* the system's constraint.

3. *Subordinate* everything else to the above decision.

4. *Elevate* the system's constraint.

5. If a constraint is broken (that is, relieved or improved), go back to Step 1.

On the other hand *Critical Chain Management* in simple view is application of the Theory of Constraints to a project. It is method of planning and managing projects with stress on resourcing project activities. The aim of Critical Chain Management is optimize project duration taking into account individual task structural and resource dependency, uncertainty risk and possible variations.

Planning of diploma writing using Theory of Constraints method

For planning my diploma writing for Master's degree I will use basic steps of Theory of Constraints.

Preparatory steps:

1. Identify the Goal of the diploma writing

My goal is to write a diploma of high quality and within time frame.

2. Establish a way to measure progress to Goal

For measuring goal the following characteristics can be used:

- o   Quality of work. Measured by grade I will get.

- o   Timeliness. Ability to finish diploma on time.

- o   Intensity of work. Workload on week and month basis.

- o   Smoothness of work process. Variation of workload in different time and stages of writing diploma.

Main steps:

1. Identify the process constraint.

For identifying process constraint first I need to make approximate work plan for writing diploma.

The work plan includes the following activities:
1. Field of interest identification
2. Finding leader for diploma
3. Idea identification within field of interest
4. Identifying approximate content of diploma
5. Finding sources. Theory part
6. Gathering information. Theory part
7. Writing theory part
8. Finding sources. Practice part
9. Gathering information. Practice part
10. Writing practice part
11. Writing Introduction and conclusion
12. Preparing list of sources
13. Preparing supplements
14. Revision

While analyzing presented activities the following **constraints** can be found:

7. Writing theory part

10. Writing practice part

These activities are more possible to cause delay. It's hard to predict duration of time needed for performing them and there are many risks and external factors that can influence their fulfillment.

2, 3. Suggestions for exploiting and subordinating process constrain of diploma writing are the following:

- o Ensure that resources at the constraint are available and used for maximum and efficiently (in diploma writing example the resources are time, literature, other needed information)

- o Use buffers after bottlenecks to protect process from breakdown and lengthening (time reserves will be used in diploma writing plan)

4. To elevate constraint I can:

- o Increase constraints capacity and efficiency (means work hard and don't digress on other things when performing constraint activities. It's not possible to increase capacity of workforce due to fact that I'm the only one who can write it)

Critical Chain Management

For constructing Critical Path for diploma project firstly I need to determine technology that will include dependence of tasks and resources needed for task implementation.

Task	Resources	Time resources	Prerequisites
1. Field of interest identification	–	1 week/8hours	–
2.Finding leader for diploma	–	2 weeks/8hours	1
3.Idea identification within field of interest	With leader	1 week/8hours	1,2
4.Identifying approximate content of diploma	With leader	2 weeks/8hours	3
5. Finding sources. Theory part	Library, internet	2 weeks/8hours	4
6. Processing information. Theory part	Books, internet	4 weeks/8hours	5
7. Writing theory part	Gathered information. Books, Internet	6 weeks/8hours	50% of 6 done
8. Finding sources. Practice part	Company, internet	4 weeks/8hours	4,6
9. Processing information. Practice part	Company, internet	4 weeks/8hours	8
10. Writing practice part	Gathered information	8 weeks/8hours	50% of 6 done, not in parallel with 7
11. Writing Introduction and conclusion	–	2 weeks/8hours	7, 10
12.Preparing list of sources	Gathered information	1 week/8hours	7, 10

13. Preparing supplements	Supplements	1 week/8hours	7, 10
14. Revision	Diploma	1 week/8hours	10, 11, 12, 13
Total		39 weeks/8hours	

Figure 1. Schedule of tasks

The Gantt chart was constructed on basis of critical path method is presented in Figure 2.

As working day consists only of 8 hours, Gantt chart in figure 2 should be converted according to time capacity. The adapted Gantt chart of diploma writing is presented in Figure 3.

Possible risks

According to ISO 31000 (2009) /ISO Guide 73 *risk* is the 'effect of uncertainty on objectives'. In another words it's a possibility that result will not be equal.

