

Innovation and Sustainability of Road Management System

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Abstract: *Road network of the 2nd and 3rd class roads in the Pardubický Region and other regions in the Czech Republic is in the condition requiring the financial flow reaching to 50% of its reproduction status. Other regions in the Czech Republic experience a very similar situation. This has a substantial influence on the Czech road network infrastructure quality. The quality as such is an important factor for the growth and development of the state economics and labour distribution in the European area.*

Key words: Management Innovation · Sustainability · Road Management System

JEL Classification: L20 · M12

1 Introduction

Taking in consideration the dynamics of the technical and economic development in a society, controlled objects encounter internal and external imbalance that need to be anticipated (Franková, 2011). Their growth must be regulated by means of internal structure innovation. At least, it is inevitable to reduce its negative impact. Formation of imbalance of a controlled object is a natural process that depends on science and technology development.

Innovation is a product of human creativeness and creativeness is a person's ability to overcome the real status of the existing operations through their changes, i.e. innovations.

Valenta (Valenta, 1969), who in 1969 published the work "Tvůrčí aktivita-inovace-efekty" (Creative activity, innovations and effects) in the "Svoboda" publishing house, is considered a representative of the Czech innovation theory. He brought the Schumpeter's theory into practice of our management. Valenta (Valenta, 1969) defines management as a transfer of one system status into another by means of changing its variables. In his words, management produces innovations. Innovations then change the internal structure of a company and the resulting effects reflect changes of the company's behaviour within its environment (Košturiak, Chal', 2008). Managers should not wait until innovative idleness negatively influences the company business results. They should prevent this from happening by new decisions or by motivating innovations (Freeman, 2010). The greater the influence of his/her decision (a motivating innovation) on the controlled subject, the higher the innovation order. It is vice versa at simple partial decisions and at decisions of local significance. A good manager must not claim the right to be a single vehicle of imagination and inventiveness, despite s/he will eventually be responsible for the innovation results (Christensen, Raynor, 2003). Managers must not degrade the creativeness of his/her team members by a disdainful attitude.

Śledzik (2013), Valenta (2001) recognizes three components of creativeness:

1. The ability to overcome the current state of production or other activity in a person's mind, i.e. the ability to imagine that things and relationships could be different,
2. The ability of invention, i.e. to resolve new state of things and relationships,
3. The ability to complete an innovative act and to take over the responsibility for its completion because it is, according to Schumpeter, a creative destruction.

Among the basic rules of an innovation process are the following:

Complexity. Exercising an incomplex innovation usually results in a reduced or even negative effect because a problem is solved in an isolated way, without considering mutual relations and without analyzing the reasons of its origin and correlation. A complex decision (an order) is reached in terms of its overall impact on the controlled object (Gruen, 2010).

That is, taking in consideration a horizontal aspect (the action radius of an innovation) and vertical aspect, an action radius of an innovation process (the innovation order).

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The trend of a complex management innovation is based on the knowledge that partial and isolated innovations can only solve a partially existing problem while reducing the effectiveness of the exercised innovation and raising imbalance of the object's internal structure. Management is thus disintegrated and fails to solve the existing situation. The condition of complexity is fulfilled in the event that the given problem is being dealt with in all the basic aspects and taking mutual relations in consideration.

Consistence. The rule of consistence enables a manager to be informed about the effectiveness of the past and future measures within an innovation process of the controlled object (Christensen, Raynor, 2003). A tool to apply this prerequisite is an analytical attitude to measurable and non-measurable values achieved within the controlled system functioning and the attitude to the economic and social benefit hereof. A major prerequisite for an innovation process of strategic development of a particular organization should be information gained from the analysis of the recent economic development and its completion deadlines.

It is mainly respecting the complexity and synthesis, i.e. the unity of quality and quantity within the management and evaluation of economic result. The degree of synthesis depends on the level of management to which information should serve. The higher this level, the higher the level of information synthesis is required because the amount of analytical information increases. A top manager needs a synthetic view of the controlled object to be able to see it in its complexity.

