

Masaryk University
Faculty of Economics and Administration



Operations Management: seminar work

Application of the Theory of Constraints, Critical Chain Project Management as a
Project Management Methodology based on TOC principles



Student: Jasna Brkić
Učo: 457125
Email: 457125@mail.muni.cz

Table of contents

Contents

1. Project description and application of TOC and CCPM	2
2. Effects expected by possible use of time buffers during the project	6
3. Current Reality Tree	9
4. Ishikawa fishbone diagram and Pareto Lorenz curve.....	11
5. Improvements of the Project.....	13
Bibliography	14

1. Project description and application of TOC and CCPM

How would you apply CCPM and TOC tools for the planning of Your own project? Can you name the main project risks? Do you know how to diminish these risk factors (to avoid obstacles)? Name at least 10 obstacles!! Name set of UDE's.

The Theory of Constraints was firstly introduced by Dr. Eliyahu Goldratt in 1980s and delivered to the wider audience in his bestselling book “The Goal”, published in 1984 (Şimşit, Günay, Vayvaya, 2014). Other connected books also written by Goldratt are *The Goal* and *It's Not Luck* (Dettmer, 1997).

The Theory of Constraints is a management philosophy for identifying the most important limiting factor (i.e. constraint) that stands in the way of achieving a goal and then systematically improving that constraint until it is no longer the limiting factor.¹

This theory is based on the system approach. Goldratt sees companies as a system, and their success depends on how well the components of the system interact among each other. He argues that systems are similar to chains or networks of chains. Like in the chain, systems performance is limited by the performance of its weakest link. This means that no matter how much effort is put into improving the whole processes only the effort put into the weakest link will improve the whole system. The weakest link in the system is called constraint (Dettmer, 1997). In manufacturing, that constraint is often called a bottleneck.

TOC deals with the problem of managing and improving complex systems using a *holistic, logical* and *win/win* approach (Ptak, Schragenheim, 2004, p. 21)

The ultimate goal of manufacturing company is to make profit both in short and long term. Theory of constraints is collection of system principles and tools, or methods for solving the problem of improving overall system performance (Dettmer, 1997). It is consisted of following tools:

- The five focusing steps – this is a methodology for identifying and removing the constraints
- The thinking processes – tools for analyzing problems and finding solutions
- Throughput Accounting – this is method for measuring performance and guiding management decisions

Five focusing steps of TOC

1. Identify the constraint
2. Exploit the constraint
3. Subordinate and synchronize to the constraint

¹ <https://www.leanproduction.com/theory-of-constraints.html>, accessed 11.11.2017

4. Elevate the performance of the constraint
5. Repeat the process

Important questions to answer using TOC:

1. What to change?
2. To what to change?
3. How to make the change happen?

It is important to mention that implementation of TOC is complicated switchover process, and it involves change. Some people don't like change, so we can encounter on some resistance.

Critical Chain Project Management

According to Turner (1992) **a project** can be defined as an endeavor in which human, material and financial resources are organized in a novel way, to undertake a unique scope of work of given specification, within constraints of cost and time, so as to achieve unitary, beneficial change, through the delivery of quantified and qualitative objectives (Chapman and Ward, 2003).

Usually projects are regarded as very unique, meaning every project is different. Projects are also characterized by bigger uncertainty and risk than business activities that are considered as usual (for example production process).

***Critical Chain Project Management (CCPM)** is a methodology for planning, executing and managing projects in single and multi-project environments.²*

It was developed by Goldratt and was first introduced to the market in his Theory of Constraints book "[Critical Chain](#)" in 1997. It was developed in response to many projects being characterized by poor performance manifested in longer than expected durations, frequently missed deadlines, increased costs in excess of budget, and substantially less deliverables than originally promised.

Critical Chain is defined as the longest chain [not path] of dependent tasks. In this case, 'dependent' refers to resources and resource contention across tasks/projects as well as the sequence and logical dependencies of the tasks themselves. This differs from the Critical Path Method.

Since project is associated with bigger risk and uncertainty Critical Chain Project Management uses safety buffers to manage the impact of variation and uncertainty related to the projects.

