

Creative Thinking about Transportation Planning

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Abstract. The transport planning process has often been characterised as consisting of a series of logical stages which lead towards the production of a final outcome. These stages include the identification of goals, the specification of alternatives, the collection of information, the modelling of alternative courses of action, the evaluation of alternatives, the selection of preferred alternatives, the implementation of these preferred alternatives and the monitoring of their consequences. While much attention has been paid to many of these processes, relatively little attention has focussed on the creative specification of alternatives. This paper seeks to show that there is an absolute need for creativity in the selection of alternative courses of action in transport planning. Drawing upon the techniques of creative thinking developed by Edward de Bono, the paper will show why creativity is needed and how all transport planners can improve their skills in Lateral Thinking. The paper will outline some fundamental ideas, and some myths, about creativity and describe three major techniques in creative thinking, namely the concept fan, random inputs, and the use of provocation. It will describe why and how these techniques work, and will then demonstrate their use in a range of transport planning applications.

INTRODUCTION

Many contemporary authors have suggested various ways in which the urban transportation planning process should operate (1, 2, 3, 4, 5). By adapting the critical components of each of these versions of the planning process, Richardson et al. (6) proposed a general transportation planning systems process as shown in Figure 1.

Most of the components of this process are well-known to most transportation planning professionals. The transportation planning process has often been characterised as consisting of a series of logical stages which lead towards the production of a final outcome. These stages include the identification of goals, the specification of alternatives, the collection of information, the modelling of alternative courses of action, the evaluation of alternatives, the selection of preferred alternatives, the implementation of these preferred alternatives and the monitoring of their consequences. While much attention has been paid to many of these processes, especially the collection of information, the modelling of alternative courses of action and the evaluation of alternatives, relatively little attention has focussed on the manner in which alternatives are generated and specified. As transportation problems become more complex and their solutions need to satisfy the triple-bottom-line criteria of economic, environmental and social sustainability, we need to become more creative in designing ways of solving our perceived transportation problems.

This paper seeks to show the role that creative thinking can play in the selection of alternative courses of action in transportation planning. Drawing upon the techniques of creative thinking developed by Edward de Bono, the paper will show how all transportation planners can improve their skills in Lateral Thinking. The paper will outline some fundamental ideas, and some myths, about creativity and describe three major techniques in creative thinking, namely the concept triangle, random inputs, and the use of provocation. It will describe why and how these techniques work, and will then demonstrate their use in a range of transportation planning applications

WHY IS CREATIVITY NEEDED

A formal consideration of creativity is needed in transportation planning because, unlike other parts of the transportation planning process which rely on logical thinking and analysis, creative alternatives cannot be generated by logical thinking. The major body of work on creativity can be found in the writings on Lateral Thinking by Edward de Bono (7, 8, 9). In his works, de Bono stresses that no new ideas can come from logical thinking; all new ideas comes from illogical and somewhat random thoughts. We have all experienced such situations where solutions to long-standing problems come to us in the most unlikely circumstances, such as when showering or when taking a walk and not really thinking about the problem.

However, de Bono has gone one step further and has invented a number of deliberate thinking strategies such as concept triangles, random words and "po" statements (po stands for "provocation operation"). de Bono describes how such strategies can result in significantly new ideas which can overcome problems which could not have been solved through the application of conventional ideas. However, de Bono also stresses that, once discovered, all of these new ideas must be able to be explained and justified in terms of conventional logical thought processes. In essence, all great new ideas are obvious in hindsight. Combining logical and illogical thinking is one of the great challenges in transportation planning.

In essence, there are two situations when there is a real and practical need for creativity:

- where there is a real need for a new idea and we cannot proceed without that new idea. The need may arise with respect to a problem, a crisis or a conflict. Other approaches have failed, and creativity is the only hope for moving forward; and
- where there is no pressing need for a new idea, but where a new idea may offer opportunities, advantage and benefit.

People are generally more aware of the need for creativity in the former case. Indeed, in the latter case, many people are much happier to "let sleeping dogs lie" and can see no need to fix things if they aren't broken. However, it is clear, in hindsight, that the best time to have changed something was when things were going well, since after that time things can only go downhill.

FUNDAMENTALS AND MYTHS ABOUT CREATIVITY

Before considering specific techniques which can be used to generate new ideas in transportation planning, some basic ideas and myths about creativity need to be considered in order to set the scene for the discussion of deliberate creative thinking techniques. de Bono (9) highlights eleven issues and myths about creativity which have developed over the years:

- Creativity is a natural talent and cannot be taught

Many people excuse themselves from being creative because they say that creativity is a natural talent you are born with, and therefore cannot be learned. de Bono positively disagrees with this view, and sets out to show how anyone can learn to be more creative, just like anyone can learn to play tennis. Clearly, not all people will learn to be Wimbledon champions in tennis, and some people will always be more creative than others. But everyone can learn to be more creative.

