The Use of Animation in the Resolution of Construction Disputes

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Abstract

Construction disputes, like construction projects, are complex, dynamic and multi-faceted. Construction claims on large projects are not only confined to disputes between the client and main contractor, but occur between contractor, sub-contractors, consultants and the supply chain. Advancing a construction claim invariably involves the examination and presentation of long, detailed and technically complex information. Although text, diagrams, graphs, tables, charts, and schedules have been used with varying effect, the use of animation has the potential to simplify complex information and present it in an engaging manner. This paper explores how animation technology can be utilised to deliver the facts that persuade by communicating specific points or elements of analysis. It is clear that although no consensus has emerged as to how such technology is to be used, animation is here to stay. As the use of animation technology increases, the benefits of envisioning complex information will find its way into the construction dispute context. With the complexity of large-scale projects and the sheer quantity and diversity of the documentation involved, animation can assist in illustrating a party‟s case.

Keywords: construction, dispute, contract claims, animation, multimedia.

1. Introduction

1.1 The focus of the paper

Construction disputes, like construction projects, are complex, dynamic and multi-faceted. Construction claims on large projects are not only confined to disputes between the client and main contractor, but occur between contractor, sub-contractors, consultants and the supply chain. Construction disputes almost always involve the consideration of complex technical information. Animation in the context of this paper is concerned with the use of a computer software to generate images with each image slightly altered frame by frame in order to mimic actual movement. This can provide an effective medium to visually communicate complex technical information..1 It is possible to use animation to illustrate the effect of a variation, how a project looks as-planned and as-built, or the consequences of delay or disruption to a construction project. This paper will explore how animation can be used to visually represent the complexities of a construction process, illustrate important points, aid understanding and persuade in order to resolve construction disputes.

1.2 Envisioning information

The most celebrated example of graphical representation of information is Charles Joseph Minard‟s famous chart of Napoleon‟s disastrous Russian campaign in 1812 (Figure 1).2 This chart, or statistical graph as it has been called, is also a map and has been described as the "best statistical graphic ever drawn".3 This chart depicts Napoleon‟s ill-fated 1812 advance into Russia and his subsequent retreat in 1813, having been beaten by the Russian army.

[1] Girvan, R., „An Overview of the use of Computer-Generated Displays in the Courtroom‟, [2001] 1 Web JCLI, page 2.
[2] Charles Joseph Minard (1781-1870), a French civil engineer who was an inspector-general of bridges and roads, but whose most remembered legacy is in the field of statistical graphics, producing this and other maps in his retirement (http://en.wikipedia.org/wiki/Charles_Joseph_Minard) (visited 10 January 2010).]
[3] Tufte, E, (2001) „The Visual Display of Quantitative Information‟, 2nd edition.

