



RISK & ASSURANCE GROUP

# **The Objectives of Revenue Assurance: Completeness, Accuracy, Validity and Timeliness**

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# Revenue Assurance: Completeness, Accuracy, Validity and Timeliness

This paper is taken from *Revenue Assurance: Expert Opinions for Communications Providers*, a book published by CRC Press and which I helped to write.

## 1.1. Introduction

It is nothing to be proud about, but I once had a flaming row with a revenue assurance expert about whether the objective of revenue assurance is completeness, accuracy and timeliness (CAT) or completeness, accuracy, validity, and timeliness (CAVT). I was giving him a lift in my car at the time, and the row got so bad that I had to pull over and let him out. Now maybe the ordinary revenue assurance practitioner may not get quite so excited about this debate, but we both got very worked up. In short, I thought, and still think, revenue assurance is CAVT and he argued it is just CAT. In fact, he went further and said validity was implied by accuracy. That really wound me up, as I dedicated three years of very hard and boring work to accountancy studies which insisted that accuracy and validity are two completely different concepts.

Where am I going with this? Well, I think the CAT definition of RA is ambiguous, open to misunderstanding and either logically sloppy, or ethically unsound. To explain why, we should begin by defining the C, A, V and T in CAVT.

- **Completeness:** There is a data record for every event or object in the real world.
- **Accuracy:** Data records accurately describe the event or object in the real world that they correspond to.
- **Validity:** Every data record corresponds to an event or object in the real world.
- **Timeliness:** All data records are captured and processed on a timely basis.

Using these definitions, the difference between CAT and CAVT is very straightforward. Data records which are CAT need not be valid. For every event or object there is a record, and that record is accurate and is processed in a timely fashion, but there may also be other records that do not correspond to any real event or object. Rather obviously, this is just another way of saying you may have some invalid records in your data. For revenue assurance practitioners who have had accountancy training, the distinction will seem natural. So arguing for a CAT definition of revenue assurance would mean arguing that it is not the responsibility of revenue assurance to find invalid records. That would mean revenue assurance departments would not try to identify duplicate records, or charges for calls that never took place, or bills for equipment that were never provided to the customer, or inventories that say network has been

provisioned when it has not. I have been in the room when revenue assurance practitioners have argued for this strict CAT view of revenue assurance. Everybody is entitled to their opinion, but I think this view of revenue assurance is plain wrong. It is wrong on three counts: it is inefficient for the business, weak for cost management, and inadequate to support good corporate ethics.

Testing for validity is the inverse to testing for completeness. If the revenue assurance department is going to test for completeness, it is more efficient for the business that the department tests for validity at the same time rather than relying on another department to do it. Invalid records are often a sign of poor cost management. Whilst invalid records may lead to higher revenues in the short term, if customers find out they are being overbilled then they are likely to lead to lower real revenues in the longer term, as a result of credits and churn. Invalid records also lead to increased costs when you consider the staff cost involved in handling and resolving customer complaints. Finally, ignoring evidence of invalid records, if this resulted in overbilling, would be a serious ethical breach. I hence cannot agree that revenue assurance should only assure the completeness, accuracy and timeliness of revenue processing, but ignore validity.

To be fair to the former interlocutor who was ejected from my car, he was not arguing that revenue assurance did not need to address validity. His argument was semantic. He thought that there was no need to use the word 'validity' because validity is already implied by accuracy. In his view, a record could not be accurate if it was not also valid. This is the same as saying his CAT is identical with my CAVT. I dislike this argument for a number of reasons.

Firstly, I do not see what is gained by taking two useful and distinct definitions for the words 'validity' and 'accuracy' and insisting that accuracy covers both. It is perfectly possible to construct different tests for validity and accuracy. It may not be possible to construct a test that addresses both at the same time. So, as an auditing principle, it is helpful to keep them distinct in order to ensure you really did check them both. For example, if I can reconcile that there is a CDR for every call made, then all the CDRs are valid, but that does not prove that the details in the fields of the CDR are all correct. Because testing all the details of all the CDRs would be a prohibitive workload, it would make more sense that I check a sample of CDRs to assess whether fields are accurately populated. Similarly, if I found there were some invalid CDRs in my check for validity, I would not waste time including them in my sample test of accuracy.

It is also possible to make mistakes if people are not clear about their goal. For example, in one tax dispute I saw a revenue assurance practitioner check if every billed account in the billing system resulted in an update to the ledgers in the accounting system. He then compared the details of the records to ensure they were consistent. They found lots of examples where a bill had been issued, but the ledgers had not updated, and also of cases where the ledgers had been updated incorrectly. The results were explained to the taxman. The taxman was not impressed. The practitioner had traced forward from billing to ledger, and checked accuracy whenever there was a match. It had never occurred to the revenue assurance practitioner to also trace backwards from ledger to billing system. In this case, there were also ledger entries not

supported by the billing system i.e. invalid ledger entries. The practitioner had got so excited by the detail of checking accuracy, as he understood it, that he never thought to do a proper check for validity.

The second reason I dislike saying accuracy includes validity is that some people honestly believe revenue assurance does not include validity as an objective. That does not mean they do not believe it necessary to check for accuracy. Whilst I disagree with their point of view, I have to permit them some way of expressing their point of view. With the CAVT definitions used above, it is possible to describe their point of view, because they simply do not agree in including validity as an objective of revenue assurance. However, if accuracy somehow implies validity, then it becomes very difficult to describe their point of view. You end up needing to say they believe the objectives are CAT but excluding validity, which just takes us round in a circle given that the whole point of dropping the 'V' was because of an insistence that validity be considered an integral part of accuracy.