Risk can be defined as uncertain event or condition that, if it occurs, has a positive or negative effect on a project objective PMI (2000, p. 127), (Chapman and Ward, 2003).

If a risk is described as an uncertain event with negative impact on objectives it represents **treat**.
If a risk is defined as an uncertain event that could have a favorable impact on objectives.

² http://www.goldratt.co.uk/resources/critical_chain/, accessed 15.11.2017

Risk management is systematic application of procedures to the tasks of identifying and assessing risks, and then planning and implementing risk responses. This provides a disciplined environment for proactive decision making.³

Risk can be:

- reduced or eliminated by including problem remediation activities into the project plan;
- transferred to other activities or other responsible parties, such as an outside vendor;
- absorbed or pooled by simply planning for them; and
- avoided by putting quality control practices and procedures into place.⁴

Risk management procedure

According to the PRINCE 2 methodology risk management procedure includes 5 steps:

1. Identify (context and risks)
2. Assess (estimate and evaluate)
3. Plan
4. Implement
5. Communicate

Description of the project

Chosen project for this seminar work is *Starting up a Travel Blog*, since I am a person who likes to travel a lot. This is a project which requires careful thinking about various topics and planning in advance how to run it effectively. Many decisions and considerations must be taken into account before starting up a blog such as:

- Name of the blog
- Main topics about which I would like to write on the blog
- Positioning of the blog
- Design of the blog
- Writing style
- Photos style
- Consider which information to share in each blog post
- Schedule of the posts (for example once per week)
- Other appropriate social media which will help increase the visibility and reach of the blog
- Hosting services or online platform on which blog will operate
- Lastly and most importantly, travel plans must be coordinated with budget and free time during the year

³ Managing successful projects with PRINCE 2, Axelos (2009)

⁴ Cervone H.F. (2006), *Project risk management*, OCLC Systems & Services: International digital library perspectives Vol. 22 No. 4, 2006 pp. 256-262, Emerald Group Publishing Limited 1065-075X DOI 10.1108/10650750610706970

As shown in previous text a lot of decisions need to be made before starting the blog in order to create successful blog which will people like to visit and read and ultimately recommend to other people. There are a lot of blogs which deal with the topic of travelling, therefore it is imperative to carefully consider all of these decisions in order to create Blog which will stand out and be original.

In the first period when the blog is started, I assume I will be writing the blog posts about my previous trips, so it is necessary to make notes about previous trips and gather the best insights and tips for each destination and create blog posts. Then it is necessary to decide in which order to put them on the blog. In the meantime, it is necessary to plan the future trips and think about future destinations and plan both time and budget for future trips.

Then it is also important to have constantly some interesting content for social media regarding travelling and maybe some other topic related to travelling, because it is important to post every day on the social media, because of the visibility and reach – which will help in attracting new people to visit my blog.

So, the next steps are also important to include in the planning:

- Writing notes about previous trips
- Research about other blogs on similar topic and assess what they do, how they write and how is their positioning
- Create a positioning strategy for my Blog (including decision about name of the blog, content, design, writing style, hosting...)
- Plan the schedule of posting on the Blog
- Make a Social Media Content Strategy and create a plan and schedule for posting content
- Plan future trips and plan budget and time

The Start of the Blog (the first post) should be no later than February 1st, 2018.
(the project duration – 2.5 months)

In the next table, risks associated with this project will be stated together with the mitigation strategies.

Project Risk	Mitigation Strategy
Lack of time for quality research, planning and making good decisions before starting the blog	Make clear plan and stick to it, Make creation of the Blog priority
Wrong judgement about the positioning strategy	Make sure to free enough time to search what competitors are doing, ask for the advice people who already have their blogs
Choosing the wrong hosting company	Do a good research about it + consult with experts in this area
Lack of quality photos from previous trips	Either make sure I have couple of them from each trip or find good photos online and give credits to people who took these photos

