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## MASTERING THE PROBLEMATICS OF COMPETITIVENESS OF THE MODERN RAILWAY TRANSPORT DEMANDS THE APPLICATION OF DIALECTIC NETWORK THINKING

### ABSTRACT

*In order to ensure a more efficient and successful management of organisational and business systems a vast amount of theoretical and practical instructions, techniques, methods, etc. are being offered nowadays. Without the knowledge and the application of the science of systems thinking we would not be in a position to integrate the theory and practise into a single, so-called uninterrupted inter-dependant dynamic process. Precisely these (quotidian) processes give namely rise to complex problematic situation, which cannot be solved by applying the simple and in many cases already outdated methods.*

*Therefore, the starting points of our research have been based on transcending merely conventional methods of the organisation study and we directed our efforts towards the intricacy – complexity<sup>1</sup>, that is, the one that we detect in the applicative example of the problematics related to railway activities. In this manner we will for the first time represent some key findings of several years of investigations (Rosi, 2004) and emergence of a new and original methodology of dialectic network thinking<sup>2</sup> in solving the complex (business) problems or problematics that arise from them (= interconnections, system of problems).*

### KEY WORDS

*railway transport system, systems thinking, dialectic network thinking, complexity, synergy effects, problem-solving*

### 1. INTRODUCTION

The processes of shaping the modern state, establishing the rules of market economy and current events related to the enlargement processes within the European Union (hereafter referred to as EU) have caused that the Slovenian economy as well is gearing up, at an accelerated pace, to compete in the demanding and liberalised international market (in the initial phase the European one, yet later also within the broader global market). It is an undisputable fact that through the en-

largement of the membership in the EU (= irreversible process) some are bound to profit while others will incur losses; however, the result for the Slovenian economy as a whole will be unquestionably beneficial, since it will be subjected to fresh incentives to develop and activate its creative potentials, particularly *innovation* and *cooperativity* of its population and to connect them through developing their expertise and their ambition to succeed.

This economic success, however, is closely related to the quality transport and particularly to the railways sector (management of railway infrastructure and the traffic conducted upon it), which ought to enable both the preservation of the extant state as well as the well-planned development level of economic activities. In such case this acts as a significant contribution to the competitiveness of the entire, let us say, Slovenian economy, and enables the facilitated, i. e. more optimal use of workforce potentials. Thus, it represents that *influential factor* which increases the mobility of population and goods and accordingly enables the increased flow of information and by the same token also fulfils the social and cultural needs of people. Within the international areas the national traffic infrastructures bind countries to one another as well as their economies and populations, whereas within the EU they stand for the external expression and the fundamental basis of the successful implementation of the principal European idea, which guarantees the free flow of goods, capital, people as well as services.

By joining the European integrations we were placed in the era of all-encompassing *globalisation*<sup>3</sup>, which causes continuous changes of business conditions. It further on brings about the emergence of ever novel (more or less) complex problems or problematics and stipulates that the organisational and business systems (hereafter referred to as OBS), among which may be ranged also Slovenian Railways Holding Ltd.



(Holding Slovenske železnice, d. o. o.) (hereafter referred to as SRH), have to adapt fast/timely in an all-embracing sense and by means of innovations. This task may be accomplished *sufficiently holistically* especially by modernised *internal organisation*, which generates sound and favourable conditions for *exploitation* of all resources and stimulates among the *employees* (all of them or a vast majority) *creativity that is oriented towards the development and innovation*. Only then may the OBS (and most likely also SRH) much more easily become a reliably functioning whole, which possesses its own systems manner of thinking and acting, the one that is also *typical of dialectic network thinking* (hereafter referred to as DNT) and which consequently makes it more competitive.

## 2. CURRENT TRENDS IN THE FIELD OF RAILWAY TRANSPORT ACTIVITIES

Modern trends of global development and the ever-increasing desire for the *mobility*<sup>4</sup> point towards *huge potentials in the development of the transport sector*. Needless to say, one should take into account all infrastructural and natural possibilities, which are in the given circumstances perhaps already overexploited and subsequently exert negative effects on the environment wherein they are located.

We are well aware that Europe is *choking in traffic jams*<sup>5</sup>, which are seriously threatening the economic competitiveness of all those players who are in any way related to or dependent on transport. Since they constitute the vast majority of population, we should without delay introduce some required measures (Traffic Policy in EU by 2010 – *White Book 2001*), which will assure the desired quality level of both transport services as well as of closely related (modern and dynamic) life standard. Nevertheless, the measures, represented in the European traffic policy (2001), are but the first important step in the direction towards the *sustainable and durable traffic system*, which will be established, in ideal case, within the next 30 years and will assure fundamentally *improved quality* and closely related *improved safety* in the EU traffic.

Traffic forecasts for the coming 10 years indicate, or threaten, that we may unfailingly expect, in case we do not act (in sufficiently holistic manner), *dramatic over-congestion of roads*<sup>6</sup>, which will *additionally burden our life environment*, whereby we mean the increased pollution, noise, traffic jams, accidents, etc. Experts forecast that the same fate awaits also air traffic, which signifies that the domains that remain *strategically developmentally important* are *waterway traffic* and *railway traffic*.

In order to make the railway traffic once again competitive and to regain its position among the leading players in the traffic systems of the expanded Europe, it still needs fundamental and *all-encompassing changes*<sup>7</sup>. These will first of all necessitate the changes (organisational and traffic related) of culture of all participants in the railway activities, e. g. employees, owners (private and state ones), users of railway services, etc. In the continuation we should therefore (sufficiently holistically) solve the complex problematics related to the state of the *railway infrastructure*<sup>8</sup>, which in numerous countries due to the obsolescence (hierarchical and bureaucratic as well as inflexible organisation) hinders the much needed development of railway activities. At this point one should *revive the development of railway services*, which comprises also the *search for* (and development) of *innovative technologies*, the growth of *productivity and reliability*, *new, particularly more transparent ways of controlling the operational costs*, *enabling the competition*, etc. which will all contribute to the increased quality of railway services.