In diploma writing process the following risks can occur:

o   Employment risk – will make time resources less

o   Availability of sources risk – if sources will not be available at library, in company

o   Possibility that diploma files will be lost or duplicated wrong

The risks can be diminished in the following ways:

o   Time buffers

o   Beforehand planning meetings' schedule and issues to be discussed

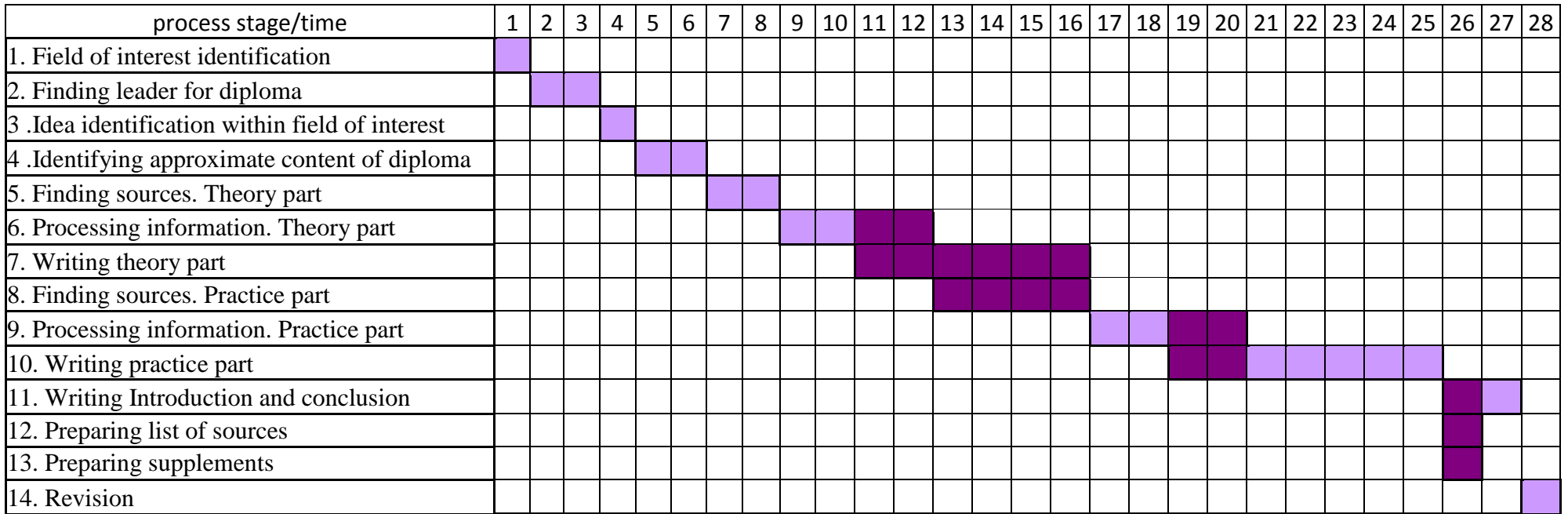o   Checking and revising diploma files while writing

process stage/time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
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2. Finding leader for diploma		■	■																									
3 .Idea identification within field of interest				■																								
4 .Identifying approximate content of diploma					■	■																						
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11. Writing Introduction and conclusion																										■	■	
12. Preparing list of sources																										■		
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Figure 2. Gantt chart

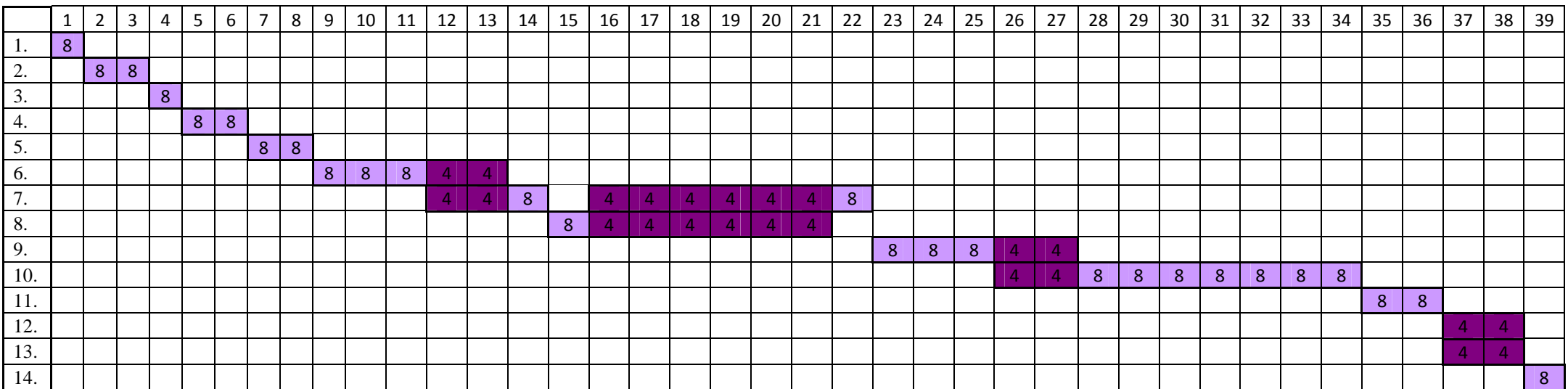|	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
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Figure 3. Adapted Gantt Chart