Don't have enough materials to post because of the too narrow Blog topic	Write not only about Past travelling experiences but also about living in CZ, Slovakia, studying in CZ, Tips for travelling, News about travelling, and later expand even more topics
Personal problems which will affect my available time for planning the Blog	This is something that cannot be predicted quite well, but it can be reduced by not procrastinating
Possibility to get sick which will postpone the start of the blog due to lack of time to plan properly	Cannot be predicted, but it can be mitigated with not skipping the crucial steps in the process and not procrastinating
Possibility to get job and have considerably less time available for hobby of blogging	Job is also needed because of the money for future trips, but with careful planning and making clear priorities it can be done
Wrong estimation of the needed effort to run the blog consistently which can result in big time gaps between the posts	Try to write the blog and see how long it will take. With good planning with all above stated decisions this can be much reduced.
Lack of time for travelling after starting the blog	Even If I find the job, plan for some weekend trips or one day trips, because also majority of people also have very limited time to travel so they appreciate one -day trip tips and advices.
Lack of budget for travelling after starting the blog	Plan carefully, search for the best deals, and make sure I have the job

2. Effects expected by possible use of time buffers during the project

Can you explain what is the time buffer? How you can measure a reached result (used metrics such as time, resource capacity, costs, good-will and so on).

According to the TOC, buffer is designed to protect only the critical areas, the areas that control the performance of the whole system. In the TOC terminology, they are they physical constraints of the system.

TOC uses time-buffers as a protection mechanism against common variations of uncertainty, but they are not enough. There is a need to identify problematic situations and respond with corrective actions. Buffer Management is a true control mechanism.

The Critical Chain/Buffer Management (CC/BM) approach aims at the construction of latest start schedules where the project activities use aggressive time estimates and puts a clear focus on the determination of a realistic project deadline. In order to keep the probability high that the project

deadline will be met, the CC/BM approach protects the project duration and the critical chain of the project using various buffers. There are different types of buffers:

- Project buffer: A unique and single buffer to protect the project deadline, usually placed at the end of the project.
- Feeding buffer: Multiple buffers to protect parts of the critical chain.
- Resource buffer: Multiple artificial buffers that act as warning signals to assure the availability of resources⁵.

Time buffer means adding some extra amount of time between the tasks or at the end of the project.

The project is consisted of 3 main phases and each phase is consisted of the following activities that are important for completing successfully the project:

- **Research phase** (about competing blogs, their positioning, finding hosting companies, finding appropriate web platform – free or for paying)
- **Planning phase** which include:
 - Think about the name of the blog
 - Plan overall design and appearance of the blog (writing style, photo style, blog design, font design...)
 - Plan content of the blog
 - Plan the schedule of the posts
 - Plan the social media strategy (Facebook, Instagram – for the beginning)
 - Plan future posts and trips
 - Plan first couple of posts to grab attention of the people
 - Plan roughly next posts and make notes about it
 - Create a plan to document all these decisions
- **Implementing phase** include:
 - Choose the web platform for blog
 - Buy the domain with my blog name
 - Buy the hosting for one year (or choose some free platform)
 - Create the structure of the blog
 - Create the first post (but don't share it)
 - Create social media and post basic information and some photos (post photos and links extensively couple of times a day to get a base of people who follow these social media profiles)
 - Share blog post on social media

Important notice:

About one month before creating or wanting to promote the blog, social media should be created, in order to get some fan base before starting with the posts.

⁵ http://www.pmknowledgecenter.com/dynamic_scheduling/risk/critical-chainbuffer-management-adding-buffers-project-schedule

It is always difficult to estimate the duration of the individual activities (especially when they are connected to brain work and thinking). In my project main phases are:

1. Researching
2. Planning
3. Implementing

I described them in detail above, and I expect that Planning phase will take most of the project time, because it will be necessary to make important decisions and document everything, so the Implementation phase goes easily and smoothly.

Research phase is also important, because the quality of the information that comes from this phase will influence the planning and implementation and whole project success.

As the current situation looks like, and with all uncertainty I would put time buffers between each activity plus at the end of the project. This is important for many reasons. Firstly, after each phase, it is good to have buffer, so I have time to contemplate about gathered information, decisions made, and maybe something will come up as an interesting idea in the last moment. Secondly, it is important to have free time in case of emergencies like unexpected personal problems, illness, tasks that cannot be postponed or changed.