We wish to achieve this also in Slovenia, for which reason we *necessitate* a great deal of expertise and involvement of all the participants in the railway activities. We are namely facing an *immense challenge* (*the greatest professional one until now*) of how to correctly and sufficiently holistically master and solve the arisen complex railway problematics, *so that we may ensure the quality of railway services*, which Slovenian Railways requires in order to compete on the highly demanding EU transport markets.

Our starting point is the assumption that all the current events and trends in the field of re-structuring European railway systems and (subordinated) *endorsements of additional political and professional expert measures* (such as the European traffic policy until the year 2010 /*White Book 2001*/, various directives, recommendations, etc.), which were designed for such systems, are *already well established, objective facts* that deserve to be thoroughly studied and *applicatively re-modified*<sup>9</sup> for the Slovenian railway activities. *New Slovenian legislation*, which regulates the *railway traffic*<sup>10</sup>, has already taken these important European experiences and recommendations into account. What is still missing is only their (sufficiently comprehensive) practical adaptation. Needless to say, this is unquestionably an immensely complex process, which demands high degree of *interdisciplinary professional involvement of all* (influential, enthusiastic, motivated, concerned, ...) participants in the railway sector, who are willing to cope (and who are truly eager, competent and capacious to do so) with the arisen complex problematics. The latter may be *significantly facilitated by the use of the DNT methodology*, which is intended for the general mastering and solving of such complex (business) problems.



### 3. DEFINITION OF DNT METHODOLOGY AS THE NEW THEORY OF SYSTEMS

#### 3.1. INITIAL FINDINGS ABOUT THE FUNDAMENTAL DIALECTIC-SYSTEMS CHARACTERISTICS OF THE DNT METHODOLOGY

*Methodology of dialectic-network thinking (DNT) is a synergetic interconnected aggregate of characteristics (Rosi 2004) of the reliable and already tested network thinking methodology (Gomez, Probst 1997) and of characteristics which are inherent to the dialectical theory of systems (hereafter referred to as DTS) (Mulej 2000 and earlier). Thus it represents the innovation (= useful novelty) in the domain of variant systems theory, since, in a new way, it succeeds in uniting all those (unique) utilizable characteristics that none of the other problem-solving methodologies known to us actually possesses, yet we constantly need them both in theory as well as in practise (Figure 1).*

On account of its soft-system properties, DNT proves useful both for *theoretical* and *practical* or *applicative problems*, where already the definition of their objective represents a major difficulty. Frequently, there occurs namely the doubt about the character of the situation, which we have detected and identified as problematic, i. e. whether we are dealing with the *real* or perhaps just *imaginary problem* (Kajzer, 1983). For that reason we should proceed from the fact that managers and other participants in the process of solving the problematic situations have to possess *clearly defined criteria*, wherewith they *tackle the identification of the situations*. Doing this we should not overlook the fact that one is here positioned in an *utterly specific situation*, wherein one senses and denotes the concrete viewpoints of the world and environment as problematic (cf. Birkenbihl 1992). This signifies not only "what should be done" (what is expected or even demanded from the person) to reach the set objectives, but moreover also "how to do it in the most efficient and effective way".

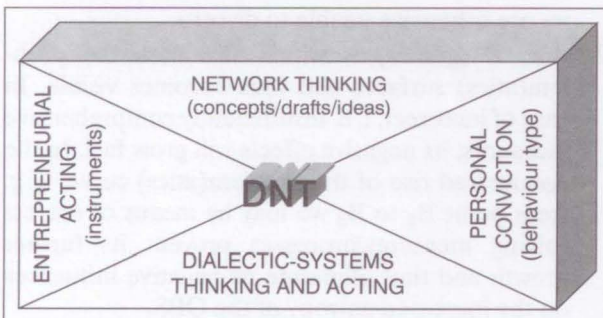


Figure 1 - The rectangle of characteristics of interdependent elements of DNT methodology

Of outstanding importance in distinguishing real problems from imaginary ones are *problem solvers' subjective starting points (assumptions)* (refined by new values, emotions, knowledge, experience and skills, etc.) and the consequent *improved control of objective starting points* (= the given conditions). This signifies that all the participants in the problem-solving process, which takes place prior to the definition of objectives, should endeavour to incorporate *the maximum number of viewpoints*, or at least the *corresponding dialectic system of viewpoints already in the phase of shaping the initial (starting) assumptions*. *Dialectic systems approach* that we integrated into the DNT methodology namely enables us to deal with the same (potential) objectives in critical and dialectic way from various different and thus interdependent viewpoints, which we also interconnect with one another.

What comes to the fore during this is *the capacity of intercommunication* and (as far as it possibly goes) of the *creative and all-embracing cooperation*, particularly the *interdisciplinary one*, already in the earliest phases of problem-solving. We all are namely more used to cooperate with colleagues coming from the same domain (Mulej 2000, Rosi 2004) and much less to work in interdisciplinary teams, which precludes us to exploit at present the so badly needed *synergy of expertise, values and knowledge* (interdependence of diverse domains and the ability to cooperate in conditions of mutual influences). And precisely this dialectics opens up the way from *narrow single-mindedness* to the synergy; it signifies that we are *interdependent due to our differences*, with which we complement one another as elements of the same whole. Thus we are also developing into a common whole with new characteristics, not possessed by the individual parts. This can be achieved by the correct organisation of labour, which is within DNT envisaged exclusively on the basis of *team work* and not merely in *just any working group*<sup>11</sup>.