On contrary, the lower management level in view of a top manager deals with the problem in a more analytical manner. However, this does not mean that they are not interested on its synthetic aspect. To be able to successfully participate in the vertical aspect of management, a good manager must know both the strategy of sub-systems and the way it participates in the system management in its whole. This is important for the employees' motivation and also for the strategy of the supervisor to effectively stimulate the staff on the particular management level (Christensen, Raynor, McDonald, 2015). Employees need to know why they work and must be aware of the meaning of their work for the whole system and for the creation of the overall strategy.

Timeliness. The objective is to minimize the management-free period, i.e. the period of the moral wear of the first innovation is outlived and the future innovation is not yet working. This period is an unwanted factor in an innovation process because the solved problem is outside the management process. This is a negative factor, especially in view of market competition and monitoring the costs relating to the reduced function of the managed system.

We often see that this rule is neglected because the desired course of the performed innovation is not maintained, which extends the deadline for its implementation. A classical example is investment construction. It is relatively easy to observe companies failing to keep this rule. Analogical course of action with equal results is, however, the same in any other management areas. Unfortunately, its consequences are not seen immediately, they appear later depending on the type of problem and on its importance. An example is the management of the legislation process. In the interim period, an innovation process is always characterized by insufficient definition of an innovation objective and unpreparedness of partial factors of its internal structure. The rule of timeliness requires minimizing of the interim management-free period by the preparation of a new innovation already during the boom of the existing one. A timely decision is important: we have to know in advance when to start the preparation and when to start the implementation. If you do so in the period when the original innovation is still functioning, the system will encounter anarchy. However, if you let the interim / management-free period happen, it is uneconomical. To estimate the speed of the solved problem dynamics development, we can, in a certain scope, use the internal documents and records of the company. However, a good manager must not neglect opinions of experts in the given field, whether those among the company employees or those working for scientific institutions.

This is connected with effective stimulation of team work and with motivation of employees and experts from scientific institutions. An irreplaceable role and test of a person's competence is in the manager's hands: s/he always has to decide about the methods of team stimulation and about the period to complete an innovation and also assume the responsibility for the project success. This is why we often hear the opinion that management is an art requiring a competent personality; a person convinced about the importance of managerial ethics and responsibility.

2 Materials and methods

The research was carried out in the Pardubice Regional road network of 2nd and 3rd class, its condition, sustainability and management. The research is based on a long-term analysis enabling the participants to become acquainted with the real state. The analytical comparison was used as the main method based of the study of statistics and previous analyses of the monitored objects administered within the plan for innovative management and sustainability of the road management system.

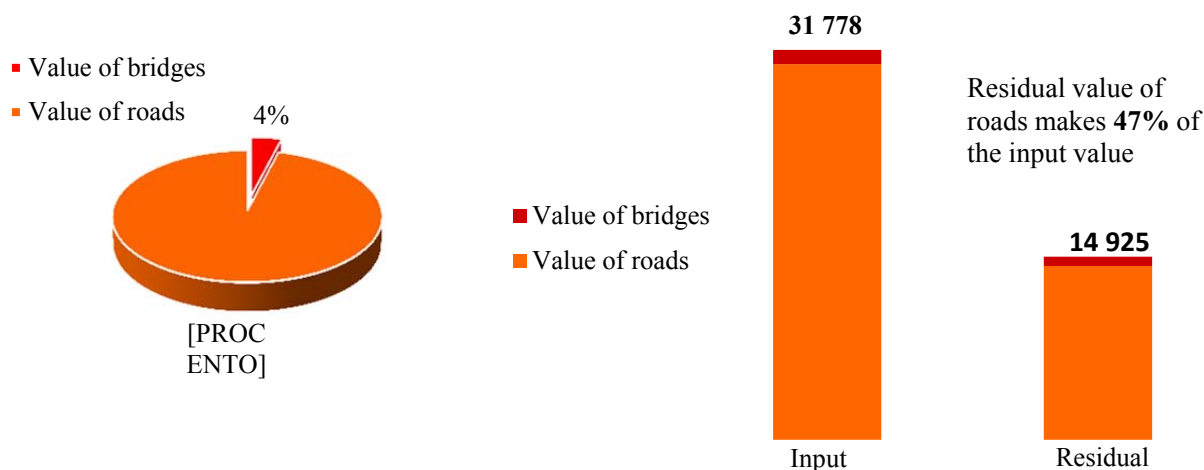
The objective is to recommend implementation of innovative methods and procedures in the Czech Republic focusing on the reduction of financial, construction and technical debt of operators and managers of the 2nd and 3rd class roads. The research outcomes will determine the critical places and points, recommendations for the project sustainability and for the shift towards quality in this area of management.