- Creativity comes from the rebels

Creative thinking is often seen to be something that is better done by the rebels in society, since they like to break the rules and think the non-conformist thoughts. However, since, as will be seen later, deliberate creative thinking is done by following a series of rules and procedures, it could be that conformists may be better at deliberate creative thinking since they are the ones who are willing to follow the rules in order to generate creative ideas at will.

- People are either left-brained or right-brained

Left-brained people are regarded as logical and analytical while right-brained people are more perceptual and holistic. It has therefore been considered that creativity is a function of right-brain thinking, and can only be attempted by people who are right-brained. However, de Bono points out that both hemispheres of the brain are used in creativity thinking. In addition, while some people are predominantly left-brained, they also have a right-brain which they can be trained to use more effectively.

- Creativity belongs in the domain of art and the artists

We often consider creativity to be most obvious in the work of artists, and others of artistic persuasion such as musicians and architects. However, many "artists" are only creative on very few occasions in their life, and thereafter tend to stick to their "creative" style. Many artists develop a style which is surprising and refreshing at first, but which is then used with minor variations from then on. They are not necessarily creative all the time or on demand.

- Releasing inhibitions is enough to be creative

It is often considered that releasing inhibitions, removing the fear of being wrong and suspending judgement will be enough to generate new ideas. However, if inhibitions simply reduce our normal level of creativity, then releasing inhibitions will merely move us back to our normal level of creativity. In order to be really creative, however, we need to go beyond this point by the adoption of some "unnatural" behaviours.

- Intuition and "sleeping on it" is enough

While it is true that many good ideas come to us when we are least expecting them, leading us to believe that our sub-conscious intuition is enough for generating creative ideas, such a method has a very low efficiency. It takes a lot of "sleeping on it" to come up with lots of good new ideas, and it is not particularly viable as a means of generating new ideas on demand.

- Creative people are a bit "crazy"

Being "crazy" is different from being conventional just as being creative is different from being conventional. However, it does not follow that being "crazy" is the same as being creative. Generating silly crazy ideas does not mean that they will necessarily be useful new ideas. It can be a good start, since it makes us move out of our comfort zone and start considering something different, but one needs to ensure that one moves on from the crazy idea to the useful idea.

- Scatter-gun processes will eventually generate creative ideas

The process of "brainstorming" gives the idea that simply listing a lot of different thoughts, and suspending judgement about them, will generate good new ideas. Clearly, the more ideas that are listed the more likely it is that at least one new idea will surface. However, it's a bit like having a thousand monkeys banging away on typewriters in the hope that they will write a best-selling novel. Most brainstorming exercises are more like "brain-dumping" where all we get are a series of ideas along the same line from each participant. We need more deliberate processes to force us out of our normal lines of thinking.

- Creative ideas must address big problems and issues

Many people, especially in Western societies, are obsessed with finding big conceptual jumps which lead to totally new paradigms of thought about a topic. Eastern thinkers, on the other hand, are more content with a series of small conceptual jumps that lead to new ideas without a major paradigm change. A series of small jumps rarely leads to the same outcome as one large jump, since the large jump may require a total overhaul of previous ways of looking at things. Creative thinking should be considered when looking at both small and large problems.

- Creative thinking is a group process

Because many people have some experience with brainstorming exercises, it is often considered that creativity is a group exercise. However, deliberate creative thinking can be an individual as well as a group exercise. Indeed, individual creativity can be better at the start of the process, where individuals can generate far more ideas and a wider range of ideas. Later in the process, groups can be good for building on ideas and suggesting variations and modifications to ideas generated by an individual.

- Creativity and intelligence are inversely related

Many people consider that high levels of intelligence are an impediment to creativity. Clearly, highly intelligent people are traditionally better at logic and analysis. They may also "know" when something won't work, and hence don't follow through on the idea. On the other hand, the less intelligent person may not be smart enough to know that the idea can never work, and hence, in their innocence, continue to work on the idea until, to everyone's surprise, it works. However, deliberate creative thinking can be used by high and low IQ people alike, so long as they are willing to follow the rules of deliberate creative thinking.

USING THE CONCEPT TRIANGLE TO GENERATE ALTERNATIVES

A common situation in which some form of creativity is required is where different ideas are needed for solving a particular problem. Typically, this is done by making a list of the different ways of solving the problem. However, a relatively simple change to this process can make the effort much more productive in terms of the quantity and quality of ideas developed. The key change is to think of an idea not as an individual idea but as a representative of a "concept" which can be used to solve the specified problem.

As an example of using concepts to generate ideas, consider the problem of emptying a glass of water without touching the glass. When faced with this problem, most people will immediately come up with a particular idea, such as sucking the water out through a straw. Rather than immediately proceeding on to suggest other ideas, we can be more productive if we pause at this stage and identify the concept that underlies this particular idea. In this case, the concept might be "raising the water out of the glass". Having identified this concept, we now proceed to generate other ideas using this same concept. For example, we might place a cloth inside the glass, absorb the water with the cloth, and then lift the cloth out. Alternatively, we might put a string in the glass, freeze the water, then lift out an ice cube! This process can be represented in terms of a "concept triangle", as shown in Figure 2.

