The Auditing Process - Applied

Abstract

The traditional audit or assurance process associated with the assessment of financial records has diffused into other professions. In essence, auditing functions carried out by Road Authorities shares a number of similarities to that used by a traditional external auditor. The differences between the traditional audit and a road safety audit lies in the nature of the audit process.

Introduction

Traditionally, the audit process was linked to the checking of financial accounting records and reports. Over the past decade, however, road authorities have also adopted an audit function to increase the safety of road users. The objectives of the audit determine the nature of the audit process and the criteria used by an auditor to form and express an opinion.

Malcolm Bulpitt developed roadway audits in the United Kingdom in the 1980s[1]. Road Safety Audits were introduced in the State of New South Wales, Australia, in 1990, when the audit of the Pacific Highway used specially prepared checklists[2]. In 1994, the Austroads guide *Road Safety Audit* was published[3].

A Road Safety Audit (RSA) as defined by Austroads is:

> A formal examination of an existing or future road or traffic project, or any project that interacts with road users, in which an independent, qualified examiner looks at the project's accident potential and safety performance[4].

'Audits are an essential component of an overall safety culture and management system that commits each person -- planner, designer, constructor, and operator -- to assume responsibility for his actions'[5].

The objective of a road safety audit (RSA) is 'to proactively manage road safety by attending to potential hazards in the road environment before they result in a crash'[6] and thus ensuring the safety of all road users. The traditional audit's objective is to provide a high level of assurance that the reports prepared by management represent a 'true and fair view' of the company's operations and financial status. In essence, both audits have similar objectives. Whilst a traditional audit provides stakeholders and other interested users, a high level of assurance that the audited company is operating in accordance to accounting and ethical standards, a road safety audit provides road users a high level of assurance that the roads they are travelling on are in accordance to road safety standards. More importantly, the credibility of the opinions expressed by auditors is enhanced due to the fact that the auditor(s) or

[1] Trenstacote, M. (October 1997) FHWA Study Tour for Road Safety Audits – Part 1 < http://ntl.bts.gov/DOCS/rpt7-pt1.html>
[2] Trenstacote, M. (October 1997) FHWA Study Tour for Road Safety Audits – Part 1 < http://ntl.bts.gov/DOCS/rpt7-pt1.html>
[3] Trenstacote, M. (October 1997) FHWA Study Tour for Road Safety Audits – Part 1 < http://ntl.bts.gov/DOCS/rpt7-pt1.html>
[4] TranSafety Inc. 1997, 'Institute of Transportation Engineers Published Report on Road Safety Audits', Road Management and Engineering Journal - <http://www.usroads.com/journals/rej/9702/re970203.htm>.
[4] Trentacoste, M. Road Safety Audit: Scanning for "Gold" Down Under <http://www.tfhrc.gov/pubrds/pr97-10/p42.htm>
[5] Brisbane, G. & Yee, S. 2002. 'Thematic Road Safety Audits'. IPWEA NSW Division Annual Conference < http://www.ipwea.org.au/papers/download/Brisbane.pdf>.

auditing team are independent to the organization or road construction project being audited.

The differences between the traditional audit and a road safety audit lies in the nature of the audit process. The traditional audit is performed on management's prepared financial reports. These reports should be prepared in accordance to the generally accepted accounting principles (GAAP)[7]. The initial stages of an audit process involve the acceptance of a client followed by the auditor's assessment and measurement of the degree of risk, that financial statements will me materially misstated[8]. The auditor does this by understanding the client's business and industry, evaluating the client's internal control and performing analytical procedures[9]. A plan of audit procedures is then prepared to gather the necessary evidence on which to base an opinion about the financial statements. Generating and gathering and interpreting audit evidence to support or contradict management's assertions in the financial statements follows[10]. Finally the auditor completes the audits by concluding whether or not each assertion made by management is true, hence expresses an opinion about the reliability of the financial statements[11]. The auditing process is carried out in accordance to the auditing standards (AUSs), which are 'the basic principles, and essential procedures that govern the professional conduct of the auditor'[12].

To avoid the perception that safety audits reflect a lack of faith in the competence of a project's designers and engineers, the audits are made an integral part of the construction process[13]. In doing this, 'the total cost of a project [is] reduced by promoting timely alterations to construction plans and lowers costs associated with finished roadways by decreasing the number of crashes and reducing litigation'[14].