My interlocutor was very insistent that he had been trained as a computer scientist and that in computer science validity is an element of accuracy. From his perspective, a record is not accurate if it does not describe a real thing. He argued that the accountants had overcomplicated a situation that the computer scientists were keeping simple. As somebody who spent a semester teaching mathematical logic to computer scientists, I did not agree with his opinions. If logic is the basis of computer science, then it is possible to describe, in logic, both my preferred definitions for validity and accuracy, and his preferred definition of a kind of accuracy that also includes validity. In logic, no definition is superior to any other. In logic, there is no conflict; it is only when we describe the logical rules in English that a clash may occur.

The usefulness of a rule is determined in practice, not through logic. But there is no advantage to the computer scientist in trying to curtail the logical basis for the science, any more than it would be an advantage to build a computer that could turn bits from 1 to 0 but could not turn them from 0 to 1. For those of you interested in the logical foundations, I have constructed some definitions of the CAVT objectives, and of my interlocutor's alternate definition for accuracy including validity, using the notation of predicate calculus. I turn to predicate calculus as a formal logical system well suited to the task; for those wanting an introduction to predicate calculus, I recommend the handy guide entitled *forall x* by P.D. Magnus, which is available for free under a creative commons license from his website, [fecundity.com](http://fecundity.com).

## 1.2. Preliminary Definitions

Define a function 'Data-record': Data-record (A) is true if and only if A is a data record.

Define a function 'Real-world': Real-world (A) is true if and only if A is an event or object in the real world.

Define a function 'Record-of': Record-of (A, B) is true if and only if Data-record (A) is true, Real-world (B) is true, and A uniquely corresponds to B.

Define a function 'Consistent-with': Consistent-with (A, B) is true if and only if Record-of (A, B) is true, and all the details of data record A are consistent with the facts about event or object B.

Define a function 'Timely': Timely (A, P) is true if and only if Data-record (A) is true, and A is created and processed before the deadline or deadlines stated in policy P.

To aid readability, variable x will always represent data records, and variable y will always represent events or objects in the real world. In other words, if we defined functions to clarify whether something is a data record or it is something in the real world, we would say Data-record (x) is true and Real-world (y) is true.

### 1.3. Definitions of RA Objectives Using Predicate Calculus

**Completeness:  $\forall y \exists x (\text{Record-of } (x,y))$**

In English, this would be described as 'for all y, there is an x, such that x is a record of y'.

**Validity:  $\forall x \exists y (\text{Record-of } (x,y))$**

In English, this would be described as 'for all x, there is a y, such that x is a record of y'.

**Accuracy:  $\forall x \forall y (\text{Record-of } (x,y) \rightarrow \text{Consistent-with } (x,y))$**

In English, this would be described as 'for all x, and for all y, if x is a record of y then x is consistent with y'.

**Timeliness:  $\forall x (\text{Timely } (x,P))$**

In English, this would be described as 'for all x, data record x is created and processed before the deadline stated in policy P'.

**Alternative ‘accuracy’ rule that includes validity:  $\forall x \exists y$  (Consistent-with (x,y))**

In English, this would be described as ‘for all x, there is a y, where x is consistent with y’.

## 1.4. Final Thoughts

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One thing is for certain. Whenever you go to one of the bigger revenue assurance conferences, you will probably find at least one speaker who describes the objectives of revenue assurance using CAVT, and another who describes it using CAT. I do not think I am biased when I say that CAVT probably gets mentioned slightly more often than CAT, but there is not much in it. Certainly I am not alone in preferring CAVT. For example, a CAVT definition of revenue assurance is given by the vendor Cartesian in the common terminology for revenue assurance they made available for free download from their website. However, I do hear plenty of people who describe revenue assurance in terms of completeness, accuracy and timeliness with no mention of validity.

Whoever is right, the reason I raise the question is more than just because I think the argument is interesting or important. Some people have started reaching the conclusion that the practice of revenue assurance is mature in an increasing number of communication providers, and is ready to evolve to take on new challenges. I question that. For revenue assurance to be mature, its foundations must be secure. Understanding whether the objectives of revenue assurance are CAVT or CAT is fundamental to determining the scope and purpose of revenue assurance. It is a principle that needs to be established and consistently communicated to everybody working in that team before rushing onward to expand the horizons. I have borrowed from logic because the debate and conclusions need to be scientific, not just semantic. If revenue assurance really is going to mature as a discipline, it will have to pass tests like whether the practitioners understand the difference between CAVT and CAT, and have come to a consensus on which is the correct expression of objectives. For those of you reading this, I recommend you reach your own conclusions on CAVT versus CAT, before moving on too quickly. At the very least, be clear about your conclusions before you ask for a lift in my car!

## 2. About

### 2.1. About this document

The Risk & Assurance Group has made this document available for the following purpose:

- For RAG members to review the document to determine if it should be approved and recommended for use by other RAG members only.

### 2.2. Document History

Version Number	Date Modified	Modified by:	Description of changes
1.0	07/01/2017	Eric Priezkalns	First issue for review by RAG members

### 2.3. About RAG

The Risk & Assurance Group is a not-for-profit limited company incorporated in England. Its purpose is to provide the services of a professional association to risk and assurance professionals working in the communications industry and other sectors.