With the "concept triangle", one uses the first idea to identify a general concept, and then uses this general concept to develop many different ideas, using this same concept, for solving the original problem. Having identified all the different ideas using this concept, one then thinks of any other way of solving the problem, and then repeats the process of identifying the concept and then generating new ideas from this concept. For example, with the same problem, one could empty the glass by filling it with stones to force out the water. The underlying concept would be "displacement", and other ideas might be filling it with another liquid that was heavier than water,

or by placing another glass inside the original glass. The same process can be repeated over and over again until all the concepts, and ideas, have been exhausted (at least to your mind). This overall process is shown in Figure 3.

It can be seen in Figure 2, and Figure 3, that it is possible to go directly from the problem to a concept and then on to ideas. However, in practice, it is much easier and more natural to first think of a specific idea and then identify the underlying concept.

The advantage of using concept triangles to generate ideas is that it is a much more comprehensive and exhaustive method of generating ideas than simply trying to list all the individual ideas. It also gives a much better understanding of the structure of alternative solutions and the nature of the initial problem. It also helps in documenting the possible solutions, because it gives a natural grouping of different ideas which helps in preparing reports on the problem.

The use of concept triangles is helpful when you are trying to identify, and categorise, ideas that are already within your span of knowledge, but when you need some assistance in remembering or identifying them. However, when you need to develop an idea of which you are currently totally unaware (i.e. when you need to be really creative), then other methods of Lateral Thinking are needed.

USING RANDOM INPUTS TO ESCAPE THE MAINSTREAM

One of the valuable functions of the human brain is in pattern recognition. Given only partial information, our brain is very good at filling in the missing information to arrive at a conclusion. We do this all the time, and everyday life would be impossible without such an ability. However, when we are trying to think of something new, this very ability can be a real impediment. Every time we come to an impasse in generating a new idea, our brain fills in the missing details and leads us back to something with which we are already familiar. Figure 4 illustrates this concept. We start at point A looking for a new idea, but each time our routine way of thinking, including our brain's powers of pattern recognition, leads us down the same path to conclusion B. We can't seem to break out of our routine way of thinking to find the new idea located at C. We stay on the well-worn path, and don't (or can't) venture into the side alley which would lead us to C. And the more we try, the more likely we are to keep finding ideas with which we are already familiar in the corridor between A and B. Just as falling rain carves deeper and deeper rivers in the valleys of the landscape (because it always runs downhill to the lowest point), so new information falling on our senses tends to run into the same thought channels, carving deeper and deeper impressions on our brainscape. What is needed is a way of forcing us out of our comfort zone (i.e. out of the obvious path from A to B) so that we have a chance of finding the new idea at C.

One way of getting out of our thinking rut is by the deliberate introduction of a random stimulus which has nothing to do with the topic about which we are thinking. This random input has the effect of deliberately moving us away from the usual path between A and B, thus putting our mind temporarily in an unusual position such that we might see the new idea at C. Having discovered this new idea, we then see, in hindsight, how it relates to the issue or problem we were considering at A. Importantly, we must be able to explain logically how the idea at C is able to solve the problem we were considering at A, as shown by the reverse arrow from C to A in Figure 5. While we could not have found C from A by logical processes, we must always be able to show, in hindsight, how C is logically connected to A. We are all familiar with this concept. Having found a new idea, by whatever process, we often say to ourselves or others "How obvious! Why didn't I see this before?". Explaining good ideas is not very hard; finding them in the first place is much more difficult, unless specific Lateral Thinking Techniques are employed.

One of the simplest, but most powerful, techniques in Lateral Thinking is the use of the Random Word. The Random Word technique is a deliberate method of generating a random starting point, from which we can start looking for new ideas. There are many ways of generating a random word. The simplest is to open any book on a random page and, with eyes closed, point to a place on the page with your finger. You then select the next noun following the place at which you have put your finger. Another technique, often used in Lateral Thinking training sessions is the use of a card containing 60 numbered nouns (specially chosen for their evocative nature). The person looks at their watch and reads the time to the nearest second. They then select the noun from the list corresponding to the number of seconds. The idea of the Random Word technique is to use this random word (noun) to generate ideas relating to the focus of the thinking effort. An example will explain the technique further.

The first thing that needs to be done is to define the focus of the thinking. This may be a specific problem or just a general area. In this case, let us assume that we want some new ideas about transit tickets (even though we haven't identified any particular problem to be solved). We write this in the Focus box in Figure 6. The next step is to select a Random Word. In this case, we have used a card with 60 nouns, have looked at our watch and seen that the number of seconds is 18, and have selected the 18th word on the list, which was "hamburger". We write this in the Random Word box in Figure 6. Now, without thinking about the Focus, we write four things that come to our mind about "hamburgers" within the brackets on the arrows emanating from the Random Word box in Figure 6. This stage of the process should be done quickly and without thinking about the Focus (which requires a degree of discipline).

