

Infobrokering Project Management in Line With the Theory of Constraints – a Case Study

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Abstract

Purpose/Thesis: The paper aims to introduce practical applications of the Theory of Constraints (TOC), developed by the Israeli physicist Eliyahu M. Goldratt. Special attention is paid to the TOC-derived project management methodology called the Critical Chain Concept, seldom yet successfully applied in business practice. An attempt to have TOC implemented in the management of an infobrokering project is reported.

Approach/Methods: Two methods were applied: (1) a critical review of the literature on the subject, (2) a case study for the purpose of which both a participatory and non-participatory observation was pursued, as well as a review and appraisal of the existing documentation reflecting the successive stages of the infobrokering project, along with an in-depth interview.

Results and conclusions: The case study indicates that TOC, especially the critical chain concept, boasts an appreciable potential in optimising infobrokering projects, as it allows to: (1) expose the concealed, deep-rooted, and disadvantageous routines in project implementation, (2) identify the inherent constraints in the project, not so much in terms of embarrassing errors (blunders), but rather as the non-removable events/components, axiologically indifferent, yet requiring remedial measures, (3) realise that the factors routinely deemed conducive may in fact prove the actual constraints themselves, (4) enhance overall executive effectiveness by identifying and strengthening the weakest link in the project processes, (5) achieve improvements in the company's performance without incurring significant expenditure.

Originality/Value: There are no published Polish studies focusing strictly on TOC in terms of information science perspective. The present paper is meant to partially address this deficit with regard to the practice of infobrokering.

Keywords

Critical chain concept. Infobrokering. Infobrokering project. Project management. Resolving organization's problems. Theory of Constraints. TOC.

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1. Introduction

Infobrokering companies in Poland have been experiencing a steady growth nowadays, keep taking in more staff on their payroll, and work on expanding their order portfolios. All this amounts to multi-tasking, i.e. the need to pursue at the same time a number of projects dissimilar to each other, as well as undertake a scope of many different activities simultaneously (be that with regard to the same project or to several separate ones). Multiplicity and heterogeneity of those activities exacerbates the problems typical for the implementation of most projects, i.e. scheduling delays, budget overruns, incorrect sequencing of the tasks, adoption of last-minute outsourcing measures, i.e. sub-contracting some activities out to outsourced contractors without ensuring due diligence, accepting orders with unclear specifications, conflicts among the staff, disputes with the clients, financial losses (Schmidt, 2020b).

Infobrokers thus join the group of entrepreneurs in need of management support in the form of project management know-how (pertinent methodologies), whose flexibility allows them to adapt to the specific nature of the company's activities in which they are being implemented. The present paper addresses a case study, whilst offering an insight into an experimental application of the methodology of critical chain of project management, derived directly from the Theory of Constraints (TOC), into an actual infobrokering project. The first part of the paper focuses on a condensed description of the method itself, also offering some insights into its origin, whereas the other one discusses the actual outcome of applying the critical chain tools to a select case study.

2. Theory of Constraints

The employees face numerous problems and limitations within the processes taking place in the organizations, mainly those of commercial character (Łopatowska, 2009, 1). They search for their causes, with rather mixed luck, while struggling to overcome them. Despite a substantial body of knowledge and a diversity of instruments offered by the management sciences so far, managerial staff continues to search for effective ways of eliminating, or at least partially downsizing various stumbling blocks along the way. Theory of Constraints (Łopatowska, 2009, 1) is one of the methods supporting effective identification of the origins of the organisation's problems, whilst offering at the same time viable remedial measures.

Management theorists and practitioners, as well as business coaches, regard it as an innovative approach to the management issue, and even as a "philosophy" of management and systematic improvement of an organisation (Schmidt, 2020a), whose effectiveness takes origin in a comprehensive recognition, consideration, and overcoming of the weaknesses within the organisation perceived as a system (Jokiel, 2013, 51; IZO TOC+, n.d.). TOC is geared towards achieving long-term benefits for the organisation through the appropriate management of the identified constraints, construed and referred to as the bottlenecks. Constraints are part of everyday reality in almost every organisation, and must not be seen in a negative way (Hetmańczyk-Bajer, 2013, 48; Teoria..., n.d.). Those should first be identified and then tackled. In Poland, this approach is still far from popular, in comparison with other management methodologies deemed the leading ones.

The TOC evolved from the Optimized Production Timetables (OPT) system, subsequently transformed into the Optimized Production Technology (OPT). OPT proved hard to understand in terms of production scheduling, though (Rahman, 1998, 336). The best-selling book *The Goal* by Eliyahu M. Goldratt and Jeff Cox, explaining the rules of OPT in an accessible way, whilst at the same time making the Theory of Constraints an attractive proposition to potential users (Rahman, 1998, 336; Şimşit et al., 2014, 932), came to its aid. According to the TOC, a real improvement in an organisation can only be achieved, when it is considered in a comprehensive manner, and a solution is subsequently developed which would take into account all internal and external factors determining the company's performance. The key principle of TOC is to identify the limiting factor, and then focus on having that particular factor addressed effectively (Schmidt, 2020b). According to TOC advocates, the organisation or company is only as strong as its limitation(s), just as the chain is as strong as its weakest link (limitation).