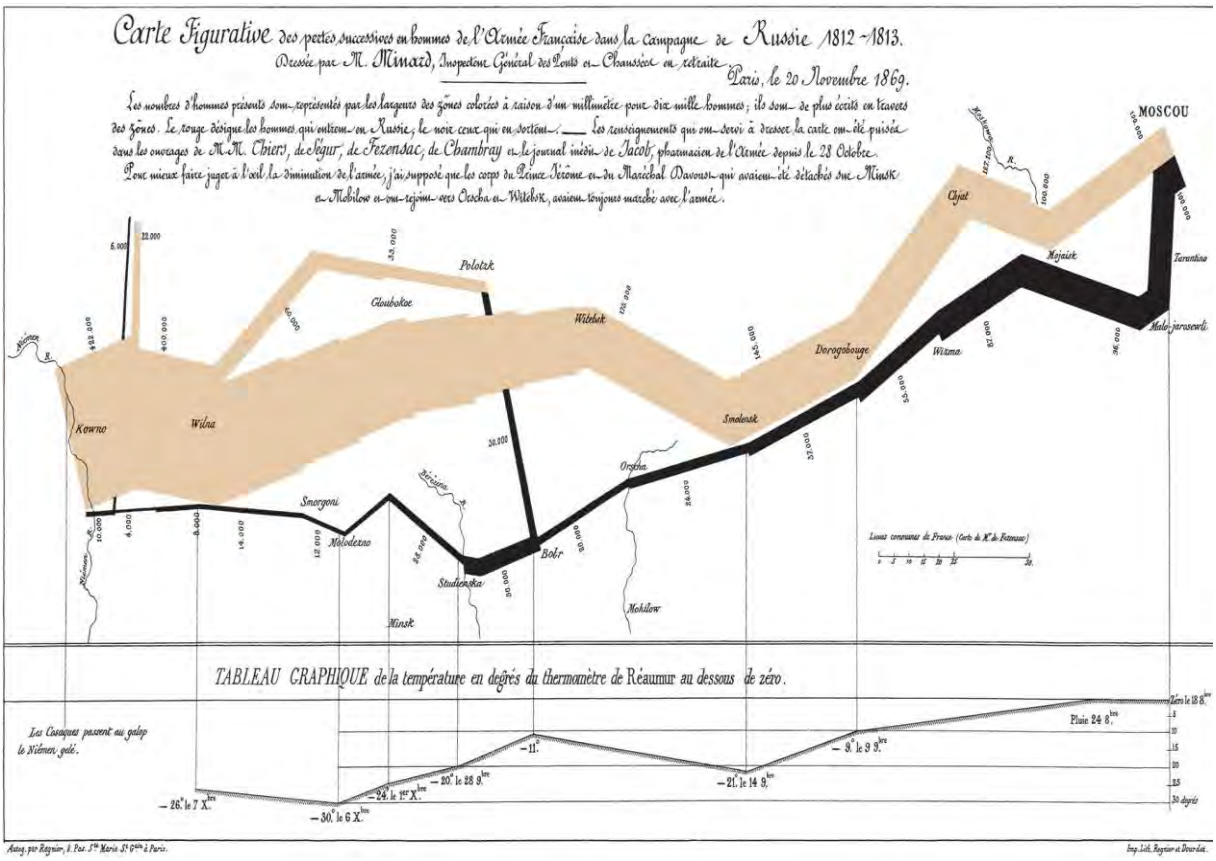

Figure 1 – Charles Minard"s chart of Napoleon"s Russian campaign.

As a medium to visually represent information, this chart delivers on numerous levels. It collates six sets of data:

- A geographical map of Russia, including rivers, cities and battles which are placed in correlation to their occurrence;
- Napoleon"s army"s course – the path represents the route in and out of Russia Napoleon that followed.
- Napoleon"s army"s direction – which is indicated by the colour of the path (gold leading into Russia and black leading out of it).
- Number of soldiers – the size of the path is relative to the number of the soldiers. As the campaign progresses, the size of the path grows successively smaller. Each millimeter represents 10,000 men.

- The temperature – the freezing temperatures of the Russian winter is indicated at the bottom of the chart.

- Time – this is in relation to the temperature indicated at the bottom, from right to left.

This chart not only gives information but tells a story. Napoleon entered Russia with 442,000, with the French army fighting its way to and occupying Moscow. However, due to overstretched lines of supply and the extreme winter conditions, the French army was forced to retreat, with Napoleon eventually leaving Russia defeated and with less than 100,00 men.[4]

Even with such complexity, it is possible to envision information accurately and with impact. Before assessing the utility of animation in the resolution of construction disputes, it is necessary to understand the distinctive features of construction and the complexity of the disputes that they give rise to.

