

Making the Connection Between Value Engineering and Access Management

David J. Plazak
Center for Transportation Research and Education
Iowa State University
2901 South Loop Drive, Suite 3100
Ames, IA 50010

Introduction

The Federal government's Acquisition Regulations define value engineering as an organized effort to analyze the functions of systems, equipment, facilities, services, and supplies for the purpose of achieving essential functions at the lowest life-cycle cost consistent with required performance, quality and safety. Value engineering was originally developed fifty years ago during the Second World War. The reason value engineering (or "value analysis" as it was first called) was developed was because shortages of certain war materials was curtailing production of weapons and other war supplies. The General Electric Company and others developed value engineering to find substitutes or other ways to do things so that shortages could be worked around. Later, the emphasis of value engineering centered on finding the best possible value for the procurement dollar. (US Department of Transportation, Federal Aviation Administration, September 1993)

A Brief Introduction to Access Management

The concept of access management embodies a key goal of value engineering. That goal is to get the best return for the highway taxpayers. In the case of access management, this is done by carefully planning, managing and engineering access to the top levels of the highway system. The main idea in access management is to balance the dual role that roadways play—serving traffic and serving land access—such that the public gains the maximum return its investment in terms of measures of effectiveness such as traffic safety and traffic operations. There are probably as many definitions of access management as there are persons working in the field. However, one comprehensive definition from the brochure for the Year 2000 National Access Management Conference is that:

“Access management is balancing access to developed land while ensuring a safe, efficient transportation system through careful location and design of interchanges, driveways, medians, and street connections to roadways”.

Access management is mainly a concern on roadways that serve a dual purpose—providing access to adjacent land as well as service to through traffic. This is a particular concern on at-grade rural expressways and on major surface arterial streets in urban and suburban areas. When too much emphasis is placed on providing direct land access from these high level roadways, safety and traffic operations inevitably suffer. The result is a sub-optimal return on investment for roadway agencies and the highway taxpayers.

The concept of access management is also somewhat like the value engineering maxim of eliminating or at least downplaying secondary functions. In the case of an arterial or other main roadway, its basic function must be providing service to through traffic. A secondary function for any arterial road, whether urban, suburban, or rural is (or at least should be) land access.

Typical Access Management Treatments

As the definition of access management at the beginning of this paper indicates interchange and driveway locations along with the placement of medians and intersections with other public streets are some of the main concerns in access management. There are many possible access management treatments. These can either be designed into new roads or retrofitted into existing corridors, where possible. Some of the most commonly used treatments are:

- Consolidation of commercial driveways through driveway spacing and driveway density standards. When the density of commercial driveways on a typical urban arterial roadway begins to exceed about 3 or 4 per block, the crash rate climbs.
- Corner clearance. Simply moving commercial driveways away from public street and road intersections and interchanges is an extremely powerful access management tool. This is because placing driveways within the functional area of intersections and interchanges creates conflicts between through and turning traffic and is inherently dangerous.
- Improving commercial driveway design. Reducing the number of commercial driveways through such measures as corner clearance and driveway consolidation can lead to the opportunity to have fewer, yet better-designed driveways. Wider driveway widths, shallower driveway grades, larger turning radii, and the incorporation of dedicated turn lanes and tapers can increase the entry speed for commercial drives. This in turn reduces the speed differential between turning and through traffic. Crash rate reduction is the likely result.
- Improving internal circulation in land developments. Oftentimes, commercial developments are designed from the building out. The parking lot and driveways are an afterthought. Designing land developments from the entry points inward can dramatically improve functionality and safety. For instance, designing the driveways and parking areas to allow for longer driveway throat lengths can provide valuable storage for incoming and outbound traffic. This in turn prevents the possibility of traffic queuing in the arterial roadway.
- Frontage and backage roads. Moving land access in the form of commercial driveways totally off major streets and onto alternative access ways is a common access management technique. Backage roads—where access is provided from the rear of properties—is becoming more and more common. This is because providing a frontage road in a limited right of way too close to the arterial can actually cause more safety and operational problems than are cured.
- Two-way left-turn lanes (TWLTL). Continuous center turn lanes are a very effective means of separating turning traffic from through traffic when used properly. A TWLTL will work best in situations where driveway spacing and density are already at acceptable levels and where the through traffic volume is moderate.
- Raised medians at intersections. Installing raised medians at and near major intersections helps eliminate some left-turning movements, particularly those critical ones near intersections.