It follows, that according to the TOC, there is usually only one area in the timeline of each complex system at any given point in time which limits its ability to achieve its objective. In order to improve performance, an organisation must be managed with this particular constraint in mind (IZO TOC+, n.d). Effective management of constraints is possible in various areas, e.g. production, distribution, marketing, sales, project management, and change management (Kosieradzka & Uklańska, 2014, 798). The TOC is most often used in planning specific tasks and managing resources in repetitive production processes. It has been implemented in many global corporations, e.g. General Motors, Intel Corporation, Boeing, Lucent Technologies, Ford Motor Corporation, ABB (Marek-Kołodziej et al., 2017, 320). A few examples of TOC implementation are also acknowledged in Poland (Marek-Kołodziej et al., 2017; Kulejewski et al., 2011).

Both in foreign and Polish studies on the subject, the TOC is referred to as the most modern method of management and improvement of the organisations and their business endeavours aimed at achieving breakthrough results within a short span of time. It is characterised by a holistic approach to improving the organisation at both its operational and strategic levels (IZO TOC+, n.d.). It is essential in the TOC to identify and eradicate any inefficiencies, and to raise awareness of squandering resources as a factor tangibly detrimental to company's profits. The efforts of experts implementing the TOC in business are therefore focused on and grounded in the instruments meant to reduce or altogether eliminate such squandering practices (Hetmańczyk-Bajer, 2013, 48; Teoria..., n.d).

Furthermore, the organisations operating in compliance with the TOC principles are advised to focus on the essentials, with a view to achieving the pre-defined objectives. In practical terms this means that, even though all processes and positions are subject to supervision, the key resources, strengths, and capacities of an organisation are harnessed to performing the priority tasks in terms of the entire system, while the non-critical one may be granted some sort of autonomy (Trojanowska, 2011, 51). Another recommendation remains well in line with the "act locally – think globally" principle, and means that in any decision-making processes regarding individual positions, any effects which may possibly occur on a company-wide scale should be given due consideration (Trojanowska, 2011, 51).

It is also recommended to adopt the assumption that individual employees are decent individuals by nature, and any tasks inadequately performed by them merely go to show

that the fault lies not so much in the individuals, as rather in the system which requires that pertinent remedial measures should be adopted. Individual employees should be treated with respect and trust, their work should be appreciated, they should be motivated and supported in acquiring habitual self-control, discipline, and self-reliance in the decision-making (Trojanowska, 2011, 51). TOC has therefore both a business and social dimension (Hetmańczyk-Bajer, 2013, 53).

According to Goldratt, the TOC is a process of continuous improvement in the five focusing steps:

- (1) Identify the system constraint.
- (2) Exploit the system constraint: Ensuring the continuity of the critical resource through maximum use of the entity's own resources.
- (3) Subordinate everything else to the constraint.
- (4) Elevate the system's constraints: Increase the productivity of the critical resource with the allocation of additional expenditure.
- (5) If in any of the previous steps the constraint has been broken, go back to step 1, but do not allow inertia to become the system constraint (Pretorius, 2014, 497).

In line with the TOC, each organisation is a system with at least one constraint, which makes it difficult or impossible to achieve the performance required. The constraint should not be demonised but, on the contrary, should simply be construed as one of the factors affecting overall performance of the system. Gradual elimination of constraints improves the organisation's performance (Goldratt, 1988, 453; Rahman, 1998, 337).

2.1. A brief note on Eliyahu M. Goldratt

The TOC was first presented in 1984 by Eliyahu M. Goldratt in the business manual *The Goal*. This renowned Israeli physicist, teacher, scholar, philosopher, and a leader in the business world (TOC for Education, b.d.) had devoted his entire life to promoting the values and ideas of TOC (Goldratt Group, n.d.). He made use of the scientific approach characteristic of exact sciences in solving business problems (Schmidt, 2020c). Throughout his career he helped numerous prominent organisations to repeatedly boost their profits and market standing (TOC Theory of ..., n.d.).

Goldratt is also the founder of Goldratt Consulting and TOC for Education (TOCFE), non-profit organisations for the dissemination of knowledge on the Theory of Constraints (Goldratt & Cox, 2004, 5; TCI, n.d.). Both have been successful in promoting and implementing the Theory of Constraints. Goldratt has promoted his body of knowledge and experience primarily through his books. Apart from the most famous book, *The Goal*, he wrote, inter alia, *Production the TOC Way with Simulator*, *It's Not Luck* (a continuation of *The Goal*), *Critical Chain*, *Necessary But Not Sufficient*, *Isn't it Obvious?* and *The Choice*. All these publications are focused on production management, project management, business problem solving, business strategy, distribution, and logistics (TCI, n.d.).