2. The distinctive nature of construction

2.1 Why so many disputes in construction?

Construction disputes refer to all kinds of disputes arising out of projects for construction work, in particular those relating to the execution of services (e.g. mechanical and engineering services), and work necessary for the implementation of a construction project.[5]

The nature of construction and the potential diversity of the participants involved in a project means disputes arise in a wide array of contexts. Construction industry disputes invariably involve the consideration of complex technical information. Construction can be differentiated from other industries in that the delivery of a construction product is not an event but rather a process that requires participating entities.[6] Capper identifies the distinctive characteristics of construction as follows:[7]

[4] http://en.wikipedia.org/wiki/Battle_of_Waterloo (visited on 18 January 2010); An article in *The Economist which has chronicled* the way in which some charts successfully visualise data sums up the impact of Mindard‟s chart: "As men tried, and mostly failed to cross the Berezina river under heavy attack, the width of the black line halves: another 20,000 or so gone. The French now use the expression *C'est la Bérézina* to describe a total disaster" (see The Economist, 19 December, 2007).

[5] This definition is consistent with the „Final Report on Construction Industry Arbitrations", ICC International Court of Arbitration Bulletin Vol. 12 No 2 (2001) p. 8.

[6] This is the case even under a design and build contract, where the client employer is likely to have a consultant team acting on his behalf.

[7] Capper. P, "Why are there so many disputes for arbitration in construction", King's College, London, Centre for Construction Law & Management 10th Annual Conference (19 September 2007).

- **The nature of standard forms of construction and engineering contracts**

A large proportion of the construction industry relies on standard forms of contracts that leave a large amount of discretion to the contract administrator (architect or engineer). Though these matters have a contractual basis, the discretion is invariably exercised in relation to matters of a technical nature (this may cover scope of works, valuations for works carried out, the granting of extensions of time and the issuing of payment certificates). Once the discretion is exercised, the resulting decision can be challenged in adjudication, arbitration or before the courts. [8]

- **The particularity of the design and split responsibility for specification and/or design**

The majority of construction projects are one-off structures constructed in accordance with the employer‟s requirements, the use of the structure and the environment in which it sits. This places an increased significance on design which may evolve during the life of the project.

- **High degree of interactivity between purchaser and supplier**

The high incidence of interactivity in the design and construction process is a particular feature of the construction process. The client‟s ability to change the scope of the works has significant ramifications for the contractor in terms of budget and time for completion.

3. Visual representation of construction claims

3.1 As built v as planned

Construction disputes often involve claims for delay and disruption that involve large sums of money and require expert input. As to delay, it is acknowledged that a specified completion date agreed between the parties may, because of some intervening event, change, is assumed in standard forms of contract by the provision made for extensions of time.[9]

In relation to disruption, it is a particular feature of construction projects that labour productivity is easily disturbed by particular events such as late information, discrepancies between contract and specification documents, variations, lack of access to the site and other contractors working out of sequence. In recognition of this, standard forms of contract make provision for recovery of disruption related costs caused by certain events. Disruption can be described as any change in the method of performance or

[8] The JCT and ICE standard forms in particular leave a large amount of discretion and/or judgment of the architect or engineer.
[9] JCT clause 2.9; NEC clause 60; ICE clause 43, 47

planned work sequence contemplated by the contractor that prevents the contractor from actually performing in that manner.10 It is important that events that cause delay and/or disruption are clearly identified and isolated from those events those that have not. Of the methods that can be used to visually identify the effects of such delay events, the most widely used is the Critical Path Network (CPN) method. The CPN is a graphic representation of a planned construction process showing its interrelationship and interdependency. It is a computerised project management tool that allows a decision-maker to modify the sequence of work for the purpose of effective and efficient completion of the project. A CPN can take account of all the resources required (labour, plant and materials) to carry out the planned works. It is also able to identify the effects of events that occur during construction on the progress of the work and show where any delay and/or disruption occurred and where it could not have occurred. The CPN is a useful method for demonstrating cause and effect of delay by comparing ‚as-planned" with ‚as-built" (Figure 2 below).