#### 3.2. CIRCUIT OF PROBLEM-SOLVING ACTIVITIES AND THE CURVE OF THE PROBLEM(ATICS) LIFECYCLE

By using the DNT methodology we were granted a new opportunity to face, in the original (= innovative) manner, the processes of problem-solving by means of the combination of dialectic system and network type of thinking and acting. Doing this we also envisaged that the *dialectic network thinking* (and acting) will take place in circuits (those typical of DNT). This signifies that some more or less complex problems will continue to resurface and for that reason we will repeatedly try to detect and resolve them. If we are to solve them only partially and not in sufficiently comprehensive manner we may risk causing the emergence of new problems or they will appear as the intermix of



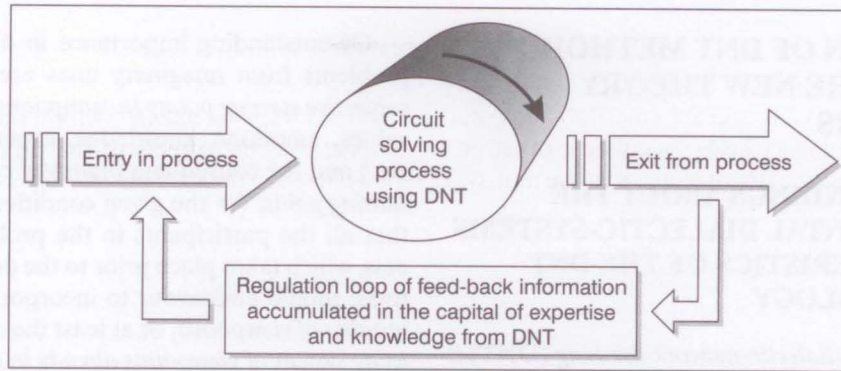


Figure 2 - Circuit and feedbacks in the process of solving complex problems

new influential (network) factors with consequently (more or less) altered characteristics, which we will have to be able to identify and resolve once again and in timely (temporally limited) manner.

For that reason we will “synergetically” permeate the envisaged procedures/steps of the problem-solving activities’ circuit with the (known) characteristics from DTS and thus add to them the needed (determined through our investigation) *dialectical systematicity*. The latter should guarantee the satisfactorily large and new degree of the *needed and sufficient comprehensiveness*, which is required for quality solutions. The findings brought about by DTS enable us namely to approach the mastering of complex problematics in a systems way and thus more holistically embrace the dialectics of the concerned processes which are primarily marked by the interdependence and the consequent dynamics of both internal and external causes of their complexity. Due to the ever changing conditions and recurring new outer appearances of intricate, i. e. complicated and complex problems, these causes must *continuously complement or adapt to values, expertise, knowledge and experience* (=capital of expertise and knowledge) that we have acquired through the use of DNT in the processes of solving new problems. We may talk of a certain feedback that is typical of cybernetic regulations and may be applied also to the problem-solving processes which are in their simplified form presented in Figure 2.

Such *regulation*, which is a corollary of the use of capital of expertise and knowledge acquired through DNT enables us to *(by means of feedback) influence, timely and sufficiently comprehensively, changes in the problem-solving processes*. Briefly, our reactions to changes are prompter and always enriched with new information – i. e. components of capital of expertise and knowledge (following the model of expert systems) – and therefore we may expect with every right that the problem-solving activities will be better adapted to development stages of complex problems.

By doing this we have to be well aware that the effects of problem(atics) on the environment or concretely on OBS, where we try to solve and control it,

prove to be of diverse nature. This signifies that the effects *change in relation to the development stages of problem(atics)* and more or less (negatively) aggressively affect – aggravate the characteristics of OBS. Correspondingly, we have to adapt the complex problem(atics) in its different life periods to the activity and to the process of its sufficiently comprehensive and therefore lasting solution. Figure 3 represent *the life curve of problem(atics)* and critical points, typical of individual periods of emergence or development of problem(atics):

1. *Area A (source)* – represents the invisible, deeper located part of emerging processes of problem(atics). Of considerable importance is the “grey area” or the region of intertwining of hidden causes of the origin and source of problems. This area may be of random size and is highly important (?), since it depends on the problem(atics) complexity. Consequently, we are by means of customary methods (mostly one-sided and not system ones) and actions not able to grasp it in the sufficient depth, which strongly influences the correctness (=quality) of all subsequent activities in the problem-solving processes. Point  $A_2$  represents two possibilities, namely: (1) ideal (timely) action whereby negative effects of problem(atics) do not occur, (2) the problem was imaginary and therefore without any impact. Point  $A_3$ , however, is that demarcation point, up to which we may permit the development of a given problem, since it indicates to us the potential weaknesses within OBS, which we are otherwise unable to discern.
2. *Area B (growth)* – within this area the problem(atics) surfaces and thus becomes visible. In case of incorrect, i. e. insufficiently comprehensive measures, its negative effects will grow fast. In the accelerated rise of the problem(atics) curve, e. g. from point  $B_1$  to  $B_3$  we may by means of correct solving measures/processes prevent its further growth and thus eliminate its negative influences on the increased entropy of the OBS.
3. *Area C (maturity)* – within this area the impact of the complex problem(atics) is at its most negative.



All subsequent action is in most cases belated and leads to the additional increment of negative effects, which finally, in a given (theoretical) point ( $C_N$ ), unquestionably causes the collapse of the entire OBS, wherein we (incorrectly or in the non-system manner) tackled the complex problematics.

4. *Area D (weakening)* – within this area the effects exerted by problem(at)ics are diminishing, yet the unstoppable growing influence of the system’s entropy, which was brought about by uncontrolled problematics, nonetheless continues. Despite this, there still remains the danger to instigate, with our belated (mostly panicky and consequently very single-sided and insufficiently comprehensive) measures, the renewed growth or the reactivation of

this time even more complex and therefore decisively altered problematics.

