

# How Operational Test And Evaluation Can Be Used To Assess Changes To Poker Machines

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## ABSTRACT

*This paper provides the reader a perspective of using operational test and evaluation (OT&E) methodology in the design of poker machines (a form of electronic gaming machines) for the purpose of gambling harm-minimisation. Although OT&E comes from a defence background, it may be applied to the problem space of electronic gaming machines. A description of how OT&E can assist in identifying the critical operational issues of harm minimisation is presented, and subsequently how these critical operational issues can be answered through their translation into measures of effectiveness and measures of performance for design changes to electronic gaming machines.*

**Keywords:** operational, test, evaluation, electronic, gaming, machines, problem gambling.

## INTRODUCTION

Poker machines are a form of electronic gaming machine originating from five-reel mechanical steppers. As technology developed, these gaming machines evolved to include video displays with virtual on-screen reels strips, different pay tables, and different line and bet combinations.

The acceptance of poker machines into Australian society has seen them installed into pubs, taverns, bars, clubs and casinos. The Australian Bureau of Statistics (2001) estimated the 2000-01 net takings from electronic gaming machines were \$8,752 million, representing 63% of total takings from gambling in Australia. This was an increase of 39% from 1997-98 (Australian Bureau of Statistics, 2002).

**Framework.** Currently there is no federal body that actively governs the use of poker machines in Australia. Responsibility has largely fallen upon the respective Australian states implementing the agreed Australian/New Zealand Gaming Machine

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<sup>1</sup> This paper forms part of the research work conducted as a post-graduate student of the University of South Australia.

National Standard (National Standard Working Party, 2002), with each state having additional differing requirements such as communication protocols, implementation, game win limits.

**Harm Minimisation.** There has been strong interest on the impact of poker machines in the Australian community, with concerns raised of problem gambling and its effect on family life and wider community activities. Indeed, this community concern has seen one member<sup>2</sup> of the South Australian Legislative Council elected solely on the basis of opposing poker machines. Other jurisdictions have also begun to respond to the issue of problem gambling with various strategies.

Harm minimisation is one strategy aimed at reducing problem gambling. Poker machines are now required to operate without exacerbating problem gambling. It is noted that there is no nationally agreed definition of problem gambling, so for the purposes of this paper Ferrar's definition (Terrapinn, 2003) that 'a problem gambler is somebody who regularly loses more than they can afford' is used.

In November 2000, the New South Wales Liquor Administration Board (NSWLAB) provided a list of recommended changes to gaming machines, proposing to assist in harm minimisation. Gaming machine manufacturers were not confident that such design changes would achieve harm minimisation and predicted they would also be costly to implement. The recommended design changes were:

- High-value note acceptors (i.e. those capable of accepting between \$50 and \$100) no longer be acceptable, with consideration to be given to removing bill acceptors all together at a later time.
- Slow the speed of games to add a few extra seconds to the time of individual games. This should be achieved by requiring a minimum wheel spin time of 3.5 seconds and a minimum of 1.5 seconds in idle mode which at least one standard block of data must be transmitted.
- Limiting the maximum bet size on stand-alone machines to \$1 on a trial basis.

The University of Sydney Gambling Research Unit was requested to conduct an independent study on the effect of the design changes on problem and recreational gamblers. The key findings of this study (Blaszczynski et al, 2001, p. 8) were:

- 20% of the sample (sample size, n = 514) were defined as problem gamblers.
- 13% of the sample used high-value note acceptors.
- Twice as many problem gamblers (22%) as recreational gamblers (10%) used high-value note acceptors.
- The 'differences between the characteristics of play in clubs versus hotels participants appeared to be a function of age rather than the characteristics of the venue'.

However, it should be noted that this study was limited in that:

- Clubs and hotels participating in the study represented a sample of convenience and was not necessarily representative of all clubs and hotels in NSW;
- Patrons were invited to participate in the project, and had to agree to undergo the South Oaks Gambling Screen test for determination of problem gambling;
- Patterns of gambling were possibly modified or modulated during the study; and
- Only the poker machine *Pirate* with denomination of 1c was modified and then unmodified.

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<sup>2</sup> The Honourable Nick Xenophon MP, No Pokies Campaign Inc Independent.

The Gaming Industry Operators Group commissioned the Centre of International Economics to undertake the likely economic impact study on the introduction of the proposed changes. This study (Centre for International Economics, 2001) concluded that if ‘all three harm-minimisation measures are introduced, the risk to revenue is likely to be around 20 per cent in clubs and as much as 40 per cent in hotels ...’ (Centre for International Economics, 2001, p.xii), but noted that neither ‘slower game speeds nor modified note acceptors are amenable to analysis based on current turnover data in the same way as the \$1 maximum bet’ (Centre for International Economics, 2001, p. xi).

