THE USE OF WEB-BASED TOOLS TO SUPPORT A CONTRACTUAL CLAIM IN ARBITRATION OR LITIGATION

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SUMMARY

Most standard forms of building contracts provide for the use of arbitration as a means of dispute resolution, failing which, the parties have to settle their disputes in court. Each dispute is resolved by examining whether the party who makes a contractual claim is able to discharge his burden of proof in both the liability issue and the quantum issue. The scope of proof is usually prescribed by the building contract. Evidence of information, facts and opinions may be adduced in support of a claim. Most project information may be stored in a web-based information management system. In existence are also some IT applications which may assist in providing facts and opinions that may support a claim. 4D Modelling may be used to simulate critical paths for the evaluation of an extension of time claim. GPS may provide the tracking of the use of resources to help attribute the cost of their use to the basis of a claim. The latest technology of LADAR may assist by recording through time, the as-built status of the project at any one time thereby determining the real-time progress of work. The use of computer-generated evidence is provided for by legislation and case law. This paves the way to use web-based tools to support a contractual claim in arbitration or litigation by linking the whole system to a claims service that monitors the situations where a claim may be made and trigger off a warning so that the procedure of claim may be pursued by a party if he chooses to do so. The claims service should then extract the necessary data from the other services in the project web to build up a claim.

INTRODUCTION

Most standard forms of building contracts provide for one party to claim against the other. Under the general principles of law, in order for a party to succeed in an arbitration or litigation, the party who lodges a claim must be able to prove by the support of evidence, that he is entitled to the claim as prescribed by the contract, that is, the liability issue; and that he is entitled to the amount of the claim, that is, the quantum issue.

The party making the claim may be the Contractor or the Employer. In either case, they generally suffer from some form of deficiency in their documentation system, especially where oral communication is not recorded in a written form. Before the advent of the use of computers commercially, a paper system of documentation would result in voluminous copies of various types of documents spanning the contract period which may be in terms of many months that may stretch to years. This meant that much work is required before the relevant documents are found, if they exist.

The parties also suffer from a failure to properly document the progress of work on site other than what is captured in rather unhelpful progress photographs taken on a monthly basis. There is usually no updating of the Works Programme submitted at the beginning of the project. This point may put in issue as to how claims for extension of time as well as extension of time grants are worked out. The preparation of as-built drawings without the use of computers may not result in very accurate measurements of completed works and their respective locations.

In last year's conference, a paper by Per Christiansson, Nashwan Dawood, Kjeld Svidt entitled, *Virtual Buildings (VB) and Tools to Manage Construction Process Operations*, tabulated the result of an extensive literature review in the area of IT applications in the construction phase of the building process industry carried out by Sriprasert, E and Dawood N in 2001 which covered 74 papers published in the 6 years before their review. Except for 2 papers in Delay/Claim Management using multimedia applications, the rest of the papers do not appear to touch on claims.

This paper first examines the type of information to be proved in order to support a contractual claim with a view to determining in the next section whether the existing technology, both web-based and non-web-based, may be put to use as a project management tool and in particular, to capture the information/facts to support a contractual claim in arbitration or litigation. Finally, the extent to which computer-generated evidence is admissible in arbitration or litigation is explored to determine the viability of the use of web-based tools to support a contractual claim.

EVIDENCE REQUIRED IN SUPPORT OF A CONTRACTUAL CLAIM

Liability Issue

Depending on the nature of the claim, certain documents must be produced before a claim is entertained under the liability issue which I will call the "initial document". Thus, a claim for an increase in the contract sum arising from a variation usually requires a written instruction from the Architect/Superintending Officer (SO) ordering such a variation. Oral instructions testified by witnesses to have been given will not suffice. In the case of a claim for extension of time, it is not uncommon that a written notice requesting for extension of time is required by the contract to be filed by the contractor on a condition precedent basis. This requirement may also apply to a claim for loss and expense suffered by the Contractor. There may be a stipulation in the contract that such notification requirement must be complied with within the specified duration failing which, the Contractor is not entitled to his claim. In addition, there may be exceptions to the notification requirement. In the case of a claim for liquidated damages, the Employer may, in some standard forms, be required to produce a Delay Certificate before he is entitled to impose such liquidated damages on the Contractor or the imposition may be made automatic on the happening of an event. There are other claims allowed by the contract where there is a difference in quantities between the as-built quantities and the quantities shown in the contract.