5. *Area E (appeasement)* – within this area we may expect that the effects of the problem(at)ics faded away and calmed down (E). Of course, this calming may prove imaginary and in case of our carelessness and non-systems approach the problem(at)ics may be once again reactivated and usually (in significantly higher degree) even reinforced ( $E_1$ ). Yet if despite the imaginary appeasement we were already beforehand sufficiently attentive and have steered the problem(at)ics to its complete (effectual) appeasement, we may reach the desired point ( $E_2$ ), where it is truly (and probably also lastingly) resolved.

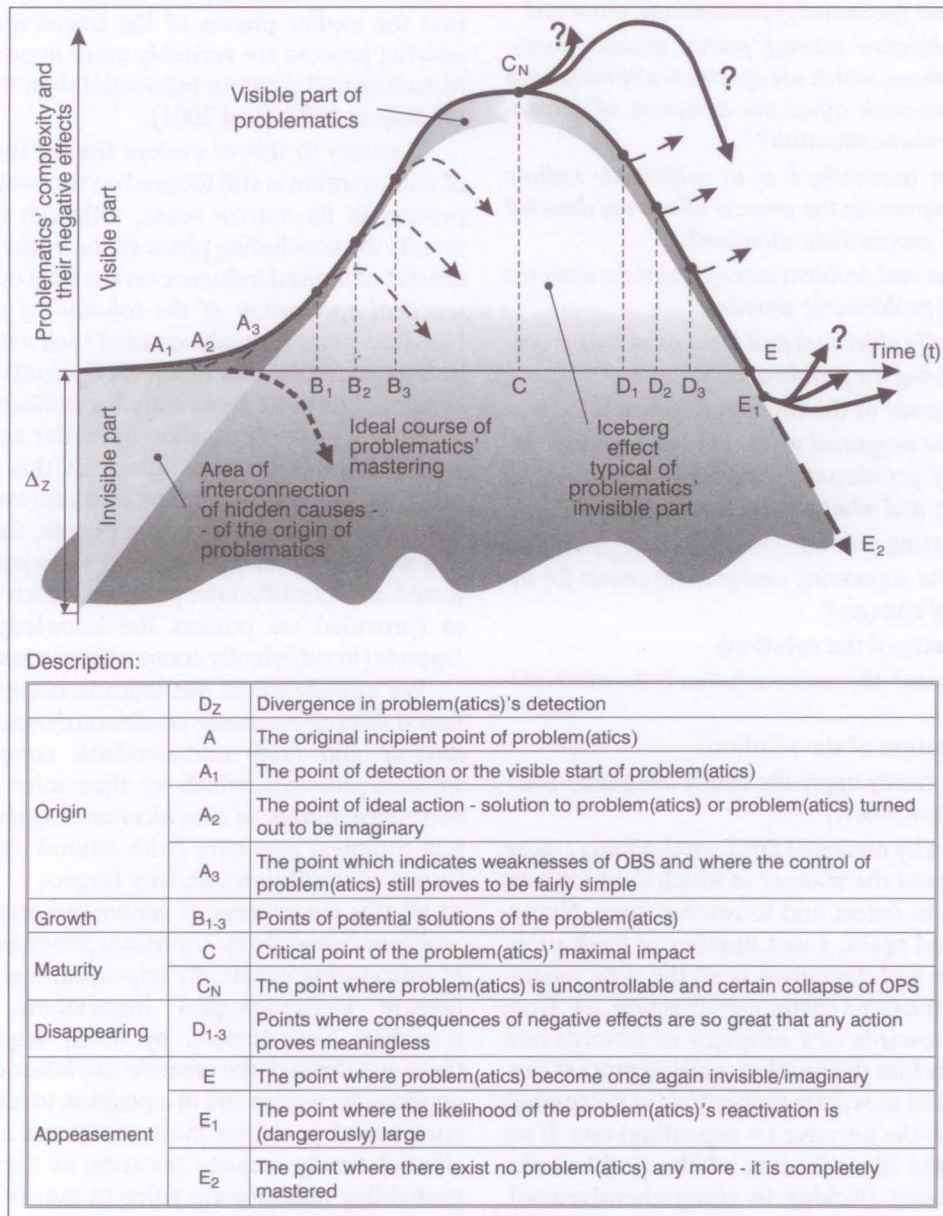


Figure 3 - Problem(at)ics lifecycle



On the basis of our findings from the problematics lifecycle curve we have to *continuously adapt our solving activities to lifecycles of problems* or to problematics that emerged from them, i. e. all the way from their occurrence, through their detection and solving, to their (more or less) final resolution. This process of (circular and when needed repetitive) »stepping (marching)« reflects the findings derived from the rule of the *hierarchy of succession and interdependence*, i. e. that *earlier steps exert greater influence than the later and consequential ones* (direct or indirect); however, *the influences of parallel occurrences also interconnect and intertwine* since they are more or less dependent on each other – they are interdependent. Such *dialectic network circuit* comprises:

Step 1: (Emergence of problem(atics))

1. *How to detect (potentially) problematic situation?*
2. *How do subjective starting points (assumptions), particularly those, which are synergetically reinforced through team-work affect the detection of (potentially) problematic situation?*
3. *How to start (correctly, i. e. in sufficiently holistic manner) confronting the process of solving detected (potentially) problematic situation?*
4. *How does the real problem emerge from the detected (potentially) problematic situation?*
5. *How to identify objectives and tasks as well as procedures for solving the problematic situation?*

Step 2: (Emergence of the integrated whole):

*How does the integrated whole emerge from individual parts of problematic situation, i. e. complex problematics and what are its characteristics?*

Step 3: (Supporting points)

*Which are the supporting and guiding points for introduction of changes?*

Step 4: (Adequacy of the solution)