Goldratt has proposed numerous instruments to support and aid management processes in the organizations, i.e. TOC, Drum-Buffer-Rope production management system, TOC Thinking Processes, Critical Chain, Throughput Accounting, a mafia offer for marketing and sales (an-offer-one-cannot-refuse) (Schmidt, 2020c; TCI, n.d.). All these instruments address the key questions, i.e. what should be changed within an organisation? (problem

identification), what should it be changed to? (what to have the defective processes replaced with?), how to change it? (when and how to implement the newly developed solutions?) (Hetmańczyk-Bajer, 2013, 49).

2.2. *TOC in a project environment – Critical Chain concept*

Specialist from TOC Institute pointed to pernicious traits of the current approach to project management:

Most projects finish too late (Schedule). Most projects exceed the assumed costs (Budget). Most projects do not achieve their goals (Specification). Project implementation time is too long. There are too many projects running simultaneously (multitasking). No or unclear prioritization system. The work is outsourced by various internal and external clients. The current planning system doesn't work. When we realize that, it is too late to remediate. Respective departments are managed as separate units / companies (silo mentality), which causes communication disruptions, prevents company synchronization and causes inevitable conflicts. Project specifications and objectives are sometimes unclear. Often the budget of a planned project is not defined and resources are not secured. Projects are persistently continued despite being unnecessary or unprofitable. Quality deteriorates. There is often a need to amend finished projects. The pressure and stress that burden managers become extreme – project management is sometimes a horror. Managers and employees are frustrated and overwhelmed (Schmidt, 2020b).

In response to these recurrent distortions and with a view to enhancing the process of project management, E. M. Goldratt developed a variation of the TOC, i.e. the Critical Chain concept, which he presented in 1997 in the book bearing the same title.

Critical Chain Project Management (CCPM), deemed by far the most advanced approach to project management nowadays, allows for effective elimination of the basic constraints encountered within the projects, i.e. a student's syndrome, Parkinson's Law, chaotic multi-tasking, budget overruns, inappropriate allocation of resources, unclear system of priorities, continuation of unprofitable or unnecessary projects, time pressure (Mańka, 2017; Połoński & Pruszyński, 2008, 46; Schmidt, 2020b). This approach is based on the denial of two widespread yet, according to the TOC method practitioners, erroneous beliefs, whereby: (1) In order to have the project completed on time, each one of its constituent parts must be completed on time, and (2) In order to have the project completed on time, the project must be commenced as soon as possible (Schmidt, 2020b).

The stability and satisfactory feasibility of the project, in line with the concept of the critical chain, requires a common-sense approach to the project as a whole. The critical chain is a sequence of consecutive and interdependent project tasks (main sequence/critical path), the execution of which is necessary to achieve the assumed project goal, with optimal resources (time, people, finances, tools). The critical chain is accompanied by a non-critical chain (feed chain/non-critical path), consisting of tasks which affect indirectly the final project outcome. The non-critical path can connect to the critical path at a specific stage of the project or just before its completion. Above all, Goldratt recommends to carefully define critical tasks in the chain and reduce their duration by 30 to 50% of the baseline time in order to avoid procrastination or Parkinson's syndrome. He preconizes to apply time buffers: (1) project buffer – placed at the end of the schedule (on the critical path), securing the project end date, and constituted of the total sum of time saved as a result of shortening the duration of critical tasks, and (2) feed buffer – placed at the end of the

non-critical path, securing the start date of a specific task in the critical sequence or timely inclusion in the critical path at the last stage of the project (at the closure of the project). The role of the feed buffers is to keep the critical chain unchanged and allow to control its stability, which proves that Goldratt takes into account possible risks and uncertainties in the project. Therefore, an important guideline in project management according to the critical chain is constant monitoring and control of the consumption of time buffers (Pruszyński et al., 2009).

In the relevant literature, it was pointed out that the constraints of the project may lie in: (1) tasks (requiring a detailed description of their scope and determination of the effect, which allows focusing only on those activities that actually lead to the task's effect), (2) resources (excessive allocation of resources, especially scarce ones is actually a waste), (3) budget (excessive allocation of resources, e.g. people, machines, time, affects the project budget – a budget including unjustified resources is charged to the project), (4) the scope of work (separation of priority tasks, necessary to achieve the project goal, from tasks that may wait), (5) quality (focusing on those tasks that inevitably affect the quality of the entire project / the assumed final result of the project) (Jokiel, 2013, 52). Series of analyses performed proved that the application of the theory of constraints actually helps to solve the great majority of the abovementioned problems, bearing in mind, however, that the phenomenon of sub-optimization of the system is also possible (Jokiel, 2013, 52–53).

In developing the concept of critical chain, Goldratt took CPM (Critical Path Method) and TOC (Theory of Constraints) as his starting point. He distinguished the following stages of project planning:

- execution of the project scope, at specified costs and in the shortest possible time;
- reducing the duration of respective tasks/activities to $t \cdot 0.5$ (up to half of their total duration, i.e. to the so-called aggressive timing);
- identification of the critical chain in the project implementation schedule;
- introduction of the buffers to protect the critical chain and the non-critical pathways;
- determining the size of the buffers;
- monitoring of the project implementation and undertaking corrective actions, if need be (Goldratt, 2009, 175–185).

