

EXPLOITATION OF THE TREE DIAGRAMS IN APPRAISAL OF THE QUALITY OF PUBLIC TRANSPORT

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Abstract: *Satisfaction of the users` requests is one of the primary business requirement in public transport. This contribution identifies requests of passenger on quality of transport and offers some method of the tree diagram which can help to detect them.*

Key words: *quality of public transport, satisfaction of customer`s requests*

INTRODUCTION

Passenger`s contentment as a psychological phenomenon expresses perceived level of performance passenger`s requests. Public utility undertaking has to focus on its customers and try to content their requests, because only satisfied customer will be willing to reuse the service.

Because customers in public transport are heterogeneous is complicated to content all requests. Therefore transport company should to focus its activities on identify main factors which influence perceived quality. It can use some of tree-based methods.

1 APPRAISAL OF THE QUALITY OF PUBLIC TRANSPORT

Appraisal of transport quality results from basic features of quality: time, certainty, promptness, reliability and atmosphere of service.

Time – it`s summary of time for joining contact to exploitation of service and time of service itself.

Certainty – it means that traffic service will be performance, for example passenger will be transported from source to target.

Promptness – it relates close to time, passenger often prefer fast, prompt service against cheap and slow service.

Reliability – it contains reliable means of transport and qualified, responsible personnel.

Atmosphere of service – in term of customer is it relation between personnel and customers.

We can define appraisal of transport quality criteria by analysis of these features.

1.1 APPRAISAL OF PUBLIC TRANSPORT QUALITY CRITERIA

Man spends in average hundreds of hours per year by travelling to work. Therefore primary aspect in appraisal of public transport quality is time which man needs to remove from source to target of his trip. **Removing time** is depend not only on time spent in means of transport, but also on time for getting to station from source, time for waiting for means of transport, time for transmission and time for getting from station to target.

Removing comfort is influenced by technical, technological factors and arrangement of transport, which effect physical and mental conditions of passengers. Removing comfort means comfort in vehicle and also comfort of stations.

Opportunity of transport can be defined from time, space aspect and capacity of transport. Opportunity of transport present the ability of removing passenger in required time and space, which claims free space on given line and in given time and direction.

Regularity of transport means compliance of specified transport interval. It is difficult to

abide this criterion especially in town centres, where is high intensity of transport.

Passengers claim to be always removed to target of their trip in time. This request is connected with **reliability of transport** – passengers need feeling of certainty that timetable will be abided regardless of daytime or season, eventually weather conditions.

Accuracy of transport relates close to reliability of transport and compares real routings run in aspect of time with data in timetable.

One of the most important criteria is **safety of transport**. It is inaccessible to improve another criteria, for example speed, comfort, price, at the expense of safety.

However, the most important criterion for passengers is **price**.

Transport company can identify on the basis of these criteria main causes, which effect on satisfaction of customers – passengers. These causes result from five main areas, from:

- means of transport,
- people – personnel or fellow passenger,
- traffic service,
- station areas,
- tariff's conditions.

2 THE TREE-BASED METHODS

The tree-based methods are mainly used to find cut-sets leading to the some events. In fact, event tree and fault tree have been widely used to quantify the probabilities of occurrence of events in probabilistic risk assessment. These methods are usually used for undesirable events, but in appraisal of quality of public transport we use desirable event – satisfaction of customer's requests).

The concept of **fault tree analysis (FTA)** was originated by Bell Telephone Laboratories in 1962 as a technique with which to perform a safety evaluation of the Minutemen Intercontinental Ballistic Missile Launch Control System. A fault tree is a logical diagram which shows the relation between system failure, and failures of the components of the system. It is a technique based on deductive logic. An undesirable event is first defined and causal relationships of the failures leading to that event are then identified.

In public transport we have desirable event a we looking for causes, which can effect passenger's satisfaction. These causes are mentioned in section 2 as public transport quality criteria.