*Which indicated alternative solution is the most adequate?*

Step 5: (Application of the solution)

*How to practically apply the (most adequate) solution of problem(atics)?*

Thus, we can by means of DNT methodology more easily comprehend the manner in which the problems arise, and how to detect and to resolve them. Nevertheless, time and again, a vast number of fresh problems may occur and the circuit is all the time repeatedly turning in the same customary direction, i. e. from the beginning towards new solutions or towards new problems. Therefore the problem-solving process cannot be considered as strictly sequential (= successive) but moreover as the iterative (= repeating) one. If we find out that the identification of the problematics proved insufficient (lacking in comprehensiveness), we may again return to the starting step. At that point, however, our options are fairly open, since it is not

obligatory to test all the steps anew in their sequential order, but we may opt for the most adequate solution (moving forward or backward within the circuit) for the given (more or less complex) problematic situation.

### 3.3. FINDINGS RELATED TO THE DETERMINATION OF PROBLEM(ATICS) LIFECYCLE CURVE AND PROBLEM-SOLVING STEPS USING THE DNT METHODOLOGY

In theory, as well as in practice we still face the deeply rooted erroneous assumption that the most crucial part in mastering problems is their solution. Figure 4 demonstrates (of course only in principle) that the earlier phases of the irreversible problem-solving process are veritably more important and effectual as well as more influential than the later ones (cf. Kajzer 2002, Rosi 2004).

Contrary to this so evident finding the major part of our attention is still focused on the problem-solving process in its narrow sense, although it represents merely the concluding phase of the entire process and exerts but limited influence on the final outcome – i. e. *practical application of the solution of problematics*. Needless to say, the advocates of such a stance cannot be blamed for the lack of knowledge and/or incomprehension, but most frequently for deliberate concealment or at least obfuscation of earlier and thus more influential and decisive phases of this multifarious process. Such approach may also represent the most effective way of manipulating people, since by doing this we may cover up who and for what reason detected and identified the problem, which we now have to (provided we possess the knowledge and will) “merely (in sufficiently comprehensive way) sort out”.

We already found out that the *circuit of problem(atics) lifecycle represents continuously repeating, unpredictable and fairly uncontrollable complex process*, wherein problems, which we then solve and control, occur then disappear, then recur once again as (more or less complex) *new ones* (with altered characteristics, forms, constellations, activity targets, ...) etc. Owing to all this the *process of continuous reappearance of problems cannot be by any means prevented*, regardless of introducing constantly improved, high quality and holistic methodological implements, tools, approaches. Nevertheless, by being acquainted with them and through the creative and holistic, i. e. correct application, we are still in a position to identify the occurrence of problems more easily and also in (sufficiently) timely manner (as soon as there exists the probability that they are going to exert/visible/effects, which is demonstrated in Figure 3 in the part of the grey/invisible/area). Thus, we may also, in a more ac-



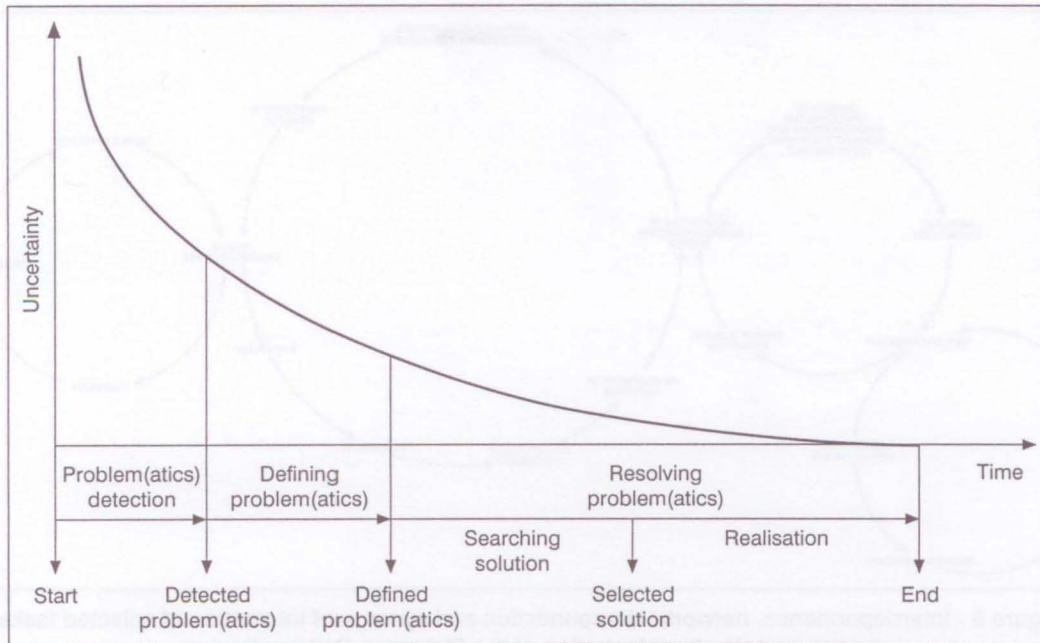


Figure 4 - Process of problem-solving (in wider sense)

curate manner, adapt the solving activities, the composition of problem-solving teams and set realistic objectives of solutions. Briefly, *we are capable of controlling them more comprehensively already at the starting point of their emergence*, which warrants us in later activities greater control of the entire lifecycle of their intricate exertion of effects, as we are familiar with for instance in OBS, or as is for example SRH.