In the following part of the paper the results of a case study on a specific, currently operational brokering project are going to be presented. The underlying purpose consists in establishing whether the Critical Project Chain Management (CCPM) method, an offshoot of the TOC, might be applied profitably in this type of projects.

3. Theory of Constraints in the infobrokering project – a case study

First of all, we ought to submit a definition of the project applicable to infobrokering. For this purpose, we will chose to quote verbatim, with necessary cuts, a synthetic list of definitions of this concept developed by Piotr Zaskórski (2015). Thus, according to Tadeusz Kotarbiński's praxeology, project is a complex action involving the contribution of multiple individuals, carried out following a plan, which, due to its complexity, is sometimes competed with the use of special methods. G.D. Oberlander's view: "action taken to produce the results expected by the contracting party". Strategor: every "is unique, both in terms

of concept and implementation” and “is a response to some individual need”. R. Hammer: activities “in which planning, management and implementation most often involve many departments of a given enterprise (or even many enterprises).” Project Management Institute: “a temporary activity undertaken to create a unique product, provide a unique service or achieve a unique result”. K. Kukuła: “contained in a finite period of time, with a clearly distinguishable beginning and end”. G. Leśniak-Łebkowska: a project is “separated from the course of daily, routine work, and carried out concurrently with it or with the total delegation of team members to the project implementation”. Prince2: (...) “a temporary organization that is created for the purpose of delivering one or more business products according to an agreed Business Case”. ICB6: “A project is an undertaking in which human, material and financial resources are structured in an innovative way to accomplish a unique scope of work, with a given specification, with cost and time constraints, over the entire project lifecycle, to achieve beneficial changes defined by qualitative and quantitative objectives” (Zaskórski, 2015, 12).

The project discussed in this case study meets the criteria of all of the cited definitions. We consider it an infobrokering project because it was consciously accepted by an information brokerage company (hereinafter referred to as the company Y), which determined that it had sufficient competences and resources to compete it. It is the first project of this kind in the Y company’s portfolio, which should not be treated as an exceptional feature, because in the light of the terminological considerations we just made, each project is unique, even though its processes are repeatable.

A characteristic feature of practical infobroker’s activity is the heterogeneity of the executed orders (Hrabiec-Hojda, 2013, 92). Being a market player for infobrokering services is all about the need to execute several projects (orders) at the same time, often divergent in character, requiring the use of different methodological approaches, subject to different timeline constraints (multiple projects). The phenomenon of multiple projects and attendant multi-tasking, especially in small organisations, prompts the search for effective, innovative project management methods. Building a project culture well-grounded in proven good business practices makes the objective of every organisation focused on sustained development.

The orders carried out by the infobrokers have a project structure, as they have to be completed within a certain timeline, at a specific cost, and provide the client with a product which is fully compliant with his business requirements. On top of everything else, such orders are unique in character, and hence require an individual approach to their planning and subsequent execution.

3.1. Case study protagonists

Company Y – a single person-managed infobrokering company operating in Kraków, with five full-time employees, established in 2014. Its owner and one of his co-workers are in charge of the “Borough X” project. The project’s co-worker joined the project about halfway through the schedule; her employment contract pending a formal sign-off (endorsement).

Project “Borough X” – an order for the development of a long-term strategy for the Polish Borough X, contracted out to Company Y in February 2020; project completion deadline set for December 31, 2020.

Ordering party: Management Board of Borough X.

Co-researchers conducting the study and Co-authors of the paper – information professionals active on the information services market (infobrokering, innovation brokering, R&D consulting, training schemes).

Techniques of gathering material for the study: participatory and non-participatory observation, an in-depth interview with the executors of the “Borough X” project, an in-depth interview with Mr. Jacek Branas, co-founder of the Institute of Constraints Management TOC in Poznań (<https://toc.org.pl/>), conducted on November 16, 2020, comprehensive review of the existing documentation on the “Borough X” project in the form of archived e-mail correspondence, chronological listing of telephone communications, and pertinent materials furnished to Company Y by the Ordering Party.

3.2. Dictionary of terms

Critical chain – a concatenation of resources and activities necessary to have the project implemented, i.e. a chain of interconnected objects, events and persons, in which the weakest link, or critical resource, is identified, requiring special protection with an aid of a buffer.

Critical resource – the weakest link in the chain illustrating the interdependence of all executive measures within the project.

Drum buffer – securing the weakest link in such a way that the speed of project implementation depends on its capacity and throughput; metaphorically: the weakest link has a drum, on which the rhythm determining the speed of work of the remaining cells of the chain is played out.