Besides the initial document, other evidence may be required. There must be evidence produced to show that the other requirements prescribed by the contract are complied with. Two examples are examined. Thus, in the case of a variation claim under the Singapore Institute of Architects' Articles and Conditions of Building Contract (SIA Conditions), there is a distinction between a variation ordered by a written instruction issued by the Architects where the Contractor is entitled to an increase in the contract sum and a written direction where the Contractor is not so entitled unless he has challenged the classification under clause 1(5) of the SIA Conditions. Accordingly, the Contractor would be required to produce a valid written instruction issued within the authority of the Architect or produce evidence that the necessary challenge has been made as prescribed by the contract.

In the case of a claim for extension of time, the Contractor must show that a delay is caused by one of the specified grounds for which extension of time may be granted. The Contractor is usually also required to establish that he had proceeded with his work with due diligence and had taken reasonable steps to avoid the delay. Assuming that the relevant specified ground is the late issuance of drawings by the Architect/SO, this would mean that the Contractor must first produce evidence to show that a "delay" is caused by the "late" issuance of the drawings. This means that the Contractor must be able to show that the activity delayed is in the critical path for the duration of the delay; that the activity delayed took a longer period to complete or that the activity delayed was prevented from starting; that the drawings were not issued at the time when the contract required the Architect/SO to do so.

Further, the Contractor must show that the delay is not contributed by him to the extent that he had proceeded with his work with due diligence or at a rate of progress imposed by the contract but for the delay complained of. In this situation, the Contractor may be required to establish that there can be only one possible critical path and the activity delayed is in the said critical path for the duration of the delay. This effectively means that he cannot proceed with other works that would improve his ability to complete the Works in accordance with the agreed Completion Date. In addition, the Contractor must prove that he has taken reasonable steps to avoid the delay. Presumably, he must have notified the Architect/SO about the time when the drawings are required and even when the time has passed to pursue the matter with the Architect/SO until the drawings are issued.

Quantum Issue

Under the quantum issue, evidence must be produced to support the amount claimed, whether it is the amount of money claimed in the increase of the contract sum or an additional amount or the number of days claimed for extension of time. Again, the two examples of variation and extension of time discussed above are used.

In the case of a claim for an increase in the contract sum, the nature of the variation ordered is an important consideration, that is, whether it is a variation on drawing only or is it a variation involving abortive works. The former would involve a smaller amount of an increase while the latter would include a sum for the former and a sum for the cost of construction, demolition and removal of debris of the works aborted. The other important concern is the ascertainment of the quantity of, whether measurement is to be carried out on the drawings or at the site or under dayworks, and the price of the constituent parts of the variation work which depends on whether the applicable rate whould be the contract rate or contract formula or market rate.

In a claim for extension of time, there may be claims that are very closely related which ought not to be separately considered, that is the claim for acceleration costs and loss and expense arising from a delay caused by the Employer or by persons for whom the Employer is responsible. Thus, there are two possible scenarios. First, the Contractor takes reasonable steps to avoid delay but the delay nevertheless occurs and results in the Contractor having to be on site longer than the agreed contract period and thereby incurring costs. Second, the Contractor accelerates the progress of his work such that it is faster than the rate of progress imposed by the contract and these results in no delay or a shorter period of delay. In order to accelerate his work he incurs expenses.