#### 4. APPLICATION OF DNT TO COMPLEX PROCESSES OF TRANSFORMATION OF SLOVENIAN RAILWAY SYSTEM

As we thus confront the mastering of the complex problems related to the application of the directive 2001/12/ES to the Slovenian railway system (hereafter referred to as SRS) and within it the identification of the new role of SRH, we have to bear in mind that *the effect and the success of the use of DNT methodology depends on the already mentioned and emphasised commitment, motivation and abilities of participants* active in problem-solving activities. *They ought to be capable (in timely and holistic manner) to identify the starting points for the controlling or solving this complex problematics* and on such a basis *define* (the sequence of) objectives, tasks and procedures of solving process.

Within the SRS one may still sense, despite the (statutory defined) allocation and demarcation of competences between the Public Agency for Railway Traffic (hereafter referred to as PART, that performs the function of the administrator of the public railway infrastructure) and HSR (the concessionaire for per-

formance of public economic services) *the conflict of interests*. This is a consequence of the influence of numerous diverse factors and interconnections (capital, market, interest ones...) such as, for instance the state and competent ministries, PART, SRH management board, SRH employees, suppliers, users of railway services, other traffic sub-systems, EU, other railways, environmental organisations, etc. We could, of course, precede with this directory, yet this list of fairly plentiful and quite influential factors or interest groups may already show us the complexity of the system we are dealing with. Taking into consideration the fact that the SRS activity focuses on the environment marked by incessant changes, wherein there occur ever greater demands for quality (= holistic) railway services, the entire SRS ought to be competently restructured and thus prepared for the successful competition in the EU transport markets.

There is probably no need to emphasise the complexity of the set tasks, their interdependence, interconnections and synergy of their interaction (Figure 5), all of which the participants in processes of SRS transformation should (and are willing to) comprehend, implement and sufficiently comprehensively carry out.

Figure 5 demonstrates the complexity of the circuit of interconnected and interdependent tasks which within the mutual (positive) synergetic interaction influence the process of complex transformation of the Slovenian Railway System. If the problem-solvers wish to comprehend the represented impacts, they should know that the central driving wheel of the effectiveness and success of the holistic transformation of SRS runs along the right "turbo drive" of the Direc-



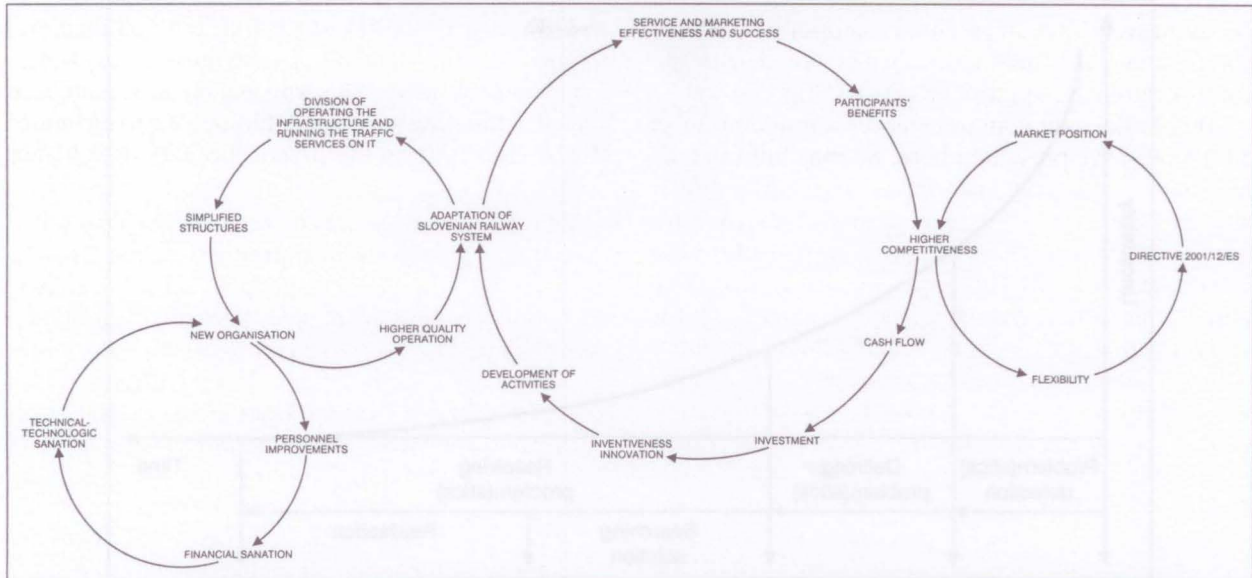


Figure 5 - Interdependence, network interconnection and synergy of interaction of selected tasks for the complex transformation of the Slovenian Railway System

tive 2001/12/ES. Intersection/juncture equals the rising competitiveness.

The left part of the intersection/juncture signifies the adaptation of SRS (reinforced by the right drive), which powers the new partition of two functions, namely infrastructure managing and running of the traffic along it. For such purposes they would necessitate new organisation of the railway system (PART, SRH). *Intersection/juncture points*, competitiveness, SRS adaptation and the new organisation are the foundation for the construction of the *network of pressure fields*. The latter are typically known to be the most critical (*breakthrough*) areas, since the (network) interconnection of the dynamic influences both on them and on the others is here at its most intensive. As soon as there occur changes of the (network) influences on the individual task, i. e. on some (perhaps also the most distant) part of the complex system of the SRS transformation, this subsequently causes the change in the operation of the entire system. On account of this, the influences within the network of tasks that act on these tasks alter, which may, for instance in the case of negative synergy, cause disruptions and therefore the imbalance of the system operation circuit – i. e. the process of the complex restructuring of the SRS. In order to be able to perform all the crucial and required tasks in a more all-embracing, holistic manner, the problem-solvers ought to possess the knowledge (and willingness) to take into account temporal dependencies and intensiveness of the operation of their constituent elements. They are enabled to do so by the use of DNT.