Rope buffer – securing the weakest link in such a way that the resources assigned to it (usually respective prerogatives and skills) are distributed among the other links in the chain, binding them with a metaphorical rope; if the weakest link fails, the other links, having the capacity to co-deal with the critical tasks, will maintain the stability of the whole chain, cushioning the imbalance of the critical resource (*Twórcz...*, 2016).

First of all, the basic question whether the TOC method might be used effectively to optimise a project, which is only slightly repetitive in character, should be addressed. Infobrokering Company Y, whose work is discussed here, has never before been involved in the development of a long-term development strategy for the borough, so the anticipated outcome of the project is a novelty to it. Only the routine scope of organisational activities required to achieve the end-result is subject to repetition. Whilst setting out to address this question, we searched for a personal source, conducting an interview with Mr. Branas, co-owner of the Institute of Constraints Management TOC, a consulting and training company, which implements the TOC methodology in Polish enterprises of all sizes and industries.

Based on his experience and command of TOC principles, Branas claims that although the method had originally been developed with improving repetitive processes in mind (goods manufacturing), it may also be applied with good results in the strictly undetermined processes, provided that their final outcome is precisely defined, whilst not being subject to significant changes during the project implementation process. The case at issue is fully compliant with this requirement.

The borough's strategy, developed to order and financed out of the local government's budgetary resources, is an official document, which is to be drafted in line with a specifically

structured template. The client has provided the contractors in advance with appropriate guidelines and models to be followed as part of the order specification. The leeway left to the authors of the strategy would therefore be limited to editorial issues only.

The affirmative answer to the above-referenced question raises a subsidiary question, as to whether the TOC method in the critical chain variant is to facilitate the actual planning of prospective orders ahead of their implementation only, or whether it might also be useful in taking remedial or corrective actions on the projects already in progress. In terms of the infobrokering company, as happens to be the case study at issue, this is a fundamental question. This is so, as the project focused on devising a development strategy for borough X was an impromptu order, non-anticipated and unplanned. As may readily be gleaned from the archived correspondence files and official notes on the actual handling of this order, the order was offered to Company Y in view of the local government's previous advantageous experience gained during collaboration on other tasks, not directly related to the development of the strategy.

The main reason for contracting this project out to Company Y was therefore the local government's belief in professional prowess boasted by its staff. Having appraised himself of the circumstances of accepting the order, Branäs asserts that having the projects already in progress enhanced with the aid of the TOC method is reflected by a common practice, with one reservation, though, to be addressed further on (in the item Constraint 1.2). It might also be worth highlighting at this juncture that it would be desirable to carry out the currently missing studies on the proportions between the impromptu orders and the ones originating in the long-term agenda of the information professionals in Poland. At the moment, we may well venture to say, even though against an anecdotal evidence only, that in the Company Y's portfolio, the impromptu projects account for a total of approximately 90% of its total output.

The case study "Project Borough X" is structured in the order directly corresponding to the successive stages of application of the TOC method, as described in Part 2, to be revisited here for the sake of greater clarity.

Step 1: Identify the system constraints

1.1. Constraint: tasks too vaguely described

In the project for Borough X, this constraint ostensibly does not seem to be there at all. This might be inferred through the fact that it was the borough which was the originator of the order in the first place, that its authorities had a clear idea of what the end-product was to be like, office staff voluntarily furnished the contractors from Company Y with pertinent materials which precisely structured the work, and also set up on their own an implementation schedule pertaining to the scope of activities envisaged within the project, and actually assisted in their implementation. Specifically, the borough officials held four online consultative meetings with the representatives of various local community groups, and secured on their own the attendees of those consultative meetings (e.g. students, teachers, residents, third sector entities, entrepreneurs). In consultation with Company Y, they developed a comprehensive survey questionnaire to probe the expectations of the community's residents as to the anticipated directions of its development, made this online questionnaire available through several channels for a month (throughout October 2020), and, despite the questionnaire's considerable size, managed to collect over 300 responses (the number of questionnaires distributed through the borough being unknown).

The results of the survey were subsequently processed, quantified, and sent out to the staff of company Y as the source input data. On top of all this, there were also collision-free e-mail and telephone communications between the client and the contractor, manifest friendliness and trust throughout, flexible approach and understanding with regard to occasional time frame overruns caused by the pandemic (quarantine orders, absenteeism in the office), and, most essentially, no expected difficulties in financial clearing of the project.

The respective tasks have therefore been diligently allocated, segmented, and to a large extent carried out with the aid of voluntary participation of the borough reps. Paradoxically, however, this ostensible lack of constraints stands for a constraint very much within its own right, as it jeopardises successful implementation of the successive stages of the project. As Branas points out, friendly relations with the client, along with the monitoring actions by the client's staff:

(1) delude the contractor that nothing untoward may happen to the project under implementation, while mutual understanding and overall friendliness would be sure to cushion any potential mishaps, and the project would eventually reach its conclusion at its own pace. Meanwhile, however, such a delusional take of the circumstances exposes the contractor to the risk of adopting the attitude of a 'student-cramming-for-the-exams', i.e. procrastinating the execution of the key scope of activities until the very last moment (in this case, such a key activity consists in generating and functionally streamlining the actual content of the above-referenced development strategy), resulting in a hectic, potentially chaotic pace of work under the pressure of an imminent deadline, (2) encourages the contractors to inadvertently pass by or even altogether dismiss (common for the TOC experts) the awareness that in the absence of even the most rudimentary instruments for monitoring overall progress of work by the project manager, its implementation is always running late, even though the contractors themselves might well be convinced of the exact opposite.