In a straightforward claim for extension of time where the delay is not a concurrent delay and no acceleration is involved, the extension of time to be granted would be the additional number of days required for the activity delayed by comparing the original activity period with the actual activity period. The related claim for loss and expense would have to be ascertained from the expenses incurred by the Contractor because of the longer period spent on site. These expenses are incurred by the Contractor on site and by the head office. In claiming acceleration costs, the Contractor would in principle be required to prove the difference between the costs of actual resources used and the costs of the original resources planned for the activity delayed.

RELEVANT IT APPLICATIONS

From the above discussion, there are several types of information/facts which must be captured in order to support a contractual claim in arbitration or litigation. The first type of information required is the complete record of all communication between/amongst the parties. This would include any written instruction/direction/confirmation given by the Architect/SO, written confirmation by the Contractor of any oral instruction/direction/confirmation given by the Architect/SO, issue of drawings, notification, issue of certificates, submission and approval of works programme and up-dates if any. The second type of information is a record of what took place on site like up-dated programmes, management of sequence of works including planning for the most efficient critical path, progress photographs, monthly claim statements, daywork record, use of resources on site, management of site-layout, and as-built works. The third type of information includes market prices, interest rates for bank loans.

Web-Based Information Management System - A Repository of Evidence

The more common web-based approach to project management is to introduce an information management system that may be used by all the parties involved in a project. In Lam and Chang 2002, the authors examined the development of a web-based project information management system for civil engineering applications which essentially enables the handling of all project related information in a global manner. In Singapore, a pilot project is being carried out to test the commercial feasibility of e-project management, beginning with e-tendering.

Lam and Chang (2002) had proposed that their WebPIM system would provide three types of services, namely, web, database and application services. The web-site is open to the public,

member and manager but the areas available to the last two categories are accessible only by way of a password. In the member areas, the services available are Message, File and Form Manager. The parties to the project may also use the web-site as a real-time and mail communication channel. In the database, all project-related documents and information are classified and stored in the respective Tables of Message, File, Form, News and Specification. The application services offered include electronic communication, centralisation of all documents in a project server, processing of forms-related activities like for acquisition, online submission, approval and notification where digital signatures may be necessary, real-time communication like chat, internet-phone and video conferencing, and the preparation, management and keeping of specification documents.

This system appears to be able to capture all forms of communication between/amongst the two contractual parties and the various consultants. It ought to capture the initial document required to address the proof required in the liability issue. Thus, the variation claim can rely on this system to produce the relevant written instruction/written challenge of direction classification/written confirmation of oral instruction. The system should also be able to produce the date of issue of any drawing.

4D Modelling – Simulation Based on Data Input

It would most certainly enhance the quality of project management if 4D technology can be commercially used as a web-based tool to run a project. The technology of visual 4D models, which combine 3D CAD models with construction activities to display the progression of construction over time, is already available. The leader in the study and use of 4D models is, I dare say undeniably, the team at the Center for Integrated Facility Engineering (CIFE), Stanford University, USA led by Dr Martin Fisher. According to CIFE, 4D modelling was already used in 1987. The 4D Model is able to match reality. An important use of 4D models is to interactively show the impact of design or schedule changes. It is also said that 4D Models are able to determine the ripple effects of changes in scope and schedule on other disciplines, project milestones, completion dates, related contracts and budgets.

This system should presumably be able to simulate the "best" original critical path and the actual critical path if the appropriate information is used. Accordingly, it should be able to show the number of days of delay for any activity delayed by comparing the original and actual activity period concerned, and allow for verification that the delay identified of the activity concerned lies in the critical path at all times of the delay.

Global Positioning System (GPS) – Real-time Tracking of Resources

GPS is a satellite-based navigation system. It allows land, sea and airborne users to determine their three-dimensional position, velocity and time. It can be used by anyone with a receiver anywhere on the planet, at any time of the day or night, in any type of weather. The applications of the GPS fall into five categories: location, navigation, timing, mapping and tracking (Reece 2000)

According to Michael W. Michelsen Jr in his e-paper entitled, *Construction in the Space Age*, found at http://www.forester.net/gec_0003_construction.html, he said that by using GPS and wireless communication, contractors are able to acquire real-time location of a machine, historical data (where the piece of equipment was yesterday and how it performed), tracking, and monitoring information. A better estimate of the machine and operator's productivity may be made.