This is how I would do it:

- 1) Firstly, assign for each of these 3 phases certain time (estimate roughly because it is almost impossible to estimate with certainty intellectual work)
- 2) Secondly, I would see which amount of the time is left from the whole duration of the project (2.5 months or 10 weeks – assigned time to 3 phases) and divide the left-over time to 3 buffers:

For example:

- 1. Researching phase – duration 1 week**
 - Buffer: 1 week
- 2. Planning phase - duration 2 weeks**
 - Buffer: 1 week
- 3. Implementing phase – 4 weeks**
 - Buffer: 1 week

Planned activities time $1+2+4 = 7$ weeks

Total project time = 10 weeks

Total Buffer time = 3 weeks (each buffer 1 week)

3. Current Reality Tree

Create CRT and create a list of Undesirable Effects (named by You as it was mentioned already in clause 1)

Current Reality Tree is useful thinking tool for detecting the core problem or the bottleneck of the project. Firstly, I defined the list of undesirable effects:

UDE 1: Lack of time

UDE 2: Wrong judgment (regarding positioning, content or blog design)

UDE 3: Lack of quality content

UDE 4: Too narrow Blog scope

UDE 5: Personal problems

UDE 6: Illness

UDE 7: Job

UDE 8: Wrong estimation of effort needed (both for planning the start of the blog and for running the blog)

UDE 9: Lack of the time for travelling after starting the Blog

UDE 10: Lack of budget for trips after starting the Blog

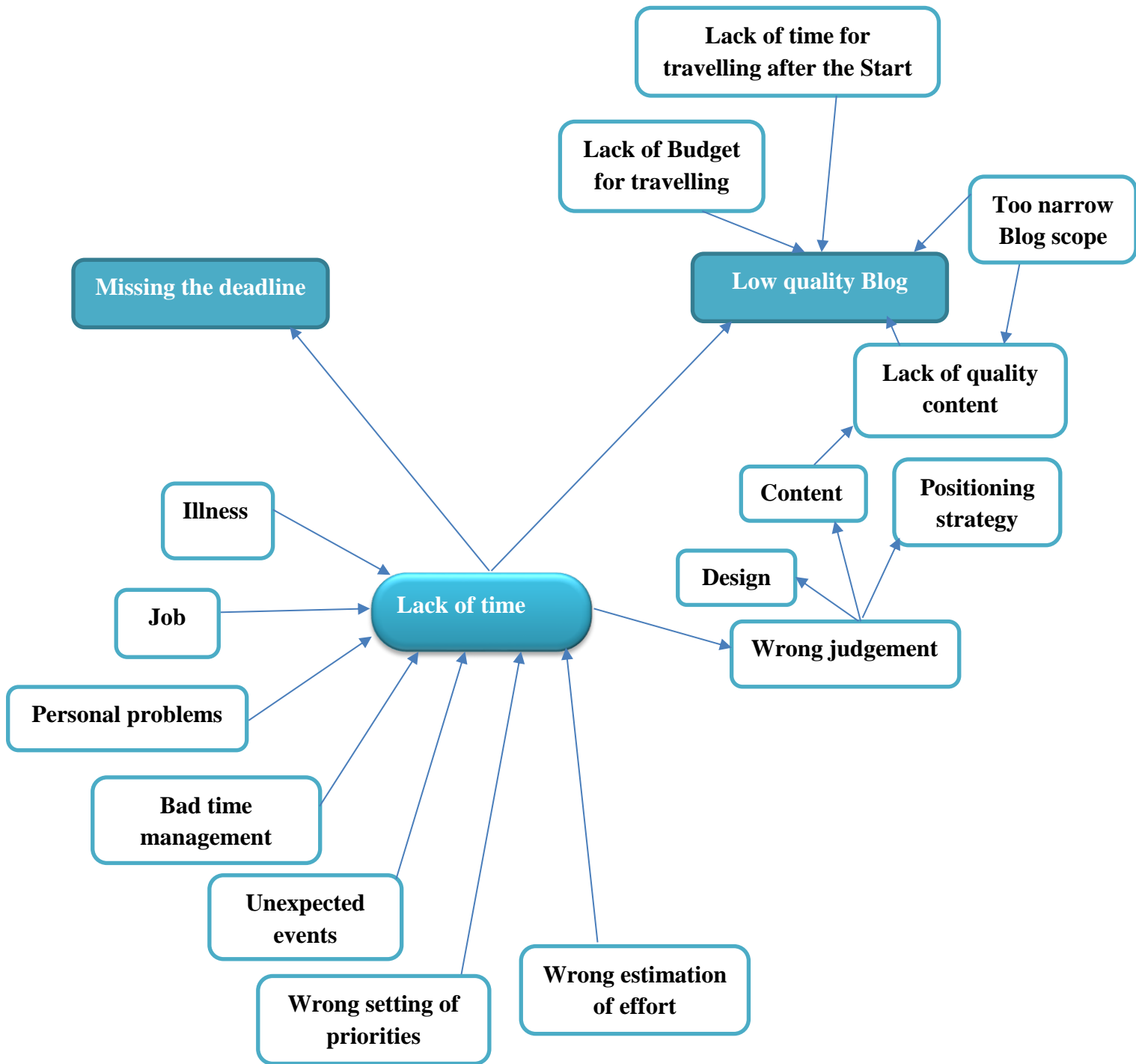
UDE 11: Unexpected events which cannot be postponed