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[7] Knechel, R. W. (1998) Auditing Texts and Cases. South-Western College Publishing. Ohio. Pg. 16
[8] Knechel, R. W. (1998) Auditing Texts and Cases. South-Western College Publishing. Ohio. Pg. 32
[9] Knechel, R. W. (1998) Auditing Texts and Cases. South-Western College Publishing. Ohio. Pg. 32
[10] Knechel, R. W. (1998) Auditing Texts and Cases. South-Western College Publishing. Ohio. Pg. 33
[11] Knechel, R. W. (1998) Auditing Texts and Cases. South-Western College Publishing. Ohio. Pg. 33
[12] Gay, G. & Simnett, R. (2003). Auditing and Assurance Services in Australia - 2nd Edition. McGraw Hill Australia. Pg 32
[13] TranSafety Inc. 1997, 'Institute of Transportation Engineers Published Report on Road Safety Audits', Road Management and Engineering Journal - <http://www.usroads.com/journals/rej/9702/re970203.htm>.
[14] TranSafety Inc. 1997, 'Institute of Transportation Engineers Published Report on Road Safety Audits', Road Management and Engineering Journal - <http://www.usroads.com/journals/rej/9702/re970203.htm>.

The process of a safety audit can be applied to any or all of the five stages involved in road construction. These stages include the 'feasibility stage, draft design stage, detailed design stage, pre-opening stage, and in-service stage'[15]. At each stage the auditor will assess different aspects in the design and construction. In the feasibility stage, such things as:

> …the scope of a project, route choice, selection of design standard, impact on the existing road network, route continuity, provision of interchanges or intersections, access control, number of lanes, route terminals, stage development, and more,[16]

would be examined. In the draft design stage:

> …horizontal and vertical alignment, sightlines, intersection layouts, land and shoulder width, pavement cross fall and superelevation, overtaking lanes, provision for parked and stationary vehicles, provision for cyclists and pedestrians, effects of departures from standards and guidelines, safety during construction, and so on,[17]

are audited. In the detailed design stage before the preparation of contract documents, the auditor will assess:

> …line markings, signing, delineation, lighting, intersection details, clearances to roadside objects, provision for road user groups with special requirements (for instance, pedestrians, cyclists, people with disabilities, trucks and buses), temporary traffic management and control during construction, drainage, poles and other roadside objects, landscaping, batters [slopes] and guard fencing[18].

At the pre-opening stage, auditors will drive and walk on the roads to assess the overall design and safety of the road[19]. This method of auditing is conducted under

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[15] Brisbane, G. & Yee, S. 2002. 'Thematic Road Safety Audits'. IPWEA NSW Division Annual Conference < http://www.ipwea.org.au/papers/download/Brisbane.pdf>.
[16] TranSafety Inc. 1997, 'Institute of Transportation Engineers Published Report on Road Safety Audits', Road Management and Engineering Journal - <http://www.usroads.com/journals/rej/9702/re970203.htm>.
[17] TranSafety Inc. 1997, 'Institute of Transportation Engineers Published Report on Road Safety Audits', Road Management and Engineering Journal - <http://www.usroads.com/journals/rej/9702/re970203.htm>.
[18] TranSafety Inc. 1997, 'Institute of Transportation Engineers Published Report on Road Safety Audits', Road Management and Engineering Journal - <http://www.usroads.com/journals/rej/9702/re970203.htm>.
[19] TranSafety Inc. 1997, 'Institute of Transportation Engineers Published Report on Road Safety Audits', Road Management and Engineering Journal - <http://www.usroads.com/journals/rej/9702/re970203.htm>.

all conditions, for example during the day and at night, in dry and wet weather[20]. Lastly, auditing the in-service stage is appropriate for newly constructed and existing roads. The team systematically identifies weaknesses in the functioning of safety features while the road is open to motorists[21].

For every stage that is audited, an audit team makes a series of formal checks against established standards and guidelines. These guidelines serve a similar purpose as the accounting standards. These guidelines and checklists are outlined in AUSTROADS Road Safety Audits, 2nd Edition, 2002[22] (See Appendix I). The Roads and Traffic Authority of NSW also follows a similar set of guidelines when conducting road safety audits (See Appendix II). In practice, these checklists have proved to be very useful as reminders for auditors, but there is also a risk that they are too heavily relied on, and therefore auditors do not consider individual situations during the assessment[23]. A combination of judgement, skill and systematic working is required to carry out an audit[24].