- Continuous raised medians. The most effective access management tool is a continuous raised median with a few, well-spaced openings. Most research indicates that an arterial roadway with a raised median will be safer and operate better than a similar roadway with a two-way left-turn lane. There is really no substitute for raised medians along high traffic volume arterials in urban and suburban areas. However, raised medians are very controversial with adjacent businesses and land developers because they restrict left-turns so completely.

An excellent, new reference on the impacts of access management techniques has just been published as National Cooperative Highway Research Program Report 420. This report categorizes the common treatments and provides an assessment of their impacts on traffic safety and operations. (Gluck, Levinson, and Stover, 1999)

Benefits and Cost-Savings Associated With Access Management Retrofit Projects

Access management is generally implemented in order to achieve benefits in terms of either traffic safety or traffic operations. These are indeed the two main categories of benefits of access management. However, there are more categories that should be considered. The main benefits of access management are:

- Traffic Safety. Research on the safety gains when access management techniques are retrofitted into existing arterial corridors indicates consistent and highly significant reductions in crashes and crash rates. Case study research in Iowa indicates an average reduction in both crashes and crash rates of around 40 percent. (Maze and Plazak, 1997) Statistical research on the state highway system in Minnesota, indicates that highly access-managed roadways are 50 percent safer than those with high commercial driveway densities. (BRW, Inc., August 1998)
- Traffic Operations. Research also indicates that access management can dramatically improve traffic flow and traffic levels of service. In Iowa case studies, implementing access management treatments often led to a one level of service increase during the peak hour. (Maze and Plazak, December 1997)
- Benefits for Non-Automobile Modes. Research on the effects of access management techniques on non-auto modes is quite limited at this time. However, this research strongly suggests that certain access management treatments are highly beneficial to pedestrians. In particular, raised medians and driveway consolidation have been found to create better opportunities for pedestrians to safely cross both streets and commercial drives. (Hodgeson, Layton, and Hunter-Zaworski, October 1998)
- Community Benefits. Benefits to the general community include potential cost and tax savings and environmental benefits. Research shows that access management is a highly cost-effective way to add or at least preserve highway capacity in major arterial corridors. Access management projects can defer the need for additional arterial roadways and bypass routes. Another important type of general public benefits is environmental. Because access management projects can dramatically improve traffic flow and service, they can be valuable in terms of meeting air quality goals.

Tradeoffs Inherent with Access Management Projects

As the definition on the first page of this paper indicates, access management is always a balancing act. Land must have reasonable road access if it is to have any value for commercial purposes. Too little access or too much circuitry of access and land loses its commercial value. Too much access in the wrong places and the road fails to function properly and becomes dangerous.

- **Motorist Inconvenience.** To a large extent, access management involves regulating and managing left-turns into and out of driveways. This means that some driveways usually need to be moved, combined, eliminated, or at least redesigned. Many times, access management also involves restricting left-turning movements through the installation of full or partial raised medians or frontage and backage roads. These sorts of measures often lead to motorists having to take alternative routes to businesses. However, surveys of motorists conducted at places of business along access management corridors in Iowa indicate that they are very tolerant of these sorts of changes. The vast majority of motorists are willing to trade a little inconvenience for what they perceive as a much safer road to drive on.
- **Business Vitality Impacts and Business Opposition.** Opposition from retail business owners and landowners and developers can be the “make it or break it” factor for access management projects. The limited research that exists on the impacts of access management on business vitality shows that businesspersons’ perceptions of the impacts of access management on their businesses tends to exceed the actual impacts. In Iowa case studies, about 86 percent of businesses either had similar or higher sales once access management projects were in place. Retail sales tax receipts along the access-managed corridors outperformed their surrounding communities a well. Finally, business turnovers were no higher in the project corridors than in their communities. (Maze and Plazak, December 1997)