2. How would you persuade Your new (in the future, after you start to work) colleagues, that CC project management methodology might be suitable for the project management? Can you define basic CC benefits?

There are numerous benefits of implementing of Critical Chain. I'll identify only some of them, that from my point of view are important.

Critical Chain management:

1. Gives a 'big picture' of the project.

Critical Chain provides consistent outlook on the inter project and emphasizes project progress. Therefore problems are easily and quickly identified and solved. It gives vision of priorities and don't let people get confused.

2. Identifies most probable task durations

On one hand task duration isn't too long, which according to Parkinson's Law "Work expands to fill (and often exceed) the time allowed" causes inefficiency of work process. On the other hand schedule isn't too intense that usually causes employees' stress and as a result lower quality.

3. Implicates control on critical resources and task schedule

Managers continuously focus on bottlenecks so preventing problems from occurring and resolving conflicts with users and providers of resources. Tasks start when they need to be started – as soon as predecessors are finished, and finished as soon as possible.

4. Protects project consistency with buffers.

Project completion is secured with buffers which locate at bottlenecks or in the end. Therefore if some unfavourable event happens during task realization which extends implementation time, buffer serves as a reserve to prevent following tasks starting later.

5. Reduces multi-tasking.

Preventing multi-tasking is implemented by setting priorities for all tasks. That gives employees direction on which tasks are critical and which are not, in a word, what to do first and what next. It reduces costs and implementation due to possibility to consentrate on performing one task at a time.

After the benefits presented earlier, it's evident that Critical Chain is a suitable method for project management. Moreover it's one of the best methods to use because it reduces duration of the project, lower project costs and improves quality of the final result.

3. What kind of effects do you expect by possible using buffers (time buffers) during the working out of your thesis (dissertation)? Can you explain what is the buffer?

Buffer is a designed reserve of time applied to project schedule.

It protects project from predictable and unpredictable risks and serves to keep real due date of project equal to planned. Also buffers are using to assist bottlenecks of the process with additional time for their completion. Buffers are very important for success of the projects.