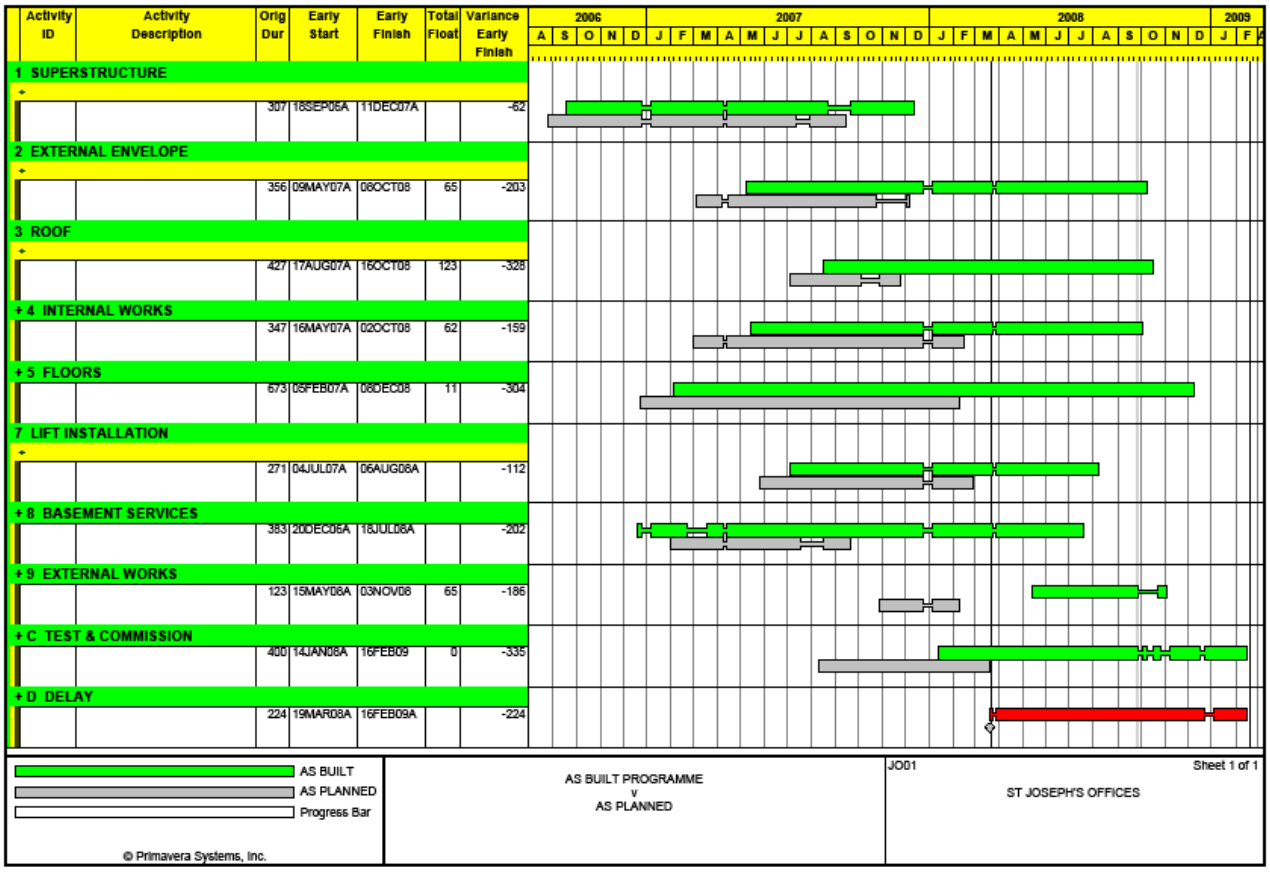

Figure 2: As-built v As-planned CPN Programme

[10] Toomey, D and Smith, R., (1990) Proving and Pricing Disruption Claims at para 6.1.