The tracking of the resources will enable the Contractor to identify more accurately the allocation of resources for any particular activity. In the claim for acceleration costs and the claim for loss and expense suffered as a result of delays caused by the Employer, his servants or agents, the ascertainment of expenses attributable to acceleration or delay can be accurately done and backed by recorded data.

Laser Distance and Ranging (LADAR) – Automated Construction Status Assessment

The National Institute of Standards and Technology of United States of America under the leadership of William Stone are working on the LADAR technology which is laser range imaging. LADAR is able to rapidly capture true 3D data from the field for an entire construction scene thereby producing

automatic "as-built" models of the object of survey. However, the use of LADAR for construction management and automation is still in its infancy (Stone and Cheok 2001).

The availability of technology that can capture information of the actual state of construction can arguably be used in support of many contractual claims. The information captured can be used in conjunction with the 4D modelling explained above to accurately provide at any time, the real-time critical path with sufficient accuracy. The technology may also be used where there is an issue of differences in as-built quantities and measured quantities for which compensation is to be given where the as-built quantities are greater.

ADMISSIBILITY OF COMPUTER-GENERATED EVIDENCE

As early as 1984, the courts in the United States of America had to consider whether and to what extent, computer-generated evidence should be accepted. In *People v. McHugh, 124 Misc.2d 559, 476 N.Y.S.2d721 (Sup. Ct. Bronx Co. 1984)*, Justice Collins said, "A computer is not a gimmick and the court should not be shy about its use, when proper. Computers are simply mechanical tools receiving information and acting on instruction at lightning speed. When the results are useful, they should be accepted, when confusing, they should be rejected. What is important is that the presentation be relevant to a possible defense, that it fairly and accurately reflect the oral testimony offered and that it be an aid to the jury's understanding of the issue" (476N.Y.S.2d at 722-723).

The latest in computer-generated evidence comes in the form of virtual reality evidence which is a computer-generated simulation that is designed to place the viewer in a simulated environment that reacts in a visually appropriate fashion to the viewer's action (Joseph 1996). In Jeffrey A Dunn's article entitled, *Virtual Realty Evidence*, found in the Lectric Law Library's stacks at http://www.lectlaw.com/files/lit04.htm, virtual reality was defined as a three dimensional motion picture with a stereo sound, along with a body suit that applies temperature and pressure. Wind and wetness might also be provided, along with such things as body orientation or g-forces. However, Jeffrey acknowledges that not all of these elements need be provided, and if a court objects to the more unusual elements, it could be argued that a court should still permit the use of the three-dimensional motion picture and stereo sound.

In an unreported case, *Stephenson v. Honda Motors Ltd of America, Cal.Supp Ct. Case No 81067, June 25, 1992*, a court has admitted the use of virtual reality evidence in support of a claim. This is the first such case in the United States of America, and presumably the whole world. It was reported that in the United Kingdom, the first instance of computer-generated graphics was used in *R v Wharton, Sept 1994*, (Horten 1994). Jeffrey A Dunn's article entitled, *Virtual Realty Evidence*, found in the Lectric Law Library's stacks at http://www.lectlaw.com/files/lit04.htm summarised the relevance of virtual reality evidence by emphasising that if virtual reality can provide relevant information that other methods of presentation cannot provide, or if virtual reality is much more effective than other forms of evidence at presenting relevant information, virtual reality evidence should be admissible unless there is some reason in a particular case that the method of presentation would be confusing or misleading, or is so shocking that it has a prejudicial impact which surpasses the probative value of the evidence.

Generally the courts in the US, UK, Canada, Australia and New Zealand are empowered by their respective legislation to allow the use of computer-generated evidence although the wording of each piece of their respective legislation may not be the same. However, this paper is only able to examine the legislative provision of Singapore in detail.