UDE 12: Wrong setting of priorities

UDE 13: Bad time management

On the next page I created Current Reality Tree.

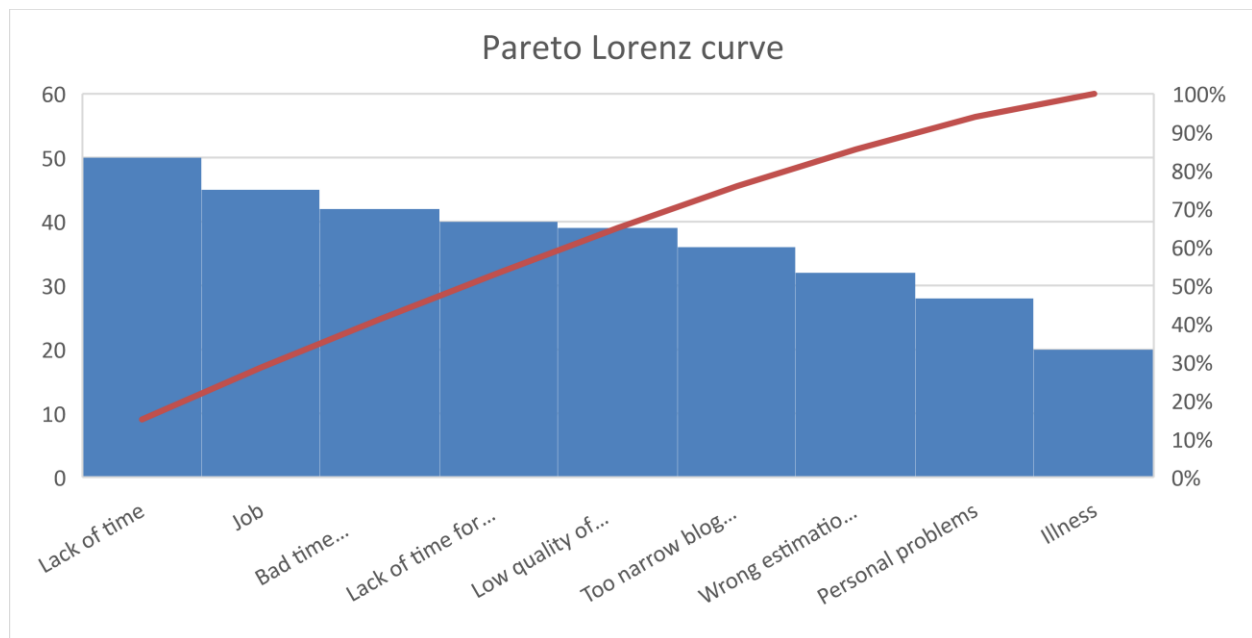
According to my analysis, main problems are Lack of time and Bad time management. It is difficult to come up with the core problem, because this is kind of introspective analysis and it is important to know ourselves very good. It is important to assess the real cause and effect, because couple of undesirable effects can be approached from different perspectives and point of views, but as I said it is really important to start from our own personality and do the analysis having in mind objectively all of our positive and negative sides.