3 Results

Among the sustainability factors in road management in the Czech Republic is the situation of the roads, in other words the problem of reproduction of the current condition. The 2nd and 3rd class roads in the Pardubický Region are on about a 50% level of their simple reproduction. The system is lacking roughly 15 billion Czech Crowns (Table and Graph N. 1)

Table 1 and Figure 1 Overview of road property and its value

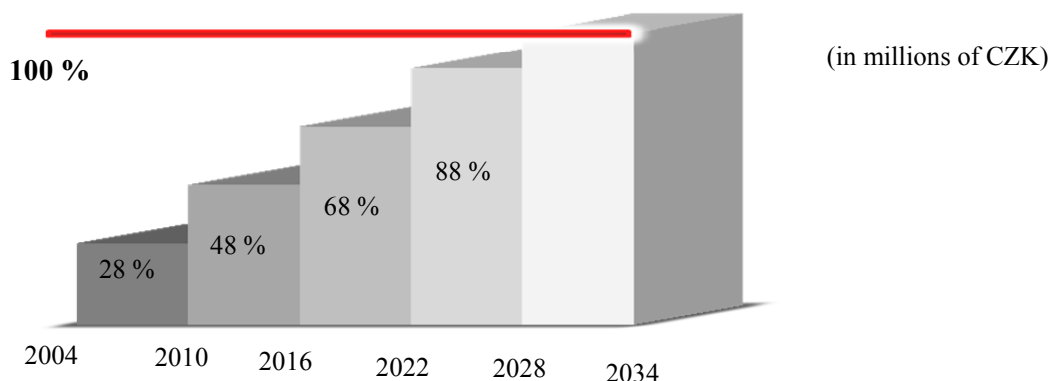
Roads			Industrial residual value	Value of roads		Value of bridges			Overall value of roads and bridges	
Class	Length (km)	Area (thousands)		Input	Residual	Number (pieces)	Input	Residual	Input	Residual
2 nd class	913	6 007	6,3	11 663	5 487	253	700	504	12 363	5 990
3 rd class	2 222	12 656	4,2	18 951	8 692	548	465	244	19 416	8 935
Celkem	3 136	18 663	4,8	30 614	14 178	801	1 165	748	31 778	14 925



Source: authors

Detailed research of the condition of 2nd and 3rd class roads reflected in Graphs 2 and 3 shows that in 2024 to 2028, all Pardubice Region's roads of the 2nd and 3rd class will be in the emergency or disrepair condition.

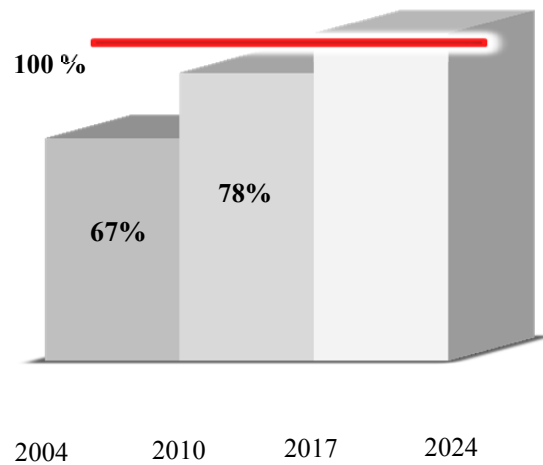
Figure 2 Expression and estimate of emergency condition percentage of 2nd and 3rd class roads in the Pardubický Region



Source: authors

Similar observations show roughly the same conditions in other regions. Differences are negligible; they depend on the amount of financial expenses in individual regions

Figure 3 Expression and estimate of emergency condition percentage of 2nd and 3rd class roads in the Czech regions



Source: authors

The impact on the Czech economy will be fatal, unless there is a change of the recent attitude.