Types of computer-generated evidence

Generally, there are two types of computer-generated evidence. The first type is the computer-stored information which is essentially a reiteration of human statements stored in a computer. The type of information stored in the web-based information management system discussed abpove is likely to fall into this category. In Singapore, this type of evidence is admissible under sections 35 and 36 of the Evidence Act:

"35. — (1) Unless otherwise provided in any other written law, where computer output is tendered in evidence for any purpose whatsoever, such output shall be admissible if it is relevant or otherwise

admissible according to the other provisions of this Act or any other written law, and it is —
(a) *expressly agreed between the parties to the proceedings at any time that neither its authenticity nor the accuracy of its contents are disputed;*
(b) *produced in an approved process; or*
(c) *shown by the party tendering such output that —*
   (i) *there is no reasonable ground for believing that the output is inaccurate because of improper use of the computer and that no reason exists to doubt or suspect the truth or reliability of the output; and*
   (ii) *there is reasonable ground to believe that at all material times the computer was operating properly, or if not, that in any respect in which it was not operating properly or out of operation, the accuracy of the output was not affected by such circumstances."*

Section 36 provides that:

"36. — (1) Where a court is not satisfied that the computer output sought to be admitted in evidence under section 35 accurately reproduces the relevant contents of the original document, the court may, in its discretion, call for further evidence.
(2) Where further evidence is called for under subsection (1), such evidence may be produced by an affidavit made —
(a) *by a person occupying a responsible position in relation to the operation or management of the certifying authority appointed under section 35 (5);*
(b) *by any other person occupying a responsible position in relation to the operation of the computer at the relevant time;*
(c) *by the person who had control or access over any relevant records and facts in relation to the production of the computer output;*
(d) *by the person who had obtained or been given control or access over any relevant records and facts in relation to the production of the computer output; or*
(e) *by an expert appointed or accepted by the court."*

The second type is produced by a programme which takes material, either stored or entered, and manipulates it in a predetermined method. Included in the second type are computer graphics or simulations. (Weitz 1997) In *Schaeffer v GM Corp., 372 Mass. 171,177,360 NE2d 1062,1066-1067 (1977)*, the Supreme Court of Massachusetts held that, `Our concern is not with the precision of electronic calculations, but the accuracy and completeness of the initial data and equations which are used as ingredients of the computer program. … Whether the simulation technique has achieved sufficient reliability and acceptance to warrant its use in judicial proceedings is a question to be decided in the first instance by the trial judge.' Since 4D modelling would produce a simulation, it falls into this category of evidence.

Graphic evidence may be used to serve two purposes. The first purpose is usually to assist witnesses in conveying complex information. These include the use of charts, graphs and models. These aids are used merely as testimonial props considered as illustrative aids and are not admitted as evidence. They are termed as demonstrative evidence. In Singapore, this type of evidence is admissible under section 68A of the Evidence Act:

"68A. —(1) Evidence may be given in the form of charts, summaries, computer output or other explanatory material if it appears to the court that —
(a) *the materials would be likely to aid the court's comprehension of other evidence which is relevant and admissible according to the provisions of this Act or any other written law; and*
(b) *the evidence that is to be given by any party is so voluminous or complex that the court considers it convenient to assess the evidence by reference to such materials."*

The second purpose is usually to arrive at a conclusion by the reworking of admitted evidence. Examples include re-creations, simulations and computer-enhanced photographs derived from information already in evidence. They are termed as substantive evidence. This type of evidence is subject to both subsections (1) above and (2) below of section 68A of the Evidence Act:

"68A - (2) Any fact or opinion asserted in any material referred to in subsection (1) shall be proved by relevant and admissible evidence, and if such fact or opinion is one that is admissible only on the

proof of some other fact or opinion, such last-mentioned fact or opinion must be proved before evidence is given of the fact or opinion first-mentioned, unless the party undertakes to give proof of such fact or opinion and the court is satisfied with such undertaking."