There are two main ways to create an as-built programme. The first is to create an as-built schedule from scratch using various types of project progress records. This is supplemented by information from correspondence, meeting minutes, document issue records, labour returns, and any other project information available. The summary bars shown provide a visual indication of the extent of the delay. The detail within each summary bar, including criticality can be examined to give more detailed information. The programme also shows disruption by the gaps in the bars. This as-built programme is then compared with the as-planned programme. Many CPN programmes on large complex projects detail thousands of activities. The facts in a dispute may not require the same detailed analysis of every activity. The challenge here is to streamline the information presented whilst limiting the risk of compromising the quality of process and the reliability of the results.[11]

As-planned v as-built can be used for identifying delays to progress but is restricted by its inability to identify concurrency, re-sequencing, mitigation or acceleration. Furthermore, when compiling a claim document or expert report in the traditional way, it can be difficult to convey the full extent of the problems faced on a project by using a series of time-slice programmes supported by narrative, however well-written it might be. This is where animation can assist.

[11] In *The Royal Brompton Hospital NHS Trust v Hammond (No. 7)* a case which concerned the alleged negligence of an architect in relation to the award of an extension of time Judge Seymour stated that the *"...accuracy of any methods in common use critically depends upon the quality of the information upon which the assessment exercise was based*". An illustrative example of the pitfalls of putting together a CPN programme can be found in *Skanska Construction v Egger (Barony)[2004] EHHC 1748* .In Skanska, two delay analysis experts were relied upon by parties to establish entitlement. The [trial judge] preferred the evidence and conclusions of claimant"s expert and criticised the defendant"s delay analysis expert for over reliance on the output of a computer programme. The Judge commented that computer programmes are only as good as the data they are fed. Furthermore, the expert appeared to have overly relied on a team of assistants in compiling his report to the extent that he lacked detailed knowledge of the contents of his own report.