**Limitations.** The proposed changes were analysed to determine the effect on problem and recreational gamblers and the effect on the New South Wales’ economy. Key questions arise when reviewing these two studies. What are the main issues that the studies are trying to answer? What is the definition of effectiveness against which the design changes are assessed? What are appropriate measures to assess the effectiveness of the design changes?

OT&E would help answer these questions in a structured manner, by forcing the path towards harm minimisation to be initiated by clear identification of the critical operational issues (COIs) and the measures of effectiveness (MOEs) to be used to judge the resolution of the COIs. An OT&E approach to evaluating the outcome of technical changes in poker machines as a means of harm minimisation would require a holistic approach to gathering field data, and together with the use of MOEs, would minimise the limitations of the University of Sydney study.

**Aim.** The aim of this paper is to discuss how operational test and evaluation (OT&E) methodology can be used to answer whether the NSWLAB’s proposed design changes to poker machines will assist in gambling harm-minimisation.

## TEST AND EVALUATION

Test and Evaluation (T&E) is the process by which a system is compared against technical or operational criteria through testing and the results evaluated to assess the performance against agreed criteria (including design, performance and supportability) to determine the system’s fitness for purpose (The Defence T&E Principals, 1998). In essence, T&E provides a structured, pre-planned and objective approach to answering three questions (Harris, 2002):

- What is the system trying to do?
- How will we know if the system fulfils its needs?
- Who carries the responsibility?

Harris (2002) considers that there are three types of T&E, which are:

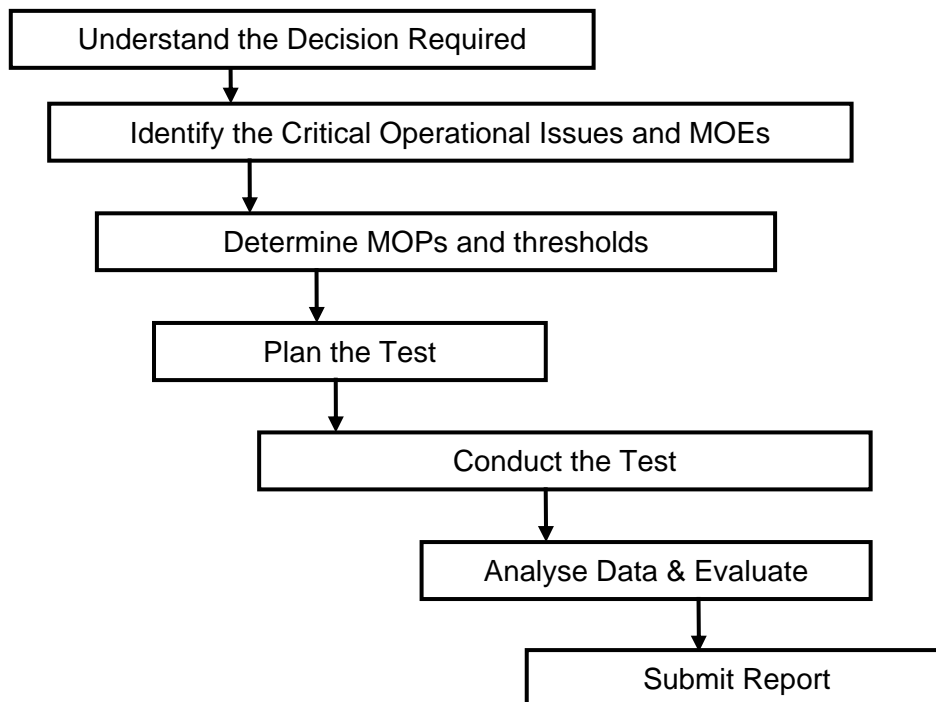
- **Developmental T&E**, conducted to assist the system design and development process;
- **Acceptance T&E**, conducted at system hand-over from manufacturer to customer to verify system meets the contractual specifications; and
- **Operational T&E (OT&E)**, conducted under realistic field conditions with representative users of the system, in the expected operational context, for the purpose of determining its operational effectiveness and suitability to satisfy the user’s need.

**Poker Machine Development.** Traditionally poker machines are developed with a six-step process. These steps are:

- Game concept (manufacturer);
- Game design (manufacturer);

- External testing (accredited test facility);
- Recommendation and certification (accredited test facility);
- Regulatory review (regulator); and
- Approval (regulator).