In this example, the associations with "hamburger" were McDonalds, beef, sesame seeds and The Lot. The next task is to use these associations to come up with new ideas about "transit tickets". In this example, the line of thought might be something like this:

McDonalds: they have package deals where you buy a hamburger, fries and a drink for less than the combined price of the individual items. Perhaps transit tickets could be sold as part of a package deal, such as a ticket plus newspaper for commuters, or ticket plus entry to sporting event for weekend users etc.

Beef: the meaning of this word is changed in our mind from "meat" to "complaint" (as in "what's your beef?"). We then arrive at the idea of a money back guarantee on transit tickets for those travellers who are willing to document their "beef" about the ticketing system in writing. This could then be used to improve the quality of the ticketing systems.

Sesame Seeds: the word "sesame" is associated with "open sesame" from the story of Alladin. This gives rise to the idea of "magic tickets" which would generate random prizes for users when they buy their ticket. This could result in a reduction in fare evasion on the transit system.

The Lot: these words give rise to the idea of a ticket that is valid for "the lot". This could take the form of a SmartCard electronic ticket that could be linked to a bank account and which could be used to pay not only for the transit ticket but for tolls and parking when using your car, or for entry to events at the end of the transit trip (probably with a discount).

The entire exercise outlined above should take no more than five minutes. In this way, you can use the technique whenever there is five minutes to spare - perhaps while waiting for the bus to arrive! The exercise could then be repeated by selecting another Random Word, which would probably result in a totally different set of ideas. However, it is important that you should not just keep discarding and reselecting Random Words until you find one that is easy to work with. You must work with the first one selected, and only after finishing the entire exercise should you move on to another Random Word. Random Words which are difficult to work with are most likely the ones that are well away from the well-trodden path between A and B in Figure 5, and hence most likely to result in new ideas well away from your normal thought patterns.

Having generated a series of ideas that show potential, it would then be necessary to subject them to critical appraisal and improvement to develop ideas that are capable of implementation. This appraisal process could well use the techniques of Six Hats Thinking, also developed by de Bono (10).

USING PROVOCATION TO DELIBERATELY LEAVE THE MAINSTREAM

The Random Word technique outlined above uses a random process to get out of the mainstream thinking between A and B. Another way of leaving this mainstream thinking is to deliberately set up a provocative situation which is known to lie outside of the mainstream. This process has been named Po (for provocative operation) by de Bono (8), and is a first step, followed by the process of "movement" in the generation of new ideas, as shown in Figure 7.

Unlike the Random Word starting point, which has no connection with the mainstream of thought between A and B, the Po process uses this mainstream to deliberately generate a starting position which is outside the mainstream, from which we can then work towards a new idea by the process of "movement". The first step in the Po process, therefore, after identifying the Focus of the thinking, is to establish something that is taken for granted

about the Focus (i.e something that is part of the mainstream thinking on this topic). One then moves away from this mainstream thought by means of one of five different techniques:

Escape: with this provocation, we simply negate what we have taken for granted about the topic. For example, if the Focus is Buses, a taken-for-granted statement may be "buses have doors". An Escape provocation would be "buses do not have doors". It doesn't matter that this statement looks to be impossible. Indeed, that is the whole point of a Po statement; it must be out of the mainstream. The issue now is how we can move on from this Po statement to find some new ideas about buses, which is the Focus of our thinking in this example. Techniques of movement will be described later in this section.

Reversal: here, we take the opposite of the statement that we have taken for granted. Sometimes this can be done by taking the opposite of a key word in the statement, or simply by reversing the statement such that the subject of the sentence becomes the object and the object becomes the subject. For example, if the taken-for-granted statement is "buses run on a timetable", then possible Reversal provocations are "buses run randomly" (by taking the opposite of "on a timetable") or "timetables run on buses" (by reversing the subject and object of the sentence).

Exaggeration: if the thing that is taken for granted contains some numerical measurement or quantity, then we can often get a provocation by simply exaggerating (upward or downward) that measurement or quantity. For example, if the taken-for-granted statement is that "each bus has an engine", an Exaggeration provocation might be that "each bus has 10 engines".

Distortion: if there is a time sequence or a relationship in the taken-for-granted statement, then we can often get powerful provocations by distorting that sequence or relationship. For example, if the taken-for-granted statement is that "passengers buy a ticket before using the bus", a Distortion provocation might be that "passengers buy a ticket after using the bus".

Wishful Thinking: in this case, we suggest a fantasy idea that we know cannot occur, and which is therefore definitely out of mainstream thinking. This is the only provocation where we don't need to specify a taken-for-granted statement in advance. We simply complete a statement of the form "Wouldn't it be nice if...". In the area of buses, such Wishful Thinking provocations might include "urban buses are luxury vehicles", "buses are always available", "buses cost nothing to operate", or "your fares are investments rather than costs".

The purpose of provocation is not to generate new ideas immediately, but simply to get you out of the rut of mainstream thinking (as shown in Figure 7). The further it takes you away from the mainstream, the more powerful is the provocation. Therefore don't shy away from "crazy" provocations. The crazier the provocation, the more likely you are to generate a really new idea at the next stage of the process.