The course of the complex problem-solving process by means of DNT anticipates (Rosi 2004) that in continuation the solvers carry out the *selection of tasks*

according to DTS from 1 to n. For each concrete task they determine concrete obligations, so that each of them (individually or as a team member) has to know, what he/she is obliged to do and which responsibilities he/she takes on. It is of some importance that the entrusted tasks are of such a nature as to permit them to be *free*<sup>12</sup> during their effective realisation (the creative work itself demands and generates freedom) to act in dialectic-systems manner, to be innovative, personally committed, as well as to be able to *optimally exploit the available capital of knowledge and expertise that they acquired during the realisation of similar tasks*. Besides this, the *team work* makes possible interdisciplinary cooperation and upgrading of subjective initial assumptions, with which they are going to confront in a more holistic and all-encompassing manner, the solving of selected tasks in the SRS complex restructuring.

*Due to the complexity of the SRS transformation the list of crucial tasks is very extensive*. Their network and synergetic interaction has already been represented in Figure 5 and the same may be determined also for elements of each individual task (the division of functions, improvements in personnel, increase of market efficiency, etc.). Owing to the extensiveness of such further detailing of the SRS transformation one should obligatory apply the represented circuit of solving complex problems by use of DNT methodology. The latter enables us to realise the problem-solving processes in the *project designing manner*<sup>13</sup>. We already know that *projects possess the characteristics of unique (complicated and complex) processes*, which are also characteristic of problems or related broader problematics. Accordingly, we may make up the *design algorithm of solving activities* (Rosi 2004), whereby we take into account the intricacy of the problems and fo-



cus exclusively on their essential standpoints and their complex network interaction, which we detect and control within the applicative case of SRS.

By (sufficiently comprehensive) consideration of all that we have presented here, we may fulfil the demands for the quality *inter-operational railway system* and *reinforce* the appurtenance to newly created transport integration bodies – in our case pan-European railway connections. This appurtenance is neither an absolute nor the everlasting, since it depends on the vast array of diverse factors, which occur as the interconnection of constant changes in the transport market. The speed and the ability to adapt to new business demands (represented in Figure 5) dictate that action is to be taken both by the whole as well as by its connecting constituent parts of the international traffic system. Herein we perceive real opportunities for the survival and existence of also small-sized, yet well-prepared railway systems, such as needed both in Slovenia and in Europe.

We will succeed in the latter more easily, if we are able to establish the interdisciplinary cooperation of all (at least of all influential) participants in the SRS and endorse new European railway directives that have been designed for the revitalisation of the railway transport. For that purpose we wish to eliminate the deficiencies of the railway infrastructure so that it may prove appropriate for the modern traffic and the inter-operativity between networks and signalling and security systems; to establish more rational patterns of labour; achieve the transparency of operations (costs); establish more balanced exploitation of capacities, raise the productivity and attain high quality (= in a more all-embracing, holistic way) railway services that will satisfy the justified expectations of passengers and other users of railway services.

## 5. CONCLUSION

The real confrontation and solving of complex problems of SRS transformation does not allow US to complete this task one-sidedly (=deficiently) and consequently incompletely. For that reason all the participants in the processes of SRS transformation ought to have the knowledge and desire to fulfil the demands for *dialectic systems and network approach* in processes of reflection and action. This signifies that they must first of all (know and desire) illuminate the problematic situation of the complex SRS transformation from the standpoint of the interconnection of diverse perspectives (!) and those selected according to DNT, so that they may attain sufficiently all-embracing view on the problematic issues, which they intend to master, i. e. resolve in a comprehensive way. Processes of sound business acting (instruments of the DNT methodology), however, demand to actively include into the

transforming processes of SRS all the qualified and change-thirsty participants, i. e. all those key and influential persons within SRS who will be personally convinced in the success and will thus be able to introduce DNT's findings into the practical reality on a higher quality level.

The effect and success of complex business transformations (adequacy, comprehensiveness, durability...) of SRS are (inter)dependent on the creativity and innovativeness of people, particularly problem-solvers, who have to possess the know-how and desire to use the DNT methodology. This signifies that they should be capable – on the basis of the capital of expertise and knowledge about the processes of controlling (more or less complex) problems – to maximally exploit the synergy and the interdependence of DNT's dimensions (=constituent elements). These will enable them sufficiently all-embracing mastering of complex problems, among which we may certainly range also the demanding transformation of SRS.

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## POVZETEK

*Aktualno soočanje in razreševanje kompleksne problematike preoblikovanja SŽS, ne dovoljuje, da bi to skušali opraviti enostransko (= pomanjkljivo) in zato necelovito. Zato morajo udeleženci v procesih preoblikovanja SŽS znati in hoteti zadostiti zahtevam dialektične sistemskosti in omrežnosti v procesih razmišljanja in delovanja. To pomeni, da morajo (znati in hoteti) problemsko situacijo kompleksnega preoblikovanja SŽS najprej osvetliti iz spleta različnih (!) in po DTS izbranih perspektiv, da lahko dosežejo dovolj celosten pogled na problem(atiko), ki jo nameravajo dovolj celovito obvladati, tj. razrešiti. Procesi podjetniškega ravnanja (instrumenti metodologije DOMR) pa zahtevajo, da v procese preoblikovanja SŽS aktivno vključujejo vse usposobljene in sprememb željne udeležence. To je vse tiste ključne in vplivne v SŽS, ki bodo osebno prepričani v uspeh in zato kakovostneje udeležali spoznanja iz DOMR v praktično poslovno realnost.*

*Učinek in uspeh kompleksnih poslovnih preoblikovanj (primernost, celovitost, trajnost...) SŽS sta (so)odvisna od ustvarjalnosti in inovativnosti ljudi, zlasti problemskih razreševalcev, ki morajo znati in hoteti uporabljati metodologijo DOMR. Pomeni, da so sposobni – na podlagi kapitala vednosti in znanja o procesih obvladovanja (bolj ali manj zapletenih) problemov – maksimalno izkoristiti sinergije in soodvisnosti dimenzij (= sestavin) DOMR. Te jim omogočajo dovolj celovito in vseobsegajoče obvladovanje kompleksnih problemov, kakršno je zahtevno preoblikovanje SŽS.*