Summary of constraints 1.1.: The harmonious course of the initial phases of the project (clearly defined tasks requiring the hands-on participation of the borough reps) and distant completion deadline (an entire calendar year) has instilled the contractors with a false sense of security. Consequently, the contractors:

1.1.a. have failed to have the upcoming scope of tasks/actions mapped out, this time round of critical character (i.e. developing the strategy synopsis);

1.1.b. have not assigned specific contractors to those tasks (the executive team's line-up remains undetermined);

1.1.c. have not put in place any monitoring instruments to check on an ongoing basis how much time each one of the current/prospective team members needs to have the scope of work assigned to him completed.

The anticipated risk of the constraints not having been broken, i.e. items 1.1.a. – 1.1.c., based on the precedents described by the staff of company Y (conjointly: R1.1.): potential overload of the project manager in the concluding phase of the project, taking on a scope of responsibilities/prerogatives which could have successfully been delegated to other staff earlier on, hasty search for sub-contractors, with no option of conclusively verifying their skills, reduced responsiveness to any potentially harmful adversity (undesirable events) originating in a previous failure to have the weakest link in the critical chain effectively identified, generating a sub-optimal (sub-standard) quality product, moral costs incurred by

the project manager with regard to the actual or imagined risk of causing disappointment (due to distress and working under considerable pressure) to a prospective, long-term client.

1.2. Constraint: having planned the commencement of the works on a project without assuming a specific time frame required for the conclusion of the on-going activities of the staff.

This constraint results directly from the previous one, i.e. it is not possible to set a specific time frame for the execution of tasks that have not been defined in sufficient detail and arranged along a specific timeline. In the case at issue, this problem pertains, as already indicated further above, to a prospective scope of tasks, i.e. those to be completed as of November 18, 2020 (the date of completion of the present paper) until the end of 2020. In the opinion of Branas, who appraised himself of current project progress during the interview, it is not too late yet to have this constraint eliminated. It is expedient, though, to have the notions of time-consuming character and labour intensity applied in the same sense as in the TOC methodology. Labour intensity is expressed in the time required for a specific activity to be carried out by an employee who deals exclusively with it. On the other hand, time-consuming character corresponds to the time required to carry out a specific scope of in a multi-tasking environment, when an employee attends to several activities simultaneously.

Summary of constraints 1.2.: The information spontaneously disclosed by the employees of Company X, as well as the information referenced by the present study indicate that:

1.2.a. In the practice of Company Y, the distinction between the notions of time-consuming character and labour intensity is acknowledged, but not sufficiently internalised.

1.2.b. In the absence of the instruments routinely monitoring overall progress of work (see item 1.1.c), there is no accumulated body of knowledge within the company on how much time is required for respective employees to have their scope of tasks/activities completed, in isolation from any external stimuli, and under the burden of multi-tasking, respectively.

1.2.c. The owner of the company, doubling as the project manager of the “Borough X” project, cannot recall a situation whereby she would manage, in a corporate environment, to really focus on a single activity only. She has not made use of any ready-made or self-designed solutions which would effectively screen off any external interference factors (e.g. a personal assistant sorting telephone or e-mail communications, applications selectively blocking incoming calls, etc.).

1.2.d. An inability (or perhaps an ability, yet still untested) to attend to and focus on a single task only may make it hard for the manager (responsible for assembling the project team) to create the environment conducive to effective performance for the single-task contractors.

The anticipated risk of the constraints not having been broken, i.e. items 1.2.a. – 1.1.d., based on the precedents described by the staff of Company Y (conjointly: R1.2.): accumulation of these constraints is not necessarily bound to jeopardize the execution of the assignment itself, but might most likely expose the project manager to yet another instalment of stressful experience caused by the need for extreme mobilisation, detrimental to the resource, as personified by herself, which, considering that she singlehandedly manages Company Y, as well as happens to be the key provider of orders, may well be deemed a critical resource. Such reckless exploitation of the key resource, e.g. getting it involved in the scope of activities which might well be delegated (attended) to by someone else, must in turn be regarded as squandering the vital resource.

1.3. Constraint: no buffer secured for any contingencies during respective operations, the completion date of the concluding task overlaps with the date of the project's delivery. In this respect, the most important observation implied by the TOC methodology is the failure to identify the weakest link in the critical chain of the order at issue. Consequently, the constraints may be summarised as follows:

1.3.a. A failure to identify any buffers whose primary function would be to have the weakest link secured.