To use provocations to generate new ideas, we need the concept of "movement". Unfortunately, "movement" is not a natural mental operation for most people. When faced with ideas or statements, our natural tendency is to use the mental operation of "judgement". That is, we examine the statement and "judge" whether it makes sense, whether it is useful and so on. In creative thinking, we need to deliberately "suspend judgement" at this stage. This is what is traditionally done in "brainstorming" sessions. Participants are asked to "suspend judgement" while they and others propose ideas. However, this is not enough by itself. Suspending judgement does not tell us what to do with the ideas after they have all been proposed. This is where the process of movement is useful. Rather than examine the idea (the provocation) to see whether it is immediately useful, we use the provocation to "move on" to other ideas. We want to see where this provocation may lead us in the future. We use provocations much as we would use stepping stones to cross a river. We are not interested in whether the stepping stones are good in themselves; we simply want to use them to get to the other side of the river, where we might find greener pastures full of new ideas. To do this, a range of specific "movement" techniques have been devised.

Five major "movement" techniques exist for use in conjunction with the provocations derived by the methods described earlier:

Extract a Principle: this is similar to the "concept triangle" described earlier in this paper. You look at the provocation and try to extract an underlying principle or concept from the provocation. You then discard the

provocation and work with the concept to identify new ideas related to the original focus. For example, if the provocation was "passengers buy a ticket after using the bus", you might extract the concept of "honesty". You then concentrate on "honesty" and see how this might generate new ideas about "buses" (which was our original general focus area). In doing so, you might generate an idea which is immediately useful (i.e. you have reached the other side of the river) or you might generate another provocation (you have generated the next stepping stone). In using this movement technique, the trick is to concentrate fully on the extracted concept and forget about the provocation that gave rise to that concept. Clearly, however, more than one concept can be extracted from a provocation. For example, we could also have extracted the concepts of "delayed payment" or "exit controls" from the above provocation.

Focus on the Difference: here the provocation is compared with the existing situation, and the points of difference are highlighted and explored to see if they might lead to a useful new idea. Even if the differences are only small, they should be concentrated upon and explored rigorously. For example, if the provocation is "buses run randomly", you might be tempted to say "so where is that different to reality"! However, the difference in the provocation is that buses are meant to run randomly, rather than running randomly by chance. From this you might identify the difference as being the deliberate introduction of variability (or variety) into the system. From this, you might consider the idea of introducing variety by differentiating your fleet and the services offered in order to cater for specific niche markets, rather than trying to maintain a uniform look and feel about the services. This could then lead on to the consideration of a wide range of new markets and services. At this stage, we have totally forgotten about the idea of "buses running randomly"; we have simply used that as a stepping stone to generate a range of other ideas.

Moment to Moment: in many situations, this is the most powerful of the movement techniques. Here, we imagine or simulate what might actually happen if we tried to implement the provocation as it stands. Along the way, we look for new ideas that are generated by the simulation. A very productive way of using this movement technique in a group is for one person to perform the simulation while others look for ideas suggested by the simulation. In this way, the performer can concentrate fully on acting out the situation, while the observers can concentrate fully on looking for new ideas. For example, if the provocation was "urban buses are luxury vehicles", the performer might simulate the process of being met at the door by a host, shown to their comfortable reserved seat, being provided with reading material and video headphones, served drinks and meals, dozing off to sleep and being woken by the host in time to get off at their stop and transferring to the waiting limousine service. During this performance, others can be noting ideas and variations of the enacted scenes that might actually be put into practice. It might not result in a "luxury service", but it could result in useful improvements.

Positive Aspects: this is a very simple technique that concentrates more directly on the provocation itself. Rather than thinking about where the provocation might lead, we look at the provocation and see whether there are any direct benefits or positive aspects of the provocation itself. For example, if the provocation was "buses do not have doors", you might ask "what would be the value of that?". Possible answers include: entry and exit of passengers would be quicker, more air circulation within the vehicle, less mechanical things to break down, and easier to see things outside the vehicle. Each of these "benefits" could then be examined to see whether they could be achieved by more practical means.

Special Circumstances: while provocations are generally crazy and unsuitable for implementation, there may be some special circumstances where the idea may have some immediate use (even though it may be impractical in general). For example, if the provocation was "each bus has 10 engines", this could suggest multiple engine buses (e.g. diesel, electric and gas) for use in situations where air quality was particularly important (e.g. buses that have terminals in confined spaces) or in circumstances where the supply of any one type of fuel was subject to disruption in supplies.

While the above techniques are specific methods of developing "movement" from a provocation, there is also an important attitude that can be developed from the idea of movement. Thus, whenever confronted with an idea that seems a bit crazy or unworkable (whether it was meant as a provocation or not), stop and think about how you can "move on" from that idea rather than simply rejecting it as "crazy". Looking for "silver linings" rather than "clouds" can be an amazingly productive source of new ideas if a conscious effort is made to apply "movement" rather than "judgement" to ideas that occur regularly in our daily lives.