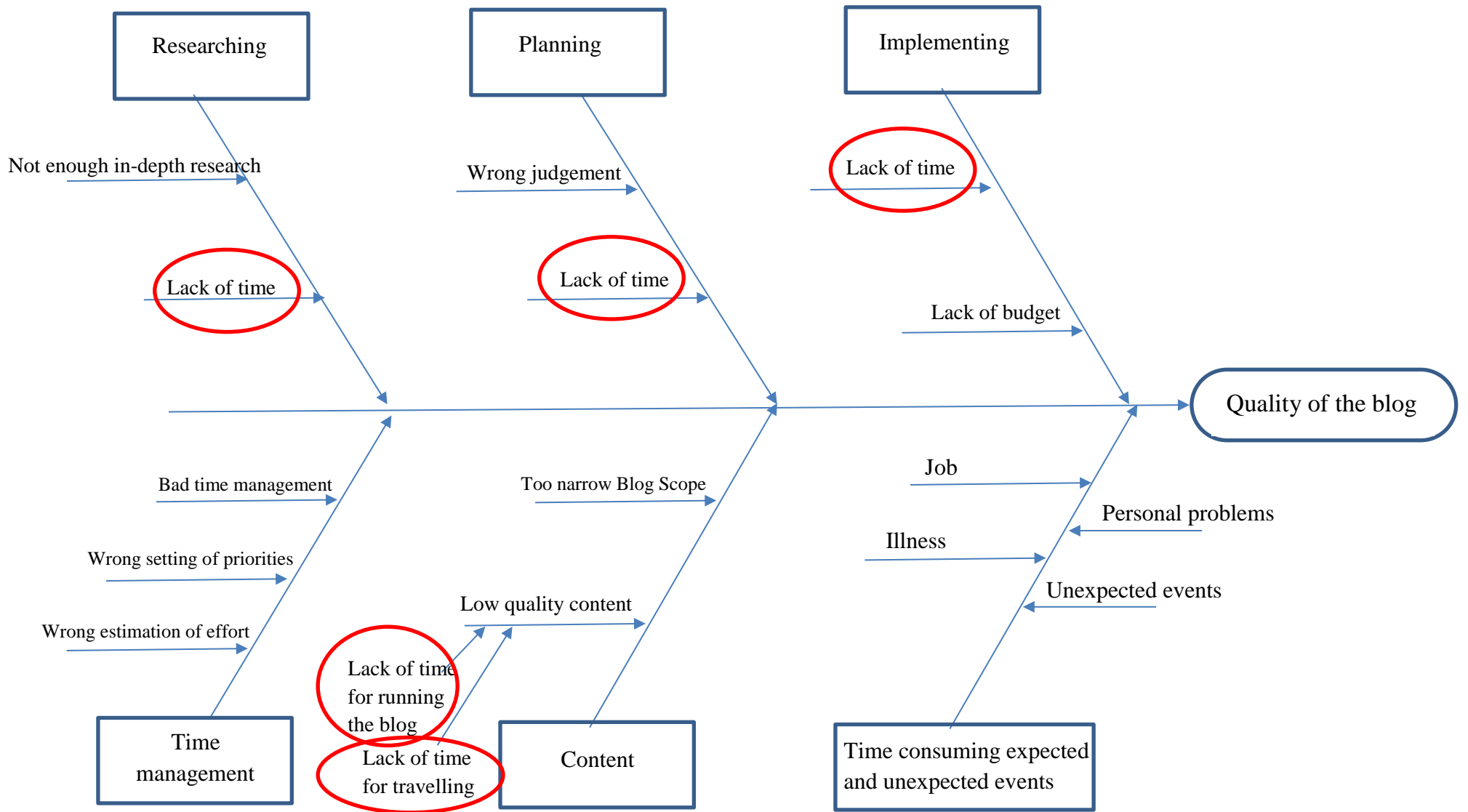


4. Ishikawa fishbone diagram and Pareto Lorenz curve

Create with use of already existing set of UDE's Ishikawa fishbone diagram and put some weights meaning numbers specifying an importance of assign reasons. It was clearly shows in Ishikawa FBD power-point presentation. Based on the set of assigned scores create Pareto Lorenz curve (use Excel). The principle is also shown in just mentioned presentation. Specify most important reasons. Compare with root problem found by use of Current Reality Tree.

UDE	Importance	Importance %	Accumulative %
Lack of time	50	15%	15%
Job	45	14%	29%
Bad time management	42	13%	41%
Lack of time for travelling	40	12%	53%
Low quality of content	39	12%	65%
Too narrow blog scope	36	11%	76%
Wrong estimation of effort	32	10%	86%
Personal problems	28	8%	94%
Illness	20	6%	100%
Total	332	100%	





5. Improvements of the Project

State clearly Your suggestions how to improve Your Project and related benefits.

By using the thinking tools such as Current Reality Tree and Ishikawa fishbone diagram, main problem which can significantly reduce the quality of the Blog and miss the deadline of the projected start is the lack of time. This is something that can happen for various reasons known and unknown, predictable and unpredictable, so it is really important to address this issue.

The lack of time can happen due to:

1. Having personal problems which consume a lot of time and energy
2. Having job (but without job, there is not enough income for travelling!)
3. Being sick
4. Unexpected events which might arise but at this moment cannot be expected or predicted
5. Lack of time can happen as well because of the bad time management

Since one of the important things is to have job, personal problems are almost always unavoidable and not easily predictable as well as being sick and not to mention unexpected events which can't be predicted, I would like to focus the source of the improvements on the time management.

Time management is a soft skill and definitely can be learned. In order to learn time management, I have to learn good practices and install a habit of always practicing time management and focus.