The current philosophy and approach to poker machine development, as outlined by Mr. Ian Hughes, the Managing Director of Gaming Laboratories International Australia (Terrapinn, 2003), is to extend this six-step process by use of a proof-of-concept with an accredited test facility and the regulator prior to a new submission. This enables issues to be raised without costly investment by the manufacturer, to ensure the submission will meet regulatory approval. However, in practice poker machines are developed with the benefit of developmental and acceptance T&E, but with surprisingly little OT&E. An emphasis on OT&E would force consideration of the critical operational issues to be answered and development of measures of effectiveness, since OT&E tends to take a more holistic viewpoint of a system than developmental and acceptance T&E which are reductionist in viewpoint by necessity. Figure 1 summarises the operational T&E approach.



**Figure 1:** Operational T&E Approach (after Harris, 2002)

The initial steps of the OT&E approach will now be discussed for poker machine development.

## **UNDERSTAND THE DECISION REQUIRED**

The decision required for this problem space can be stated as whether NSWLAB's proposed design changes to poker machines will assist in gambling harm-minimisation.

## CRITICAL OPERATIONAL ISSUES

In T&E, the objectives or the questions seeking to be answered must be outlined clearly. In OT&E these are outlined as critical operational issues (COIs), which are the collective 'show stoppers' which must be resolved for a system to be effective in satisfying the user's needs. If the COIs are not satisfied, then the system fails to meet its need. In the case of poker machines with the design changes (modified poker machines), the COIs are likely to be:

- COI 1. Is the incidence of problem gambling reduced?
- COI 2. Is there a significant change in revenue?
- COI 3. Will the gaming industry remain viable?

In stating these COIs, OT&E provides a focus for the test objectives, as these COIs must be satisfied since they are the 'show stoppers' for the proposed design changes.

## MEASURES OF EFFECTIVENESS

As Sproles (2000) points out, measures of effectiveness (MOEs) are viewpoint dependent, and so it is impossible to determine a single set of MOEs. Despite this difficulty, MOEs should be identified for a selected viewpoint, to allow a holistic assessment of the effectiveness of the system and its outcome.

For the decision of whether the NSWLAB's proposed design changes to poker machines will assist in gambling harm-minimisation, MOEs for the viewpoint of the NSWLAB are proposed and have been linked to their respective COIs:

- Ratio of problem gamblers to total number of players (COI 1);
- Revenue raised per modified machine (COI 2);
- Number of licensed poker machines (COI 3).

Other stakeholders may have other MOEs they would like to use, since their viewpoint of the COIs will differ from the NSWLAB's viewpoint.

## MEASURES OF PERFORMANCE

Measures of performance (MOPs) are directly quantifiable characteristics of a specific solution system. These can include size, speed, colour, range etc. As succinctly described by Sproles (2000), measures of performance differ to MOEs in that they specify performance of a solution system, whereas MOEs are external to any particular solution system by being purpose-oriented rather than solution-oriented. MOPs can be optimised and traded-off to optimise the system solution.

For a poker machine with a video display unit (VDU), an example MOP is resolution. The higher the resolution, the better the performance of the VDU. This MOP is traded-off with cost for example, since going from a 24 dpi screen to a 28 dpi screen would increase the cost of the poker machine.

Given the NSWLAB's design changes (requiring a move away from high-value note acceptors), an MOP for the note acceptors could be the rate at which notes are accepted. This MOP in itself however does not necessarily indicate that a modified note acceptor is effective for harm minimisation. Whilst the technical performance of a modified note acceptor (as measured by this MOP - the rate at which notes are accepted) may be known, its relative operational effect remains unknown. For example, if the rate is so high that the modified note acceptor can accept twenty, five-dollar notes in the same time it took an unmodified system to accept two, fifty-dollar notes, then the harm minimisation outcome is negated. Thus, the threshold for this MOP needs to be stated to

ensure the designer and the tester know the highest rate acceptable for a note acceptor to contribute to the harm minimisation system.

**Measures of Suitability.** Measures of suitability are MOPs specifically used to assess the operational suitability of a system. Operational suitability may be defined as the system's capacity, when operated and maintained by typical operational personnel in expected numbers, at the expected training and experience level; to be reliable, maintainable, available, logistically supportable, compatible, interoperable, safe and ergonomically suitable (Commonwealth of Australia, 1996).

With the NSWLAB's design changes, the suitability of poker machines would be expected to meet the same level of suitability that the unmodified systems are currently meeting. MOSs for key additional suitability concerns would be:

- Mean Down-Time To Modify Note Acceptors. This affects availability of the machine for the club while the gaming machine is modified; and
- Mean Playing Time Per Player. This seeks to analyse whether the changes alter the entertainment and comfort of the player.