Applying the Value Engineering Methodology to Access Management Projects

The similarities between what must be done to plan and implement access management successfully is strikingly similar to good practice in value engineering. Value engineering projects typically operate through an eight-phase process. (US Department of Transportation, Federal Highway Administration, October 1983) These phases include the:

1. **Project Selection Phase.** This involves selecting projects that are good candidates for value engineering. Projects must have some potential to be made significantly more cost-effective and or beneficial through modification.
2. **Investigation Phase.** This phase involves acquiring knowledge about the project design to be studied and to assess its major functions, quality and worth.
3. **Speculation Phase.** This phase involves brainstorming and searching for possible alternatives. The aim is to find high cost elements and promising possibilities for change.
4. **Evaluation Phase.** This phase follows the speculation phase and reviews and develops costs for the feasible alternatives. The feasible alternatives are evaluated against measures of effectiveness and then ranked to find the best ones.

5. Development Phase. During the development phase, additional information is gathered and analysis is performed on the most feasible alternatives. Cost estimates are developed.
6. Recommendation and Approval Phase. The recommendation phase involves making a recommendation to decision-makers and (hopefully) having it approved.
7. Implementation Phase. This phase involves the implementation of the approved project.
8. Audit Phase. The final phase involves learning from the experience of the project. Not all value engineering projects will be wildly successful.

The eight-step process outlined could be easily adaptable to finding and developing access management projects. For example, good candidates can be found by looking at measures of effectiveness such as accident rates, particular types of accidents associated with access control problems, and traffic levels of service and congestion. Pin maps of particular types of accidents are particularly useful; access management problems are often associated with outbreaks of left-turning vehicles or rear-end crashes.

In the speculation phase, a laundry list of potential access management treatments could be tried out against the constraints and characteristics of the corridor. The evaluation phase might involve a cost-effectiveness ranking based on such factors as crash rate or cost reduction. Applying brainstorming to access management projects is particularly valuable in that access management designs must often be shoehorned into existing corridors. Flexibility, creativity, and some level of compromise are essential.

Access management, like value engineering, is best done (and really must be done) with a team. The best access management projects involve persons with knowledge about traffic engineering, land use planning, small business, and public involvement and education.

An important consideration in access management is the need for early and extensive public participation. Access management is not only a planning, design, and engineering process, it is also a political and regulatory process. Businesspersons often apply political pressure on decision-makers to modify projects. Driveway openings may be allowed where they should not be; two-way left-turn lanes may be used along corridors where an unbiased evaluation would favor a raised median. Lawsuits claiming takings of property do occur in rare cases. Such problems can be eliminated or at least reduced through early involvement of the public and education of businesspersons and elected decision-makers about the need for and impacts of access management.

The need for an audit of access management projects is simply critical. Most roadway agencies find that it next to impossible to sell access management as a concept and in a specific instance to local businesspersons, landowners, and elected decision-makers. Luckily, more and more states are realizing this and the base of research on the impacts of access management is growing by leaps and bounds.

Conclusions

Access management is a proven way to engineer additional value into the public road system. The highway safety and traffic operations benefits of access management can be highly significant.

Making the connection between value engineering and access management is important in two ways. First, access management treatments can be and should be important alternatives for value engineering teams to consider when they tackle a difficult highway project. Second, access management practitioners could benefit from the use of a rigorous process such as has been developed over the past 50 years by value engineers. Making this connection will ultimately lead to greater value for motorists, taxpayers, and the public in general.

References

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