USING CREATIVE THINKING IN TRANSPORTATION PLANNING

The methods of Lateral Thinking described in this paper are just three of the possible ways of generating new ideas. In describing these methods, some simple examples from transportation have been used to illustrate the concepts and techniques. In general, though, where and when can Lateral Thinking be useful in transportation planning?

There are at least three main areas where Lateral Thinking can be useful:

- Developing new services

In the short and medium term, there is a need to develop new services and products. This is particularly the case for transit operators, especially in a privatised, competitive environment where increasing patronage in a profitable manner will be of prime importance. New markets will need to be identified and new services designed to serve these markets. Since the development of new services will be a new experience for many involved in transit over the past few decades, a way of deliberately breaking out of traditional thinking modes will be particularly useful.

- Developing new policies

In the medium and long term, the development of new transportation and land-use policies is of crucial importance in shaping the transportation systems of the future. Many policy decisions for the future are constrained by the decisions of the past. This situation is termed the "time sequence trap" by de Bono (9). He notes that any system collects information over time. At any point in time, decisions are made based on the information available at that time. However, at any future point in time, when new information has come along, the best decision may not simply be to add onto or slightly modify the decisions made previously. It may be necessary to disrupt the decisions made previously, and come up with a substantially new policy direction. In such situations, the techniques of Lateral Thinking will be useful for deliberately breaking with the policy decisions of the past.

- Developing new analytical techniques

In addition to the development of new services and policies, there may also be a need to develop new methods of modelling and evaluating those services and policies. The techniques currently in use have developed incrementally over the past 50 years. Considerable effort and intellectual capital has been invested in the development of the various analytical techniques, and there is a natural reluctance on the part of those who are the experts in these areas to look for new ways of analysing transportation systems. The conventional four-step modelling process, followed by an economic cost-benefit analysis, has become entrenched as the way to analyse such systems. However, there have been substantial changes in computing power available to typical transportation analysts, together with major advances from research on the behavioural underpinnings of travel behaviour. To take advantage of these developments, we need to make a break with traditional methods of analysis and think creatively about how the advances in computers and theoretical understanding can be used to develop new methods of analysis.

CONCLUSION

This paper has outlined some of the basic characteristics of creative thinking, and has described three methods of Lateral Thinking proposed by Edward de Bono. The Concept Triangle has been shown to be useful in expanding the range and number of alternatives, given an initial idea about an area or problem. The Random Word technique has been described as a way of generating substantially new ideas, well removed from our conventional line of thought. The use of Provocation and Movement has also been described as another technique for generating creative new ideas. With each of these techniques, examples have been given to illustrate the concepts involved. In general, these techniques may be used to develop new services, new policies and new methods of analysis of transportation systems.

It is considered that there is a need for creative thinking in transportation planning because, after 50 years of the profession of transportation planning, we seem to be well and truly struck in a rut of conventional thinking. We continue to apply ideas and techniques developed in a different era (when expansion of the system was the

major activity), long after the conditions which gave rise to those ideas and techniques have long passed. We have not taken due account of changes in demographic and socio-economic conditions, and continue to propose policies that do not apply to today's multicultural and fragmented family environment. We continue to try serving the needs of those without cars with transit technologies developed in the 19th century. Our management structures pay little attention to modern theories of management. Our evaluation methodologies do not take adequate account of environmental and equity considerations, even though we often pay lip-service to these objectives. In all these areas, a drastic re-think is required as we enter the new millennium. The techniques of Lateral Thinking offer a way of enabling us to deliberately break out of the confines of our intellectual straightjacket.

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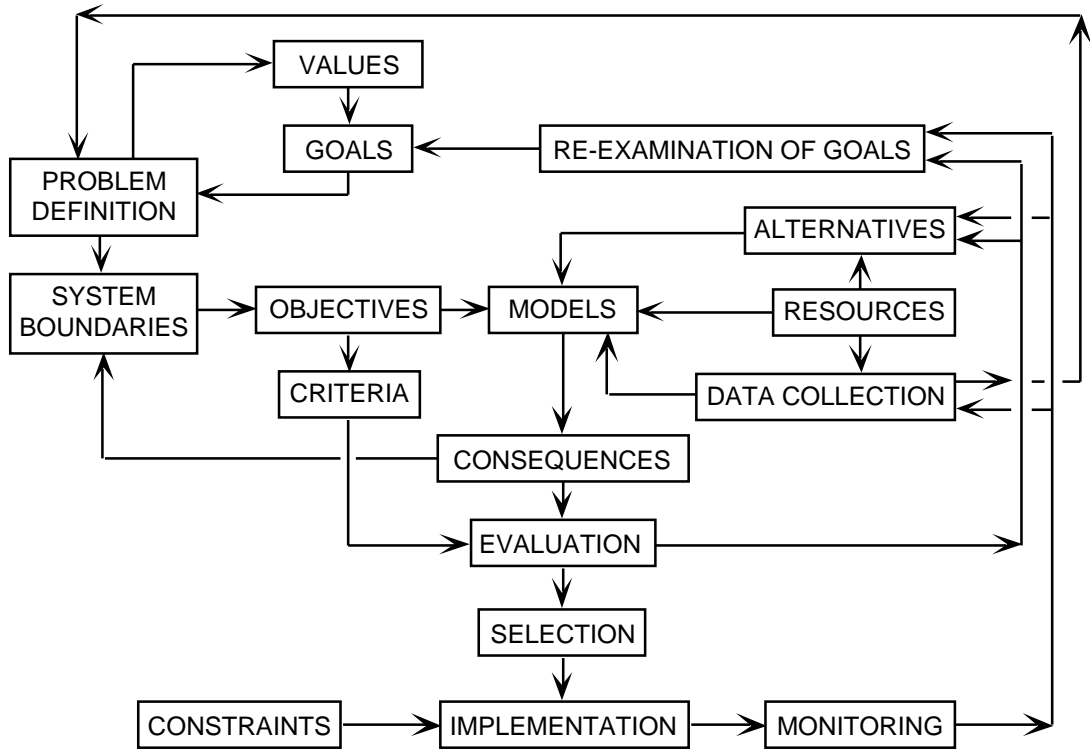