In order to conduct an audit, the auditor must have expertise in both highway design and road safety and be properly trained and experienced in carrying out audits[25] in the same way that traditional auditors must have 'tertiary education, are required to complete the education program of one of the two accounting bodies (CA Program or CPA Program) and also undertake continuing professional development throughout their audit career'[26].

In Britain, for example, the audit team includes 'a road safety engineering specialist with expertise in crash investigation, a highway design engineer, and a

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[20] TranSafety Inc. 1997, 'Institute of Transportation Engineers Published Report on Road Safety Audits', Road Management and Engineering Journal - <http://www.usroads.com/journals/rej/9702/re970203.htm>.
[21] TranSafety Inc. 1997, 'Institute of Transportation Engineers Published Report on Road Safety Audits', Road Management and Engineering Journal - <http://www.usroads.com/journals/rej/9702/re970203.htm>.
[22] European Road Safety Council. (August 1997) 'Road Safety Audit and Assessment' - <http://www.etsc.be/roadaudit.pdf>
[23] European Road Safety Council. (August 1997) 'Road Safety Audit and Assessment' - <http://www.etsc.be/roadaudit.pdf>
[24] European Road Safety Council. (August 1997) 'Road Safety Audit and Assessment' - <http://www.etsc.be/roadaudit.pdf>
[25] European Road Safety Council. (August 1997) 'Road Safety Audit and Assessment' - <http://www.etsc.be/roadaudit.pdf>
[26] Gay, G. & Simnett, R. (2003). Auditing and Assurance Services in Australia - 2nd Edition. McGraw Hill Australia. Pg.47

person experienced in the safety audit procedure'[27]. Specialists in the various areas join the team during certain audit stages. In Australia however, an auditor who is qualified under the Institute of Public Works Engineering Australia's (IPWEA) Road Safety Auditor Accreditation scheme leads the team[28]. The remainder of the audit team is comprised of people who are appropriately experienced within the area of construction being audited[29]. In a similar manner, throughout the process of a traditional audit, the auditor too may require an expert's opinion towards a particular subject matter, such an industry specialist, or technical specialist to provide a greater deal of specialised information.

The auditor must also possess communication skills, which are necessary to present audit results in a constructive manner in order to encourage a positive response from the design team. It is preferable to hire a small auditing team rather than a single auditor for two main reasons. As a team, each member can offer their skills and expertise thus generating better solutions and also as a team, individual biases are avoided thus making the auditing function more independent and successful[30]. An integral part of the audit is monitoring and evaluating the process itself. Auditors should monitor the effectiveness of procedures and checklists and keep track of costs and benefits. Certain sections of the checklists may need to be altered in the future for example to take into consideration new technological developments or designs in the same way that certain auditing standards could be altered in relation to the changes within the profession.

The results of the audit should be documented and reported at each stage to the design team and in turn to the client of the scheme. The audit report usually includes recommendations for improvements to the design. Conducting safety audit reports, however, can sometimes lead to conflicts between the audit team, the design team and the client for the scheme. Therefore it is essential that prior to the audit a solid agreement be made (whether or not supported by law) that enables audits to be carried

[27] TranSafety Inc. 1997, 'Institute of Transportation Engineers Published Report on Road Safety Audits', Road Management and Engineering Journal - <http://www.usroads.com/journals/rej/9702/re970203.htm>.
[28] Brisbane, G. & Yee, S. 2002. 'Thematic Road Safety Audits'. IPWEA NSW Division Annual Conference < http://www.ipwea.org.au/papers/download/Brisbane.pdf>.
[29] Brisbane, G. & Yee, S. 2002. 'Thematic Road Safety Audits'. IPWEA NSW Division Annual Conference < http://www.ipwea.org.au/papers/download/Brisbane.pdf>.
[30] European Road Safety Council. (August 1997) 'Road Safety Audit and Assessment' - <http://www.etsc.be/roadaudit.pdf>

out successfully and the recommendations based on the audits to be implemented[31]. This agreement can be likened to an "engagement letter" proposed by the external auditor to the client, which explicitly states the terms of the engagement and thus avoiding future misunderstandings between the parties[32].