4 Animation examples[12]

4.1 Animation no. 1 - as-built v as-planned

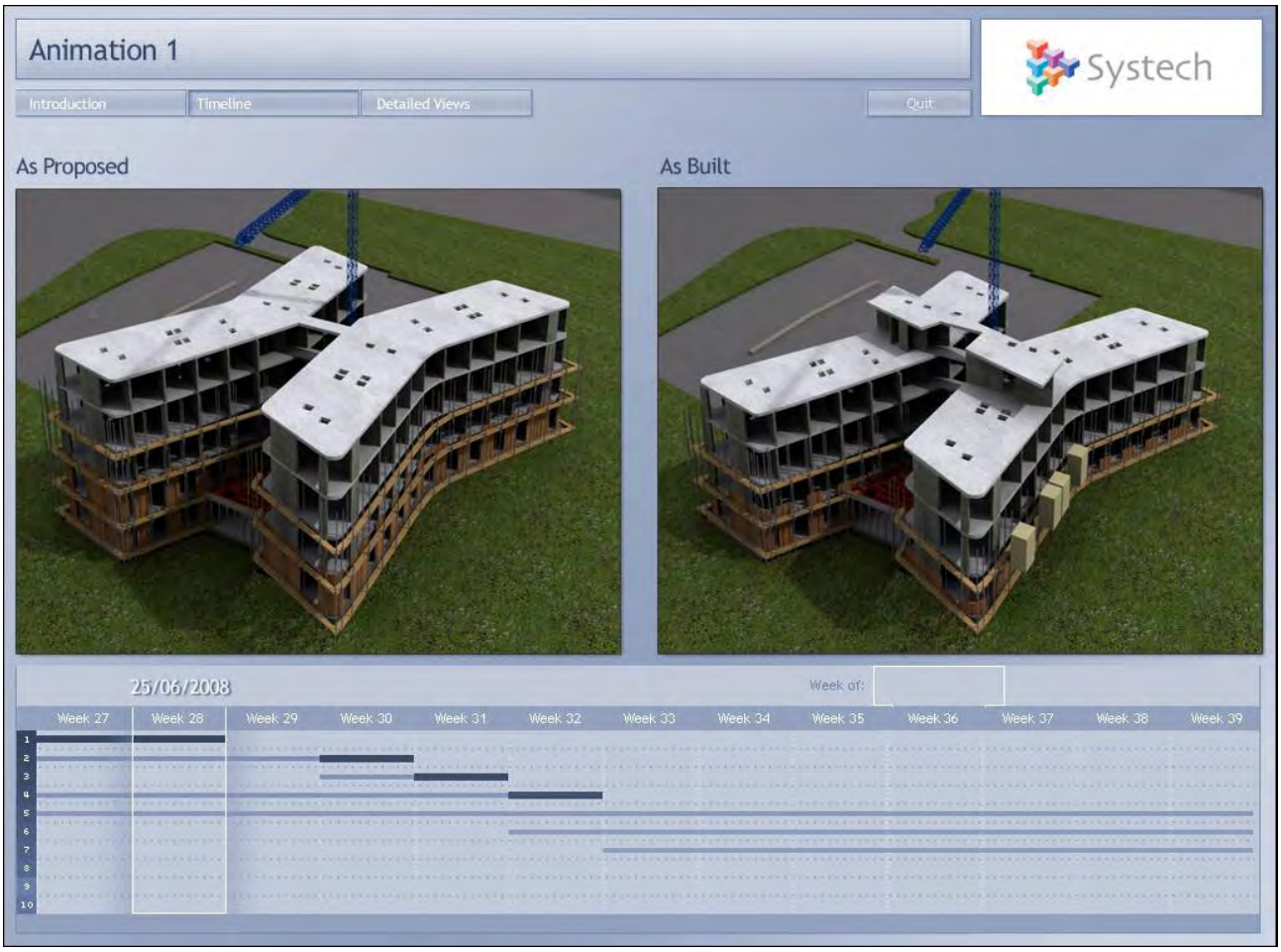

Figure 3. Animation 1 As-built v As-planned

Animation 1 is a comparison between the planned construction progress and the actual progress achieved by June 2008. It shows that the Contractor had planned to have the roof slab in place with the external envelope following, and for the concrete sub-contractor to have left site. In contrast, the progress actually achieved by that date was limited to completion of the roof structure over the stair and lift cores but the main roof sections over the wings had not been progressed. Figure 3 is able to visually convey not only the progress of the works, but project programme information along the lower part of the screen. Like Minard's chart, it brings project information to life and will support any pleading or claim document.

[12] The animation examples have been produced for illustrative purposes only and do not reflect live projects.

Furthermore, Animation 1 allows the viewer to explore the project further. There are three buttons on the top right hand corner of the screen shot:

- **Introduction** – is able to introduce the animation scenario and provide a brief project history, animation description and claim documents and/or pleadings can be shown here. It is possible for example to start with a slides show presentation illustrating key points of the animation.

- **Timeline** – this can be designed to include date and time, resources, and costs information,

- **Detailed views** – can provide different visual perspectives of the project such as fly through, bird‟s eye views, the project on a floor-by-floor basis etc.