Figure 1 illustrated simplified fault tree for desirable event: satisfied customer.

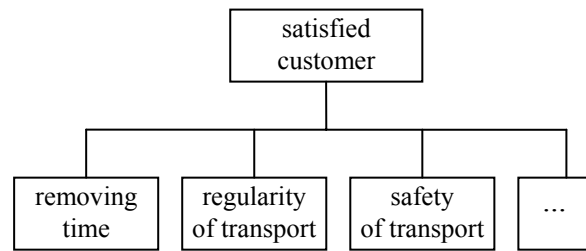
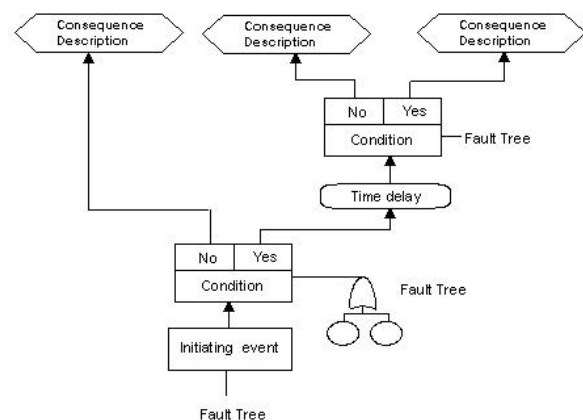


Figure 1 Simplified fault tree for desirable event: satisfied customer

Event tree analysis is a method for illustrating the sequence of outcomes which may arise after the occurrence of a selected initial event. This technique, unlike fault tree uses inductive logic. It is mainly used in consequence analysis for pre-incident and post-incident application. The left side connects with the initiator, the right side with plant damage state; the top defines the systems; nodes (dots) call for branching probabilities obtained from the system analysis. If the path goes up at the node, the system succeeded, if down, it failed.

Cause-consequence analysis(CCA) is a blend of fault tree and event tree analysis. This technique combines cause analysis (described by fault trees) and consequence analysis (described by event trees), and hence deductive and inductive analysis is used. The purpose of CCA is to identify chains of events that can result in undesirable consequences. With the probabilities of the various events in the CCA diagram, the probabilities of the various consequences can be calculated, thus establishing the risk level of the system. Figure 2 below shows a typical CCA.



Picture 2 Typical Cause-Consequence Analysis [9]

The **Ishikawa diagram** (also **fishbone diagram** or **cause and effect diagram**) is the brainchild of Kaoru Ishikawa. It is simply a diagram that shows the causes of a certain event.

Causes in the diagram are often based around a certain category such as the 6 M's (Machine, Method, Materials, Measurement, Man and Mother Nature), 8 P's (Price, Promotion, People, Processes, Place/Plant, Policies, Procedures, Product or Service) or 4 S's (Surroundings, Suppliers, Systems, Skills). 6 M's are recommended for manufacturing industries, 8 P's for administration and service industry and 4 S's for service industry. Cause-and-effect diagrams can reveal key relationship among various variables and possible causes provide additional insight into process behaviour.

A generic Ishikawa diagram showing general (a, b, c, d) and more refined (e – p) causes for an **event**. The main body of the diagram is a horizontal line from which stem the general causes, represented as "bones". Off each of the large bones there may be smaller bones highlighting more specific aspects of a certain cause, and sometimes there may be a third level of bones or more.