Road Safety Audits have been adopted in NSW as an effective means of preventing potential crashes and reducing the severity of crashes should they occur. However, a road safety audit team cannot guarantee that crashes will not occur, even though the construction of the roadways are in accordance to safety standards. Road users, are human, and will make mistakes or law infractions on the road. In much the same way, a traditional auditor, provides assurance that the statements represent a 'true and fair" view of the company's financial status, however, it is not the auditor's responsibility to detect fraud, and thus cannot guarantee that fraud does not exist.

[31] European Road Safety Council. (August 1997) 'Road Safety Audit and Assessment' - <http://www.etsc.be/roadaudit.pdf>
[32] Knechel, R. W. (1998) Auditing Texts and Cases. South-Western College Publishing. Ohio. Pg. 56

Conclusion

The auditing function is a beneficial way of ensuring that a business' practices, whether it be financial reporting or a construction of a road, is carried out in the most professional, ethical and safest way possible. The auditor has the responsibility of assessing the subject matter to provide end users of the financial statements (shareholders, creditors, investors and others) and roads (road users and pedestrians) a high level of assurance that the subject matter has been prepared in accordance to the required standards. More and more professions are seeing the opportunities audits provide and are making the auditing function an integral part of their business.

Appendix I

Sample Checklist from Austroads: STAGE 4 – Pre-Opening Stage
Excerpts are reprinted from *Road Safety Audit*, Austroads, 1994.
Reference: Trenstacote, M. (October 1997) FHWA Study Tour for Road Safety Audits – Part 2
< http://ntl.bts.gov/DOCS/rpt7-pt2.html>

Item	Issues to be Considered	Check	Comments
1 Changes since Stage 3 and translation of design into practice	Carry out a general check -- particularly for matters changed at previous audits.		
	Check the translation of the design into its physical form and any changes that could affect safety.		
2 Drainage	Check drainage of road and surrounds is adequate.		
3 Climatic conditions	Check effectiveness of any facilities put in place to counter climatic conditions.		
4 Landscaping	Check that planting and species selection is appropriate from safety point of view.		
5 Services	Check that boxes, pillars, posts and lighting columns are located in safe positions.		
	Are they of appropriate materials or design?		
6 Access to property and developments	Check that accesses are safe for intended use.		
	Check on adequacy of design, location and visibility in particular.		
7 Emergency vehicles and access	Check that provision for emergency vehicle access and stopping is safe.		
8 Significant adjacent developments	Check effectiveness of screening of adjacent developments and other special features.		
9 Batter treatment	Check that batter treatment will prevent or limit debris falling on to the carriageway.		
10 Shoulders and edge delineation	Check that all delineators and pavement markings are correctly in place.		

Item	Issues to be Considered	Check	Comments
11 Signs and markings	Check that all signs and pavement markings are correctly in place. Check that the appropriate sign has been used (especially Chevron Alignment Markers).		
	Check that they will remain visible at all times. Check that old delineation (signs, markings) have been removed and are not liable to confuse.		
12 Surface treatment, skid resistance	Check all joints in surfacing for excessive bleeding or low skid resistance.		
	Check all trafficked areas for similar problems, including loose stones.		
13 Contrast with markings	Check that the road markings as installed have sufficient contrast with the surfacing and are clear of debris.		
14 Roadside hazards	Check that no roadside hazard has been installed or overlooked.		
15 Natural features	Check that no natural feature (e.g., a bank rock or major tree) creates danger by its presence or loss of visibility.		

Appendix II

Sample Checklist from Roads and Traffic Authority: STAGE 2 – Draft Design
Excerpts are reprinted with permission from the Roads and Traffic Authority of New South Wales.
Reference: Trenstacote, M. (October 1997) FHWA Study Tour for Road Safety Audits – Part 2
<http://ntl.bts.gov/DOCS/rpt7-pt2.html>