For my diploma I've decided to use 1 week buffers after bottlenecks (activities 7 and 10). That will lengthen project for 2 weeks but will protect from expected delays in performing these tasks. The Final Gantt chart with buffers is presented on Figure 4.
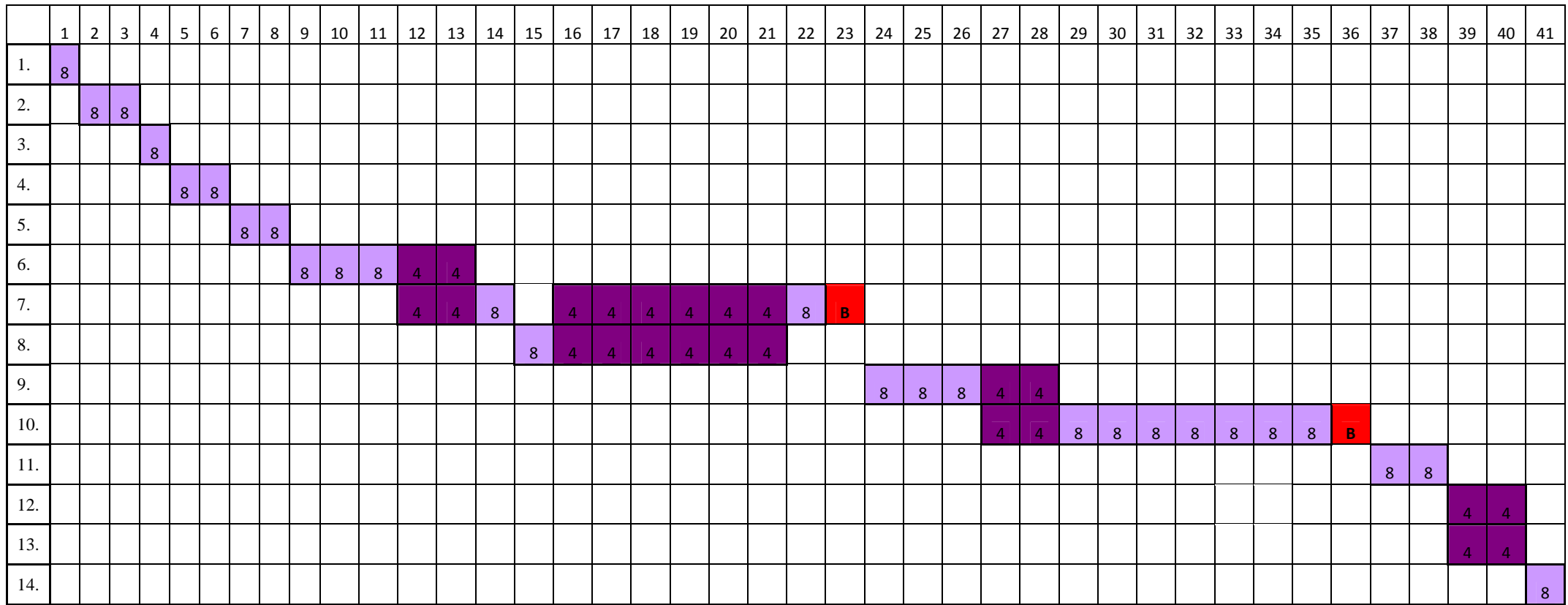
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
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Figure 4. Final Gantt chart with buffers

4. Can you specify by use of Thinking Process Tools. Your personal bottleneck as far as studying processes or writing a work or working on assigned school tasks (by other tutors) is concerned? Try to use CRT – Current Reality Tree and create a list of Undesirable Effects (named by You).

Thinking process is a part of Theory of Constraints and enables focused improvement of a system.

Current Reality Tree measures current state and presents the network of cause-effect relation between undesirable effects. It helps to analyze current state of system and find the core problem.

First, I'll make a list of **undesirable effects (UDE)**:

1. I have not enough time
2. I can't plan my time
3. I can't do things on time
4. I have student syndrome (I start fully work only when it's last moment before deadline)
5. I'm busy doing other things than writing diploma (they can be also important)
6. I can't concentrate
7. I have low quality of work (diploma)

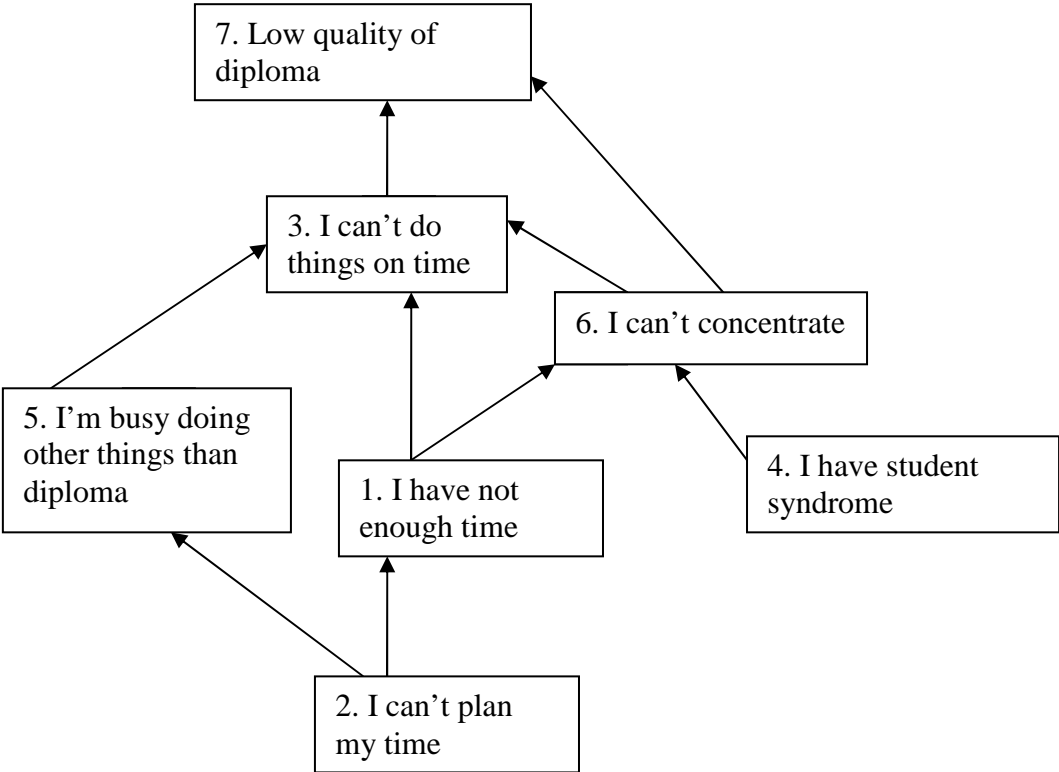Using these undesirable affects Current reality tree can be constructed:

Figure 5. Current reality tree

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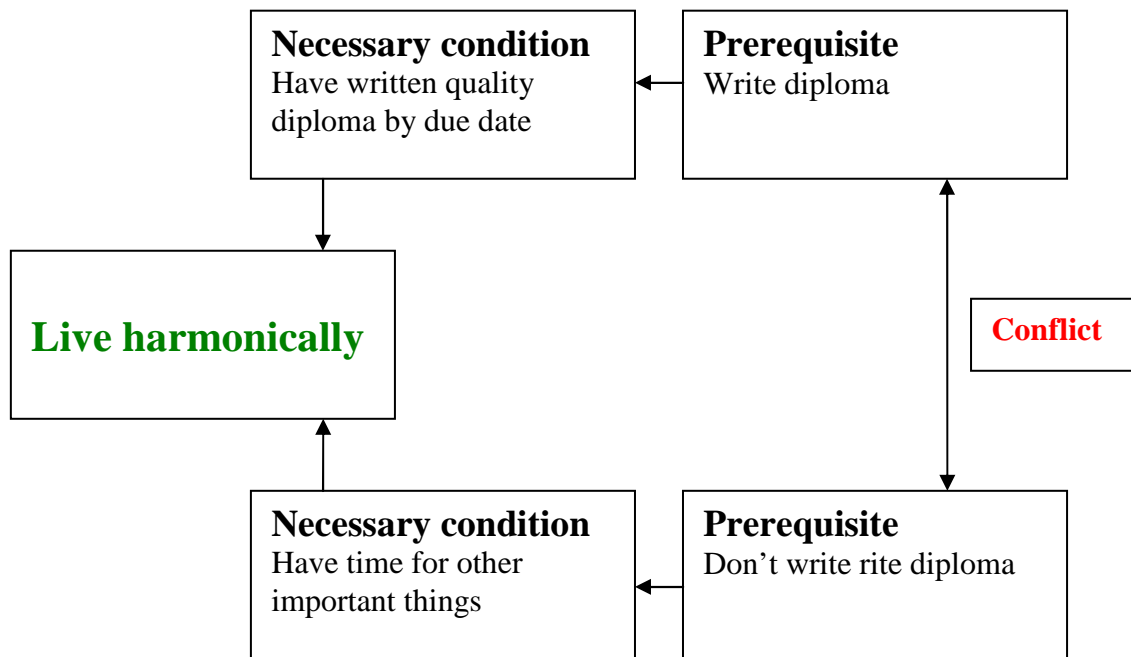*Evaporating Cloud Tree* is aimed to find and solve conflicts.

Necessary condition Have written quality diploma by due date	**Prerequisite** Write diploma
Live harmonically	**Conflict**
Necessary condition Have time for other important things	**Prerequisite** Don't write rite diploma

Figure 6. Evaporating Cloud Tree

5. State clearly your suggestions to improve your dissertation writing (project management question) and related benefits.

Some of improvements were already presented earlier while applying Theory of Constraints and Critical Chain tools:

- o First of all after identifying bottlenecks to which I should pay more close attention while planning and writing diploma.

- o Second, a plan (Gantt chart) for diploma writing process was created using Critical Chain tools.

- o Third, to protect project from possible risks I've used buffers that were included in Final Gantt chart after bottlenecks.

While analyzing list of undesirable effects, Current Reality Tree and Evaporating Cloud Tree I've came to a conclusion that injections to improve current situation will be needed. Therefore, a Future Reality Tree should be constructed to reflect these improvements.