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1. Our research is based upon the *complexity* of the business problematics, which we are familiar with, or in other



- words, which we experience in our everyday lives (Mulej 2000, Rosi 2004), and approaches its topics:
- from the viewpoint of the characteristics of individual phenomena, characteristics of their constituent elements and of significant details, since by means of this perspective of intricacy, which we also call *complexity*, and which is studied by specialists – practitioners as well as researchers – within specific professions; yet they are dealing with important details separately, without relating them to other domains;
  - from the viewpoint of the characteristics, which the individual phenomena does not possess, yet they come into being due to their interconnections, interdependence, and mutual effects; this perspective of intricacy, also called complexity is unfortunately neglected by the large majority of specialists; for that reason the vast and also essential part of actually existent characteristics remains overlooked. This disregard, however, may prove fairly perilous and the theory of systems was introduced precisely to eliminate such dangers.
2. Numerous authors (Vester 1983; Gomez, Probst 1987, 1991, 1997; Dörner 1989; Mulej 2000; Ossimitz 2000; Rosi 2004; et al.) equal the *systems thinking* (in connection with the complex problem-solving) with the *network thinking or acting*, i.e. *the thinking and acting that focuses on relationships, connections and interdependencies*.
  3. *Globalisation* is not a result or creation introduced by the EU, but rather a consequence of effects exerted by large multinationals, which are shaping both global as well as European business policies. Their above-average innovativeness and the economic and political power enable them to subjugate (colonially), in the name of the free market those less innovative (though not the others, i.e. innovative ones).
  4. Personal mobility (White Book 2001), which has increased from *17 km per day* in 1970 to *35 km per day* in 1998 and is still on the rise, is nowadays considered as everyone's acquired right.
  5. Although the majority of traffic jams or bottlenecks affect the urban areas, the entire European traffic network increasingly suffers from the *chronic over-saturation*: around 7,500 km, i.e. 10 % of the road network is daily affected by traffic congestions: *16,000 km of railway lines, which is 20 % of the entire network*, are regarded as bottlenecks. 16 EU principal airports have reported delays exceeding 15 minutes on more than 30 % of their flights. *All these delays combined result in the consumption of additional 1.9 billion litres of fuel (!) which represents no less than 6 % of the entire annual consumption*. Do we truly know (for the benefit of our descendants), where all this is leading us? Numerous, among them also those accountable and competent persons, unfortunately do not (cf. White Book 2001).
  6. Due to the over-saturation there is a serious danger that *Europe may lose its economic competitiveness*. The latest research on this topic demonstrated that merely external costs of congestions in the road traffic amount to no less than 0.5 % of EU GDP. Traffic forecasts for the coming 10 years indicate that, if EU does not react properly, the road congestions will significantly increase by 2010. The costs that may be ascribed to congestions, will rise by 142 % and reach *80 billion euro per annum*, which is equal to 1 % of EU GDP (cf. White Book 2001).
  7. One should also welcome the heightened awareness (White Book 2001), which is manifested by the endorsement of the common definition of the uniform strategy for European railways that envisages the introduction of the unified European railway system until 2020. Within the document, signed by International Railway Association (UIC), European Railways Community, International Association of Public Transport and the Union of European Railway Sector (UNIFE), all stakeholders agreed that *until the year 2020 the following objectives should be achieved*:
    - increase of the railway market share in the passenger traffic from 6 % to 10 % and in freight transport from 8% to 15 %;
    - tripling the productivity of employees in the railway sector;
    - 50 % saving due to more efficient use of energy;
    - 50 % reduction in air pollution;
    - increase in the capacity of the infrastructure in proportion to the traffic development objectives.
  8. For these purposes EU co-finances national programmes and projects (Rosi, Novak 2002; 2003; 2004), which are intended to bring investment into traffic infrastructure.
  9. Hereby we think of the *application of the "starting point" Directive 2001/12/ES*, which complements the Directive 91/440/EEC. Within it we will represent the complex problems of the reorganisation of the Slovenian railway sector by separation of function of *running the railway infrastructure* from the function of operating the traffic on it.
  10. Railway Traffic Act – officially corrected version, Novel to the Safety in Railway Traffic Act, Transformation and Privatisation of the Public Company Slovenian Railways, plc. Act, other diverse decrees issued by the Government of RS, substatutory regulations, etc.
  11. Under the term *working group* we usually mean (Srića 1996) three to twenty persons, who are committed to realise the common business task. Mutual relationships among members, bound into working groups, display their particular characteristics, which one cannot find in other forms of uniting, e. g. within the "ordinary group". Members are more oriented towards the *common organisational objective – which is also the reason for their bonding together –, they are strongly interdependent* due to interconnection of their various activities and focused on their own personal task. They are therefore less interested in the work of other members of the group. There is a stronger mutual interaction among them and the direct communication as well is stronger than the one we may detect in an "ordinary group".
  12. Mulej (2000) warns that the freedom is not in doing what you want but in acting on the basis of things you know and understand.
  13. Many times we have already heard or even ourselves identified a given project as small, simple, undemanding, etc. or as large, extensive, complex, capital demanding, etc. Would it not be possible to describe in the same



manner also the problem(atics)? Undoubtedly yes. For that reason the non-routine control of the complex problematic situation can be regarded as the project and its characteristics compared to project characteristics. Thus the process of mastering complex problems becomes a target-oriented and temporally limited process, which has to be carried out in the project-oriented way (cf. Hauc 2002).

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