	N/A	Yes	No	Comments
STAGE 2: DRAFT DESIGN At this stage, issues like intersection or interchange layout and the chosen design standards are addressed. Where land acquisition is required, the draft design stage audit is undertaken before title boundaries are finalised. It should be noted that the auditor may not be able to answer some questions at this point. Where the question cannot be given a >Yes' due to lack of detail at this stage, it should be answered >No= with the comment simply indicating that the auditor cannot determine that issue at this stage. **2.1 GENERAL TOPICS** **1 Changes Since Stage 1 (Feasibility)** 1A Do the conditions for which the route was originally designed still apply? (i.e. there have not been significant changes to the surrounding network or area to be served or traffic mix.) 1B Has the project design remained unchanged, in principle, since a Stage 1 audit (if any) was carried out? **2 Drainage** 2A Will the new road drain adequately? 2B Has the possibility of surface flooding been adequately addressed, including overflow from surrounding or intersecting drains and water courses? **3 Climatic Conditions** 3A Has consideration been given to weather records or local experience which may indicate a particular problem? (eg., snow, ice, wind, fog). **4 Landscaping** 4A Has safety been adequately considered in the landscaping design or planting? (eg. Will road traffic see pedestrians and vice versa; etc). 4B Has safety been adequately considered for when vegetation is mature or growth is seasonal (eg. through loss of visibility, obscuring signs, shading or light effects, leaves, flowers or seeds dropping onto the highway)?				

4C Has the use of "frangible" vegetation been considered?				

	N/A	Yes	No	Comments
2.1 <u>GENERAL TOPICS</u> (contd.)				
5 Services				
5A Does the design adequately deal with buried and overhead services (especially in regard to overhead clearances)?				
5B Has the location of fixed objects or furniture associated with services been checked, including the position of poles?				
6 Access to Property and Developments				
6A Can all accesses be used safely? (entry and exit/merging).				
6B Is the design free of any down-stream or upstream effects from accesses, particularly near intersections?				
6C Have rest areas and truck parking accesses been checked for adequate sight distances, etc.?				
7 Emergency Vehicles and Access				
7A Has provision been made for safe access and movements by emergency vehicles?				
7B Does the positioning of medians and vehicle barriers allow emergency vehicles to stop & turn without unnecessarily disrupting traffic?				
8 Future Widening and/or Realignment				
8A If the scheme is only a stag towards a wider or dual carriageway:				
- is the design adequate to impart this message to drivers?				
- is the signing adequate to impart this message to drivers?				
8B Is the transition from single to dual carriageway handled safely?				
8C Is the transition from dual carriageway to single carriageway handled safely? (this is especially important in transition from freeway to 2 lane-2 way highway.)				
9 Staging the Scheme				
If the scheme is to be staged or constructed at different times: 9A Are the construction plans and program arranged to ensure maximum safety?				
9B Do they include specific safety measures for any temporary arrangements? (eg. signing; adequate transitional geometry; etc.).				

	N/A	Yes	No	Comments
2.1 <u>GENERAL TOPICS</u> (contd.) **10 Staging of the Works** 10A If the construction is to be split into several contracts, have each of these been arranged for maximum safety? **11 Adjacent Developments** 11A Does the design handle accesses to major adjacent generators of traffic and developments safely? 11B Is the driver's perception of the road ahead free of adverse effects of lighting and/or traffic signals on adjacent roads? **12 Stability of Cut and Fill** 12A Has a satisfactory report on the geological stability of the country through which the road is to be constructed (and resulting cut and fill) been completed? **13 Maintenance** 13A Can maintenance vehicles be safely located?				

Reference List

1. Brisbane, G. & Yee, S. 2002. 'Thematic Road Safety Audits'. IPWEA NSW Division Annual Conference < http://www.ipwea.org.au/papers/download/Brisbane.pdf>.
2. Gay, G. & Simnett, R. (2003). Auditing and Assurance Services in Australia - 2nd Edition. McGraw Hill Australia.
3. European Road Safety Council. (August 1997) 'Road Safety Audit and Assessment' - http://www.etsc.be/roadaudit.pdf
4. Knechel, R. W. (1998) Auditing Texts and Cases. South-Western College Publishing. Ohio.
5. TranSafety Inc. 1997, 'Institute of Transportation Engineers Published Report on Road Safety Audits', Road Management and Engineering Journal - <http://www.usroads.com/journals/rej/9702/re970203.htm>.
6. Trenstacote, M. (October 1997) FHWA Study Tour for Road Safety Audits – Part 1 < http://ntl.bts.gov/DOCS/rpt7-pt1.html>
7. Trenstacote, M. (October 1997) FHWA Study Tour for Road Safety Audits – Part 2
8. < http://ntl.bts.gov/DOCS/rpt7-pt2.html>
9. Trentacoste, M. Road Safety Audit: Scanning for "Gold" Down Under <http://www.tfhrc.gov/pubrds/pr97-10/p42.htm>