The Pardubický Region and the Road Management of the Pardubický Region have been trying to solve the handicap through public interest declared in Memoranda of Cooperation between the state and regions. This way can help to obtain subsidies for the road infrastructure development, which cannot be obtained otherwise. The documents in question are the following: The Memorandum of D35 Highway, The Transport Node of

Pardubice and the Memorandum of the Foxconn company. The projects are a product of a high degree of management level, of the motion in the field of crisis. They represent innovation, dynamics, they support employment on the basis of responsibility, ethics and demands for high qualification of the involved labour in the hard and soft project management.

Due to this, managers of organizations providing maintenance and region-owned property administration have to create innovations and carry out activities that reduce and delay such adverse impact. Recommended innovation and activities are the following:

Additional economic activities of the involved organizations:

The purpose is to use extra capacity of the transport, mechanization, technology means, buildings, premises and human resources. This is the way to reduce operating expenses and cost of the main activities in a company, i.e. to reduce the price of individual road works by as much as one quarter.

- New technology

The use of new technology provides reduces the price of construction and maintenance works and extends service life of construction works already carried out. Its secondary effect is a real construction work completed within the new technology testing. Commonly obtained financial flows would not allow for new acquisitions or property repairs.

- Development areas

This form of innovation means administration of a regional, national or European project within public interest. The projects concern industrial zones, public logistic centres, river ports, airports, as well as sports and leisure centres and national heritage in terms of transport. These are usually investment units worth several millions up to billions of Czech Crowns.

- Intensive involvement of information technologies

Extensive use of information technology in company processes largely reduces financial expenses. It has been documented that compared with 2002, when regional organizations of property administration and road maintenance were established, the prices and scope of summer and winter maintenance remain almost the same at similar scope of the

works carried out. This is true in spite of the fact that the input prices, e.g. energy, construction material, services etc., have doubled or even tripled.

The tools to be used are Dispatcher module and the winter maintenance difficulty index. The index advises, with a twelve-hour advance, weather forecast in a 500 x 500m square. The index of difficulty determines the optimum consumption of labour, ploughing, gritting material, emergency and check drive in reality compared to the theoretical curve line.

It is recommended to process thermal maps enabling the users to differentiate among winter maintenance in open terrain, going uphill, in bends, forest sections and on bridges. This especially concerns different dosing of the gritting material.

- Media support

Its main task is to provide road users, community, regional and central politicians and industry with information that the adverse situation of the road property is caused by the discrepancy or by the deficit between social demand for maintenance, repairs, modernization, reconstruction and construction of roads covered by the disposable financial resources and the real condition of the road network. Further, marketing and advertisement support to the additional economic activities of organizations with the aim to offer free capacities of the company in benefit of the commercial demands. Last but not least, it is advisable to use the regional development planning campaigns for application of new technologies.

All of the above mentioned presents a great demand on management quality in the organizational structure and also on the hard and soft project management teams.

The teams are established for individual projects. Majority of them are management and working groups headed by a project manager. Individual members are selected in a way to provide expertise, experience and education covering the whole project requirements. The work of project teams is finalized by the project evaluation. Their work is continuous; the projects are designed, solved, completed and finally evaluated.

The activity has soft support, since the teams deal with the process ethics, monitoring the eligible needs of the teams, monitoring media reactions and social impact, among others.

Most road management organizations have established websites to inform the employees, general public and media about their activities. An integral part is the page "Responsible Organization." Companies assume social responsibility while giving a part of their excessive profit to charity, to humanitarian, environmental and other activities. The main objective is to sustain the company's good reputation.

4 Conclusion

All of the above mentioned can be considered an innovation process which indirectly reduces the financial, construction and technical debt in road property. Such procedures help to form financial resources and construction and technical added value outside financial flows directed from the road owner onto 2nd and 3rd class roads.

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