## PLANNING THE OPERATIONAL TESTING

In planning the operational testing based upon the identified COIs, a useful tool is the Essential Elements Analysis process. Figure 2 illustrates how COIs can be resolved into test items, with 'must do' and 'must not do' aspects for consideration of the test objectives. For example, the measure chosen for resolving COI-1 (Is the incidence of problem gambling reduced?) was the ratio of problem gamblers to the total number of poker machine players. The test item would be those who play a poker machines. The aim of the design changes in limiting or decreasing problem gambling would only be successful, i.e. effective, if the ratio of problem gamblers decreased for a defined period, and conversely would be unsuccessful if there was an increase in the ratio of problem gamblers.

The emphasis of OT&E is on operational environments, tools and users, and so it follows that the data for OT&E needs to be gathered in the operational environment. Setting up operational tests with authorised technicians, attendants, players and operators in the field by using poker machine venues, such as clubs and taverns, will provide the accurate operational conditions needed for OT&E, within the testing and cost restraints.

To acquire the data sought in the operational tests, the T&E engineer could set up cases analysing the impact of the design changes. A suggestion initially would be to select four separate venues with similar patronage, entertainment, turnover and poker machines. The venues should be demographically separated such that they have a minimal effect on the other selected venues. The first venue will only have machines implemented with the note acceptor modified to accept only low-value notes, while the second implements slow reel speed and the third implementing maximum bet on stand-alone machines to \$1. The fourth club will have no changes and be used as a control for comparison. Surrounding poker machine values should be monitored to see if patronage and revenue change as a by-product on the venues.

COI	MOE	Test Item	Must Do	Must Not Do
<u>COI-1:</u> Is the incidence of problem gambling reduced?	Ratio of problem gamblers to total number of players.	Population of poker machine players	Decrease the incidence of problem gamblers	Increase the incidence of <u>new</u> problem gamblers
<u>COI-2:</u> Is there a significant change in revenue?	Revenue raised per modified machine.	<u>Modified</u> machines	Increase or maintain current revenue	<u>Decrease</u> revenue
		<u>Non-modified</u> machines	Decrease or maintain current revenue	<u>Increase</u> revenue
COI-3 : Will the gaming industry remain viable??	Number of licensed poker machines	Population of poker machines	Maintain or increase the number of licensed poker machines	Increase the number of illegal (non-licensed) poker machines
		Population of gamblers (all forms)	Increase or maintain current number of poker machine players	Decrease the number of poker machine players
		Population of gaming industry staff	Increase or maintain current number of jobs	Decrease the number of jobs

**Figure 2:** Essential Element Analysis Process.

The permutations of the modifications could be examined, but understanding the confounding effects may be difficult. It would create significant confusion, impact on social well being where jobs are involved if uninformed decisions are being made. OT&E provides the process for informed decision-making at the operational level.

Following on from the COI-1, the population of poker machine players would need to be determined. This could be difficult to determine without influencing the operational conditions of the club. A suggestion could be for the purpose of the data acquisition, have a counter for those entering the gaming room. This may not necessarily reflect those that play, it may be the closest that the T&E engineer may get without upsetting the venue's ambience or the players themselves if they are asked if they were gamblers.

It will be even more difficult to determine the number of problem gamblers. Anonymous surveys or questionnaires at the start and at the end of the trial period may be helpful, but these will need to be carefully worded using the definition of a problem gambler rather than simply asking, 'are you a problem gambler?' Indirect approaches, though less accurate in terms of the effect of the venue under test, may be more acceptable to the venues and the gambling population under test. Indirect approaches may include pre- and post-test counts of problem gamblers identified by problem

gambling help groups in the test venue's vicinity, or counts of gamblers banned (including self-banned) at the venue.

Naturally, the T&E engineer needs a test period sufficiently long enough to capture a reasonable amount of data. In the case of gaming venues, this may require an operational test period of three to six months!

## SUMMARY

An approach using OT&E has been described which could assess whether the design changes recommended by the NSWLAB would be effective in achieving harm minimisation. OT&E asked key questions of the design changes through the need to identify three critical operational issues (COIs):

- (1) is the incidence of problem gambling reduced,
- (2) is there a significant change in revenue, and
- (3) will the gaming industry remain viable?

The COIs were then translated into measures of effectiveness. The role of measures of performance and suitability were briefly discussed. In discussing the data gathering for resolving one of the identified COIs, the need for operational conditions experienced in the field (namely, testing in real venues such as clubs) was emphasised.

## DISCLAIMER

This paper represents the views of the authors, and is not meant to imply the views of Gaming Laboratories International.

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