1.3.b. High level of uncertainty and sensitivity to contingencies (i.e. coincidence of undesirable events), jeopardising the appointed time frame and overall quality of the project under implementation.

1.3.c. The project's completion deadline overlaps with the end of a calendar year, which, in line with previous experience of Company Y's employees, means an increased workload and a paramount need of complying with the appointed deadlines. Not only any failure to meet those deadlines would be tantamount to putting the company's public image in open jeopardy, result in financial losses, but would also have it exposed to serious civil and legal liability, in the event of any such collaboration having been established with any public corporate entities.

1.3.d. The project's completion deadline (delivery date) overlaps with Christmas and the New Year amidst the raging pandemic. In the event of there being any practices that do not take into account the difference between a time-consuming character and labour intensity of a certain scope of tasks/activities, while at the same time unduly burdening the project leader, the TOC methodology requires that due consideration also be given to any constraints encountered at the junction of corporate and private life. In those terms, the exceptional circumstances of spending a family Christmas in 2020 by the project contractors should be deemed a fully-fledged and tangible factor on the map of recognised constraints.

The anticipated risk of the constraints not having been broken, i.e. items 1.3.a. – 1.3.b., based on the precedents described by the staff of company Y (conjointly: R1.3.): this bundle of constraints, much like the previous one, indicates that in the project at issue, the pivotal point is the resource represented (personified) by the key contractor. In the light of her own admissions that whenever the project implementation problems start piling up, and it comes to the crunch, ultimately it is always herself who effectively applies a pertinent scope of remedial measures, at personal cost. In her opinion, the end of 2020 appears as potential crisis time.

Step 2: Ensuring the continuity of work of the critical resource by making maximum use of the entity's own resources (Exploit the system constraint)

Branas explains that the actual point of this step is to find a solution for each one of the identified constraints, whilst making use of the company's existing resources only. The principal aim is to protect a critical resource from exhaustion, or a sudden drop in productivity. It is desirable to look for solutions that may effectively disarm (resolve) several constraints at once.

In the Table 1 are the suggestions for preventive and remedial actions assigned to each one of the constraints (previously numbered 1.1.a. – 1.3.d.).

Tab. 1. Practical tips aimed at eliminating specific constraints

2.1. An interview of the project manager with the other project executive, followed by other Company Y's staff, with a view to formulating hypotheses regarding the weakest link in the project's critical chain.	1.3.a.
2.2. Assign the contractors to the newly appointed tasks. Determine the time frame that each contractor will need to complete the task/activity at issue. Make a drum buffer and rope buffer for the weakest link.	1.1.b. 1.3.a.
2.3. The project manager or one of Company Y's staff is to pursue a market research, with a view to possibly recruiting the contractors boasting the competences necessary for an effective execution of the pre-determined scope of activities, unavailable in the company's own resources. Check the readiness and availability of respective candidates.	1.1.b. 1.3.a.
2.4. Establishment and testing of simple mechanisms aimed at routine monitoring of project implementation progress. Initially, this monitoring may pertain to the scope of activities carried out by Company Y's staff with regard to other projects. Suggestions: making use of instant messaging Internet devices (project manager reports an overload of telephone conversations). Make a drum buffer for the weakest link.	1.1.c. 1.3.a.
2.5. Designing and testing a solution allowing the project manager to work in isolation, in a single-task mode. 2.6. Practical test whether the Company Y's staff, including the project manager, are capable of respecting each other's single-task conditions (e.g. accepting the fact that one of their colleagues is unavailable on a specific day within the week).	1.2.a. 1.2.b. 1.2.c.
2.7. A simulation game involving the entire team of Company Y: „Let us pretend it is December 28, 2020, and the development strategy for Borough X is half completed. What's going to happen now?” According to the information provided by the project manager, there will soon be an opportunity to run such a simulation game in the company, with no need to allocate any extra time for this, as part of the upcoming training scheme in management techniques, into which such an exercise may well be incorporated.	1.3.a. 1.3.b. 1.3.c.

Step 3: Subordinate everything else to the constraint

It is rather hard to infer from the literature on the subject what “everything else” actually means in practice, which should be “subordinated to the constraint” in Step 2. For the purposes of the present study, and primarily with the improvement of the critical chain in the “Borough X” project in mind, we make a working assumption that:

- all activities in the “Borough X” project are to be suspended until the activities in Step 2 have been carried out, and then resumed (continued), whilst making use of the solutions developed in Step 2;
- these solutions shall henceforth be implemented in all subsequent projects undertaken by Company Y.

Step 4: Elevate the system's constraints: Increase the efficiency of a critical resource with the allocation of additional expenditure

The verb ‘elevate’ in the original name of this step may be slightly confusing at first glance. Branas explains that, according to TOC practitioners, this means finding solutions to overcome the existing constraints, but this time round by making use of the resources originating outside the company's own environment, which usually requires extra expenditure.

In the case at issue, this might translate into outsourcing some sub-contractors boasting specific professional competences unavailable in the Company's own resources, with a view to buffering the project (see item 2.3. in Tab. 1). Much as in Step 5, the ultimate aim is to have the critical resource (the weakest link) effectively protected.