Future Reality Tree is used to solve problems uncovered in Current Reality Tree and conflict of Evaporating Cloud Tree by breakthrough idea (injection) and shows possible future state of the system possible after introducing improvement measures.
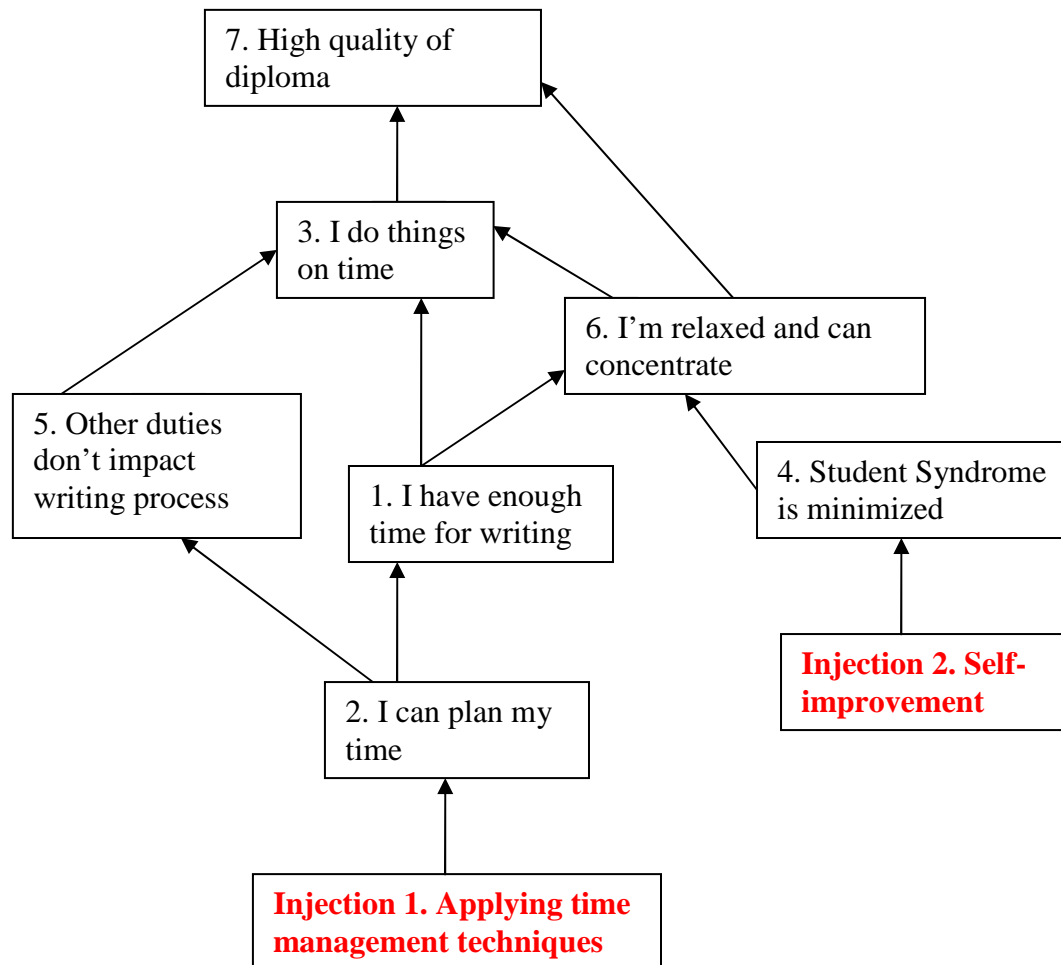
Figure 7. Future Reality Tree

Injection 1. Applying time management techniques

Time-management aims to control time spent on activities to increase efficiency. It includes range of tools, techniques and skills for managing time and special activities, such as planning, setting goals, prioritizing, organizing, scheduling, analysis of time spent, monitoring etc. This tools can be helpful to me to organize my time and not be stressed about its shortage.

Injection 2. Self-improvement

For improving process of writing diploma (as well as other aspects of my life) a continuous work on my weaknesses, comprehension of my mistakes and enhancement of my strengths is needed. It includes struggling with student syndrome and laziness as well.

Benefits

All mentioned above improvements can bring numerous benefits. The main for me are:
1. High quality of end result
2. Smooth process
3. Elimination of stress factor
4. Prioritized time organization, that allocates time for other important things in my life than studying
5. Harmonious time distribution