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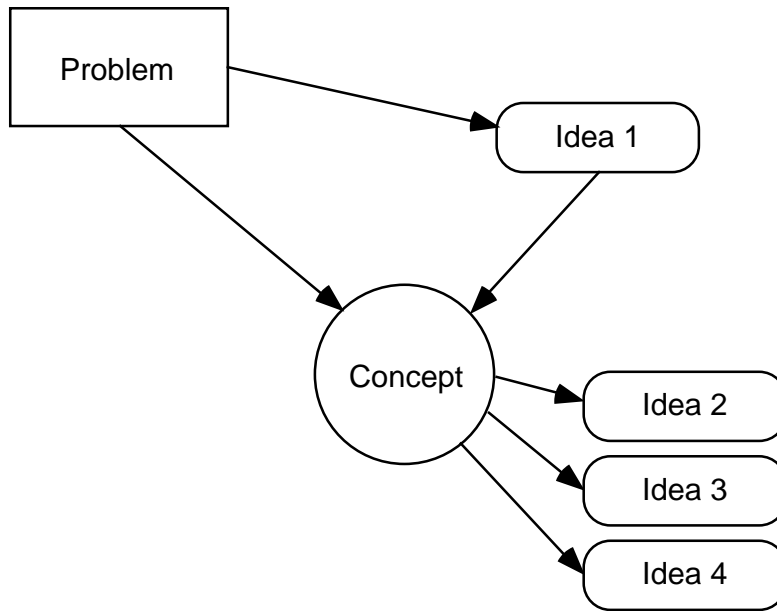


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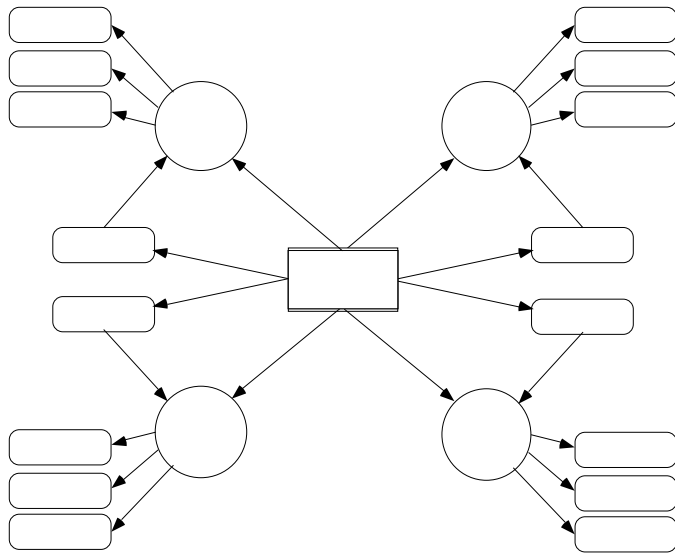


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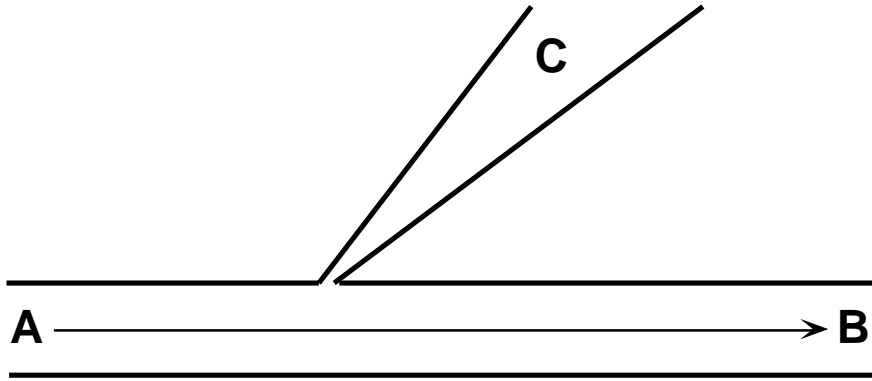