At the final stage of this study we realised that at least one co-author of this paper might well be delegated to take care of the making the buffers in the "Borough X" project, as in the course of the present study all of us got well acquainted with the critical chain of the project. Besides, we took part in public consultations, also for research purposes, providing material to be ultimately used in mapping out the development strategy for "Borough X".

Step 5: If, in any of the previous steps the constraint has been broken, go back to Step 1, but do not allow inertia to become the system constraint (Pretorius, 2014, 497).

As the preventive and remedial measures implemented in Company Y have not yet gone beyond Step 5, this step should merely be regarded as a recommendation for the future.

4. Conclusion

The Theory of Constraints is an expression of a systemic approach to organisations and management. All undertakings, also in the information industries, may be construed as the constellations of elements and the interrelationships between them. Infobrokering companies, in view of specific nature of the implemented projects, offer a specific example of such tightly intermeshed relationships. Here is an example of how an unpredictable direction such relationships may follow. The fact of certain constraints existing in Company Y, giving grounds to appreciable concern, gave rise to the present study, which ultimately proved instrumental in developing a number of specifically targeted solutions to have them eliminated. This may well be deemed a hands-on corroboration of Goldratt's views, as he always highlighted that constraints should not be perceived in a negative way, whereas bottlenecks may not necessarily lead to overall breakdown of the system.

Important update: between the date this text was accepted for review and the date it has been granted an "in press" status, the Company Y implemented all the recommendations listed in Table 1 above. As a result of carrying out the activities referred to in point 2.1. of Table 1, the project manager identified in her team a person with extensive experience in drafting development strategies of local government administration units. This employee has been entrusted with the task of completing the project. At the moment, the progress of the project indicates that its timely completion is not at risk.

The present case study proves that the Theory of Constraints, especially the critical chain concept, boasts high application potential in optimising infobrokering projects, as it allows to: (1) expose the hidden, deep-rooted, and disadvantageous routines in project implementation, (2) perceive the constraints encountered within the project not in terms of embarrassing errors, but as irremovable events/elements, axiologically indifferent, requiring remedial measures to be adopted, (3) realise that the factors routinely deemed conducive may in fact prove the actual constraints themselves, (4) increase overall executive effectiveness by identifying and boosting the weakest link in the project development processes, (5) achieve improvements in company's performance without incurring appreciable expenditure.

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Zarządzanie projektem infobrokerskim według teorii ograniczeń – studium przypadku

Abstrakt

Cel/Teza: Celem artykułu jest przybliżenie praktycznych zastosowań teorii ograniczeń (ang. *Theory of Constraints* – TOC) opracowanej przez izraelskiego fizyka Eliyahu M. Goldratta. Szczególną uwagę skupiono na wywodzącej się z TOC metodyce zarządzania projektami zwanej koncepcją łańcucha krytycznego, która rzadko, lecz z powodzeniem bywa stosowana w praktyce gospodarczej. W niniejszym opracowaniu zrelacjonowano podjętą próbę implementacji TOC w zarządzaniu projektem infobrokerskim.

Koncepcja/Metody badań: W artykule zastosowano metody (1) analizy i krytyki piśmiennictwa, (2) studium przypadku, a na jego użytek obserwację uczestniczącą i nieuczestniczącą oraz analizę dokumentacji zastanej odzwierciedlającej kolejne etapy projektu infobrokerskiego, a także wywiad pogłębiony.

Wyniki i wnioski: Przeprowadzone studium przypadku dowodzi, że teoria ograniczeń, szczególnie koncepcja łańcucha krytycznego, ma wysoką przydatność w optymalizacji projektów infobrokerskich, gdyż pozwala: (1) zdemaskować ukryte, głęboko zakorzenione, a niekorzystne rutyny realizacji projektów, (2) postrzegać ograniczenia występujące w projekcie nie w kategoriach wstydliwych błędów,

lecz jako zdarzenia/elementy nieusuwalne, aksjologicznie obojętne, wymagające po prostu przeciwdziałania, (3) przekonać się, że czynniki odruchowo kojarzone jako sprzyjające bywają *de facto* ograniczeniami, (4) zwiększyć wydajność wykonawczą dzięki zidentyfikowaniu i wzmocnieniu najsłabszego ognia w procesach projektowych, (5) osiągnąć poprawę wyników firmy bez poważanych kosztów. **Oryginalność/Wartość poznawcza:** W polskiej literaturze naukowej nie znaleziono badań skupiających się stricte na tematyce teorii ograniczeń z informatologicznego punktu widzenia. Niniejszy artykuł jest przyczynkiem do uzupełnienia tej luki w odniesieniu do praktyki działalności infobrokerskiej.

Słowa kluczowe

Infobrokering. Koncepcja łańcucha krytycznego. Projekt infobrokerski. Rozwiązywanie problemów organizacji. Teoria ograniczeń. Zarządzanie projektami.

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