According to Rychlak 1995 at page 350, "A reconstruction uses known data derived from an investigation, along with physics and mathematical science, and produces a complete animation intended to show what actually happened at the event in question. At the end, you are left with a visual version of the facts that you can replay from various angles and distances. A simulation, on the other hand, takes known data along with physical and mathematical certainties and allows the operator to insert variables to show what would have happened under a different set of circumstances. It may also be used to show an alternate theory as to how something took place." In the case of a reconstruction, the courts tend to be very strict about the data entered into the program. Precise measurements and exact data are needed.

CONTRACTUAL CLAIMS – THE MISSING IT LINK

Generally, IT applications are either web-based or non-web-based. In most instances IT applications may be provided as a web-based service. The advantage of having a web-based tool is that the information may be used by the parties to a project and stored on a project basis. The above experience gives an idea of the potential power of web-based tools used in project management to act as a repository of evidence. However, the experience shows that the users of the web-based tools do not appear to consciously have in mind the use of the tool in support of a contractual claim, whether by the employer or the contractor.

In order to capitalise on the potential of the IT applications to support contractual claims, two proposals are made. All relevant IT applications that may help in providing information in support of a contractual claim be made web-based. In addition, it is proposed that a web-based claims service be provided that must be able to support the contractual claim as represented by the need to comply with the production of information/facts as identified under the liability issue and quantum issue discussed above as well as comply with the procedural requirement prescribed by the contract.

The claims service must provide for the monitoring of the development of events that may trigger the claims process. There must be a automatic warning to the party concerned that a claim situation has come into existence, for example, if an instruction has been given by the Architect/SO, there may be potentially a few claims coming into existence, namely, a variation claim for an increase in the contract sum, an extension of time claim and the related claim of acceleration costs and loss and expense incurred due to the delay caused by the Employer, his servants or agents.

The claims service should also be able to select information from the other web-based services to support the contractual claim or initiate a search for the necessary information, for example, a search for the relevant market rate required in pricing a variation. It should also be able to work out the number of days of delay for which extension of time is required by extracting information from the 4D modelling service to determine the original and actual activity periods of the activity that is delayed always bearing in mind that the activity delayed must remain in a critical path which cannot be moved to another route.

CONCLUDING REMARKS

Usually, parties continue to be in a contractual dispute because they cannot agree to the interpretation of a clause or because a party making a contractual claim does not appear to be able to support it by the necessary evidence of facts. On the other hand, in the latter case, unless a party is disputing for other reasons, the party would give in to the other party's claim if the necessary evidence in support of the claim is available. The creation but not the fabrication, preservation and production of evidence in support of any claim is critical to its success. A web-based repository of evidence that is accessible to all but is protected from unauthorised corrections or corruption is ideal because it allows all parties to properly evaluate their legal positions in respect of any claims that may be made and whether the party has a chance to succeed against the other party. If the dispute continues to arbitration or litigation, the IT applications discussed above may be used to support a contractual

claim by providing admissible computer-generated evidence that is necessary to discharge the party's burden of proof in respect of both the liability issue and the quantum issue.

REFERENCES

Horten, M. (1994) Solicitors Journal 1289*: Graphic Evidence*.

Joseph, George P. (1996) 2 B.U.J.Sci & Tech L 12*: Virtual Reality Evidence.*

Lam, HF and Chang,Tse-Yung Paul (2002) 17 Computer-Aided Civil and Infrastructure Engineering 280: *Web-Based Information Management System for Construction Projects*.

Reece, Mary E. (2000) *Academic Eritings submitted to Lawrence J. Clark, Professor of Technical Writing, New Mexico Institute of Mining and Technology*, found at http://www.nmt.edu/~mreece/gps/tableofcontents.html

Rychlak, Ronald J. (1995) *Greal and Demonstrative Evidence*, The Michie Company Law Publishers

Stone, William and Cheok, Geraldine, LADAR Sensing Applications for Construction, June 1, 2001 found at http://www.bfrl.nist.gov/861/CMAG/publications/LADARSensing.pdf