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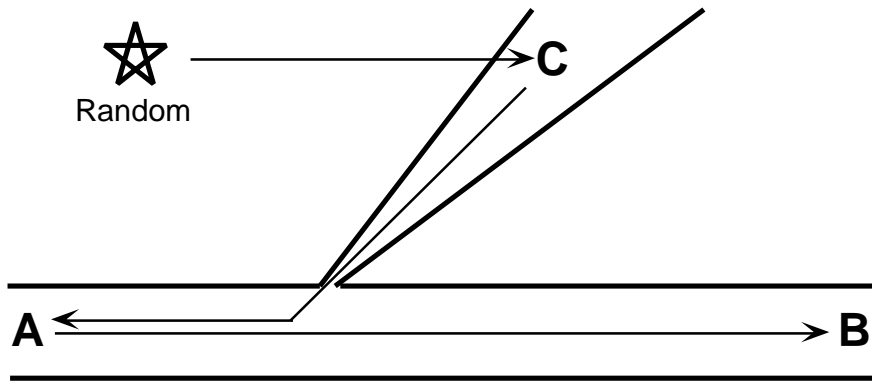


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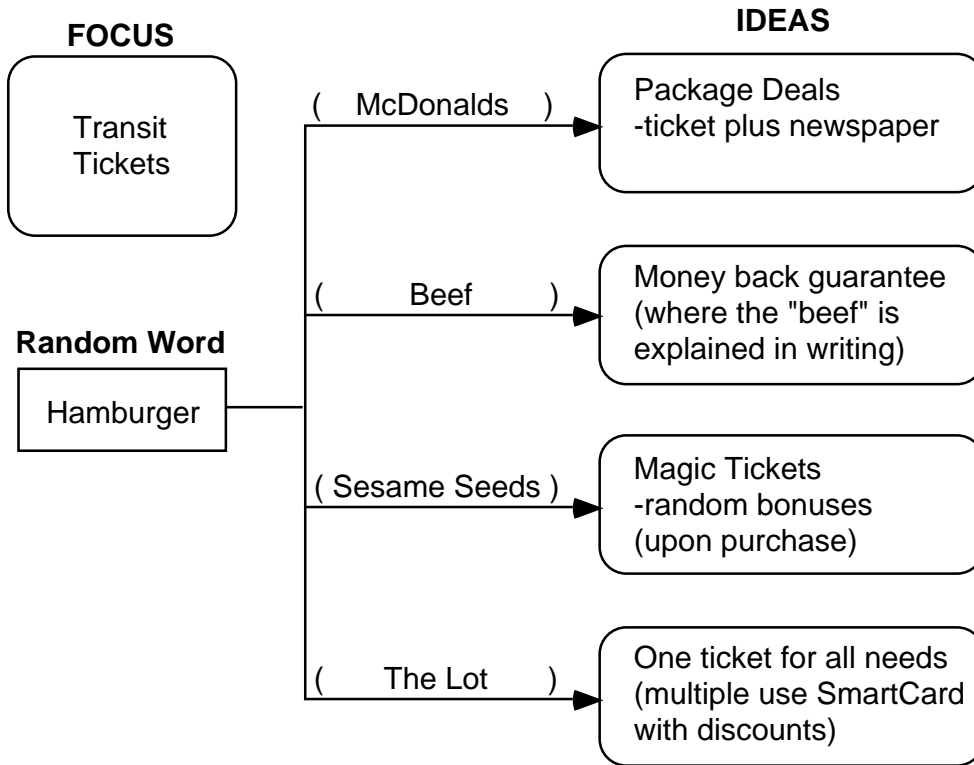


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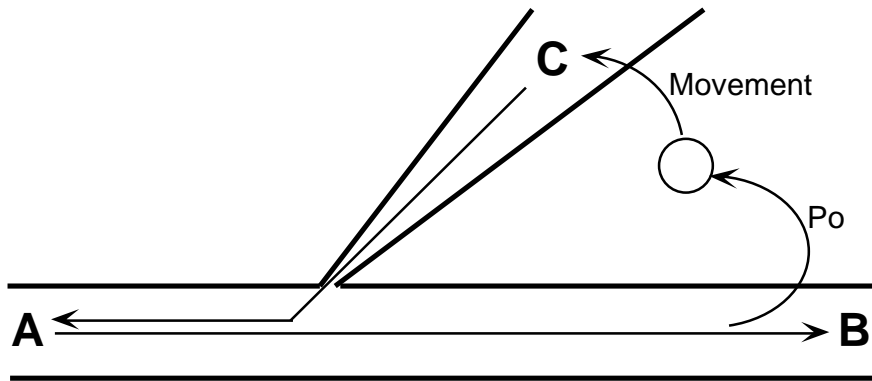


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