4.2 Animation No 2 – additional project information

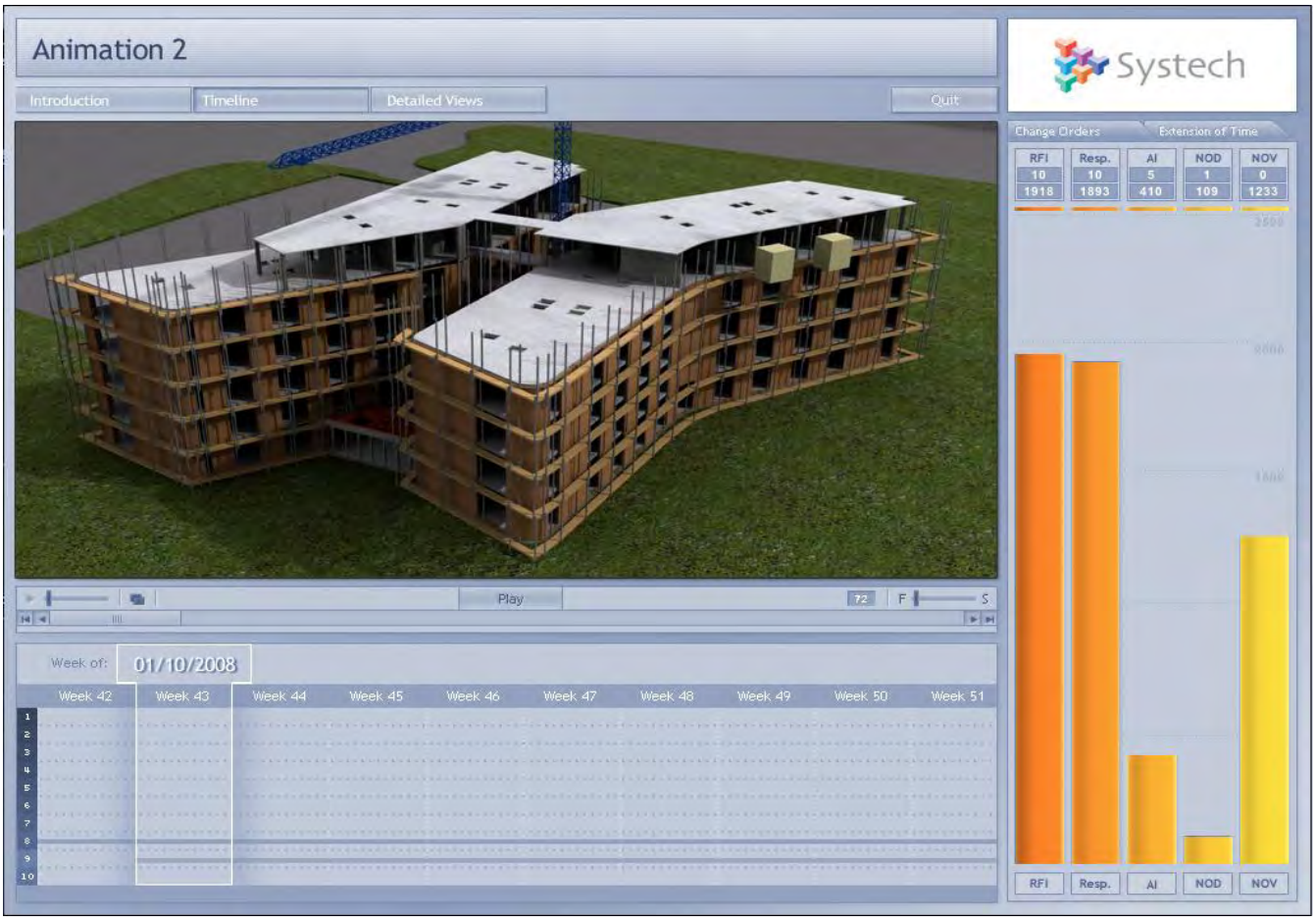

Figure 4: Animation 2 Additional Information

Animation No. 2 goes further in that it details information in relation to notices, architect‟s instructions, variations etc. The key to demonstrating disruption and/or loss of productivity is to establish that a planned event or sequence of events was affected by causes for which the employer bears the risk which results in the contractor being prevented from carrying out the work in the planned sequence. This involves:

- establishing a baseline;
- establishing the actual performance;
- identifying and analysing the differences between the baseline and actual performance.

A further step is to develop an analysis that demonstrates entitlement, damages and causation[13]. A contractor must show that the facts support its contentions that the event actually occurred and had the claimed disruptive effect on its progress. This must be further supported by evidence in support of the loss incurred.[14] . Animation No.2 is able to visually represent the information that can illustrate the reasons for the delay and/or disruption. This animation shows that by October 2008, some four months later, the contractor had only managed to make partial progress with the roof slabs due to design issues with the column loading details. The contractor had had to issue and consider 1,900 requests for information and 2.300 responses and instructions from the design team in relation to the feature roof plant rooms and executive offices at roof level. These changes – made well into the construction sequence – disrupted the progress of the concrete subcontractor who was working in a piecemeal manner when areas were released to them following clarification of the design. In addition to this there would have been a significant increased expenditure on design and site supervision which would need to be recovered.