Some practices which I would like to implement are following:

- Concentration and Focus at the present activities (in order to avoid tiredness of constant thinking about multiple things at once and bad multitasking)
- Prioritizing
- Scheduling
- Goal setting
- Sticking to the Plan

Benefits which I think would be achieved by daily usage of these practices are not only connected to this project, but they will improve overall my soft skills, and help me be better at work and in all personal or corporate activities. Expected benefits are:

- Avoid over-tiredness
- Less stress
- Better life-work balance
- Fulfillment of the both career and hobby goals

- Better work quality (better blog, better job performance)
- Greater productivity and efficiency
- Better career advancement
- Higher levels of happiness
- Higher level of self – confidence

Bibliography

Books and articles

Chapman, C., and Ward S. 2003. *Project Risk Management Processes, Techniques and Insights*. Second Ed. England: John Wiley & Sons Ltd.

2009. *Managing successful projects with PRINCE 2*, Axelos.

Cervone H.F. 2006. Project risk management, OCLC Systems & Services: *International digital library perspectives* Vol. 22 No. 4, 2006 pp. 256-262, Emerald Group Publishing Limited.

Şimşit, Z. T., Günay, N. S., and Vayvaya, O. 2014. Theory of Constraints: A Literature Review. *Procedia - Social and Behavioral Sciences* 150, 930 – 936

Dettmer, W. 1997. *Goldratt's Theory of Constraints: A Systems Approach to Continuous Improvement*. Milwaukee, Wisconsin: ASQ Quality Press.

Ptak, C. A., and Schragenheim, E. 2004. *ERP Tools, Techniques and Applications for Integrating the Supply Chain*. Second Ed. US: St. Lucie Press. A CRC Press Company.

Internet sources

<https://www.leanproduction.com/theory-of-constraints.html>, accessed 11.11.2017

http://www.pmknowledgecenter.com/dynamic_scheduling/risk/critical-chainbuffer-management-adding-buffers-project-schedule , accessed 15.11. 2017

http://www.goldratt.co.uk/resources/critical_chain/ , accessed 15.11.2017