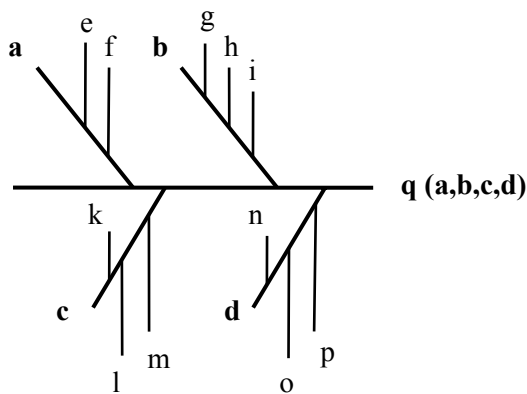


Figure 3 Generic Ishikawa diagram
http://en.wikipedia.org/wiki/Ishikawa_diagram

If we use five main areas which influence customer's perceived level of quality public transport (specified in section 2.1) then skeleton of Ishikawa diagram will have following form:

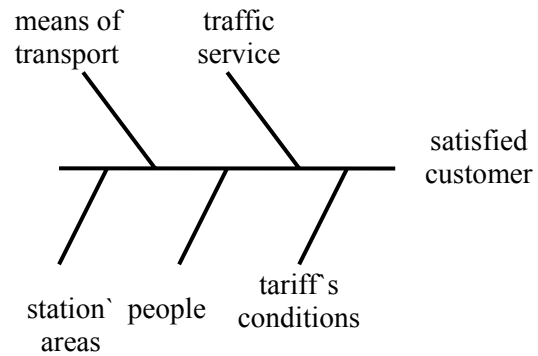


Figure 4 Exploitation of Ishikawa diagram in public transport

Several refined causes effect on every general cause. As complete cause and effect diagram is too large, figure 5 illustrate only one of main areas – people and refined causes, which effect on passenger at the hand of people. We can proceed also with another areas.

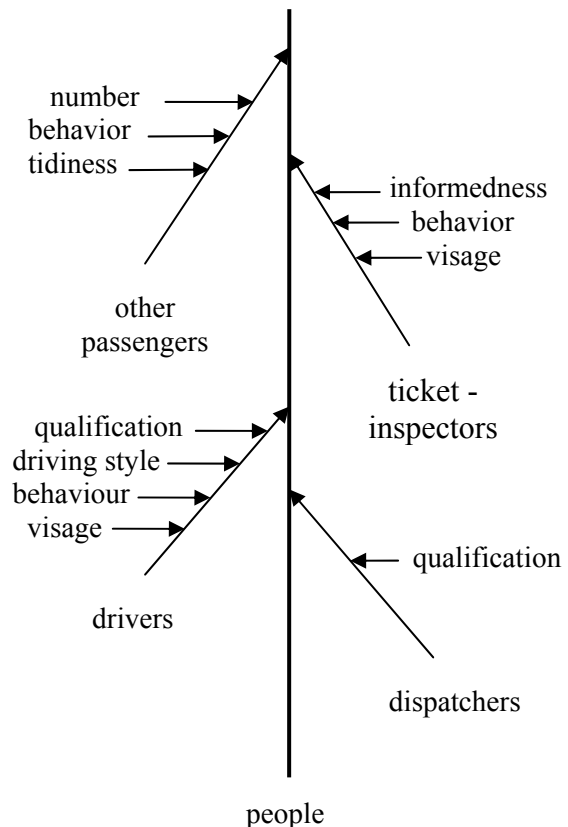


Figure 5 Influence of people on passenger's satisfaction

CONCLUSION

Contribution refer short characteristic of tree-based methods. These method are used to identify risk sources, but the can be used also in appraisal of the quality of public transport. Methods and also diagrams are valid only for given conditions, which can change in time. Therefore they have to be filled up with new knowledge.

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ИЗПОЛЗВАНЕ НА ТРИ ДИАГРАМИ ЗА ОЦЕНКА НА КАЧЕСТВОТО НА ГРАДСКИЯ ТРАНСПОРТ

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СЛОВАКИЯ

Резюме: Удовлетворението на потребителските изисквания е едно от първостепенните бизнес изисквания в градския транспорт. Тази разработка установява изискванията на пътниците за качество на градския транспорт и предлага метода на трите диаграми, който може да помогне за откриването им.

Ключови думи: качество на градския транспорт, удовлетворяване на изискванията на клиентите.