The practicality of linking causation to effect in order to award a just extension to the contractor is a particular problem, given that many delays may be inter-related.

4.2.1 Concurrent delays

Animation No. 2 is also able to assist with illustrating the very complex concept of concurrent delay. Concurrent delay occurs where a delay is caused by two or more effective causes.[15] When both the Employer and Contractor have caused delay, the central question here is whether or not the Contractor is entitled to an extension of time. Two approaches have been used to assess concurrent delay in construction contracts:

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[13] Monarch Steamship Co Ltd v Karlshamms Oliefabriker (1949): “Causation is a mental concept, generally based on inference or induction fro uniformity of sequence as between two events that there is a causal connection between them…”
[14] Wiltshire Area Health Authority [1988] AC 1074
[15] Keating on Building Contracts 8th edn (2006) para 8-22 – 8-31

4.2.1.1 Dominant Cause

This approach to assessing concurrency provides that the delay is to be allocated to the more dominant of the concurrent events. Thus, if the dominant event is an employer-caused relevant event, then a contractor is awarded an extension of time for the delay. However, if the dominant event is a contractor-caused relevant event then no extension of time is allowed. This approach was given support in John Doyle Construction Ltd v Laing Management (Scotland) Ltd (2004) where Lord Drummond Young. [16]: The impact of this approach on delay claims is significant. For the purpose of determining a contractor"s entitlement to loss and expense, a distinction must be made between periods when the employer"s action is the dominant cause of the delay from those where there is concurrent default of the part of the contractor.[17]

4.2.1.2 Malmaison Approach

This approach, based on Henry Boot Construction (UK) v Malmaison Hotel (Manchester) Ltd[18], recognises that, as a matter of causation, any one delay or period of delay may be attributed to more than one delaying event. Thus, it appears that it will be sufficient for the contractor to succeed on his monetary claim if one delaying event is a sufficient basis to claim such money. The underlying logic for the Malmaison approach is that it simply reflects the allocation of risk agreed upon by the parties when they entered into the contract. Thus, the parties have been taken to recognise that:

- any one delay and/or period of delay might well be attributable to more than one cause; and
- provided one of the causes affords grounds for relief under the contract, then the contractor should have his relief.[19]

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[16] "… the question of causation must be treated by „the application of common sense to the logical principles of causation"…In this connection, it is frequently possible to say that an item of loss has been caused by a particular event notwithstanding that other events played a part in its occurrence. In such cases, if an event or events for which the employer is responsible can be described as the dominant cause of an item of loss, that will be sufficient to establish liability, notwithstanding the existence of other causes that are to some degree at least concurrent…"

[17] Burr. A, and Palles-Clark. R, "The Consideration of Critical Path Analysis in English Law", Const L.J. 2005, 21(3), p. 222

[18] (1999) 70 Con LR 32

[19] This approach was supported in The Royal Brompton Hospital NHS Trust v Hammond (No. 7) [2001] 76 Con. L.R 148, QBD (TCC). In dismissing a claim against the architect for negligence in granting an extension of time, Judge Seymour stated: "…if Taylor Woodrow was delayed in completing the works both by matters for which it bore the contractual risk and by relevant events, within the meaning of that term in the Standard Form, in the light of the authorities to which I have referred, it would be entitled to extension of time by reason of the occurrence of the relevant events notwithstanding its own defaults" at para 85.

In a construction dispute where matters of concurrency are in issue, an animation can greatly assist to communicate the effects of complex interactions of events. Animation No. 2 is able to illustrate the Malmaison approach. The information bars on the right hand panel can be used to detail the delay event and its impact.

4.3 Animation 3 – the impact of design changes

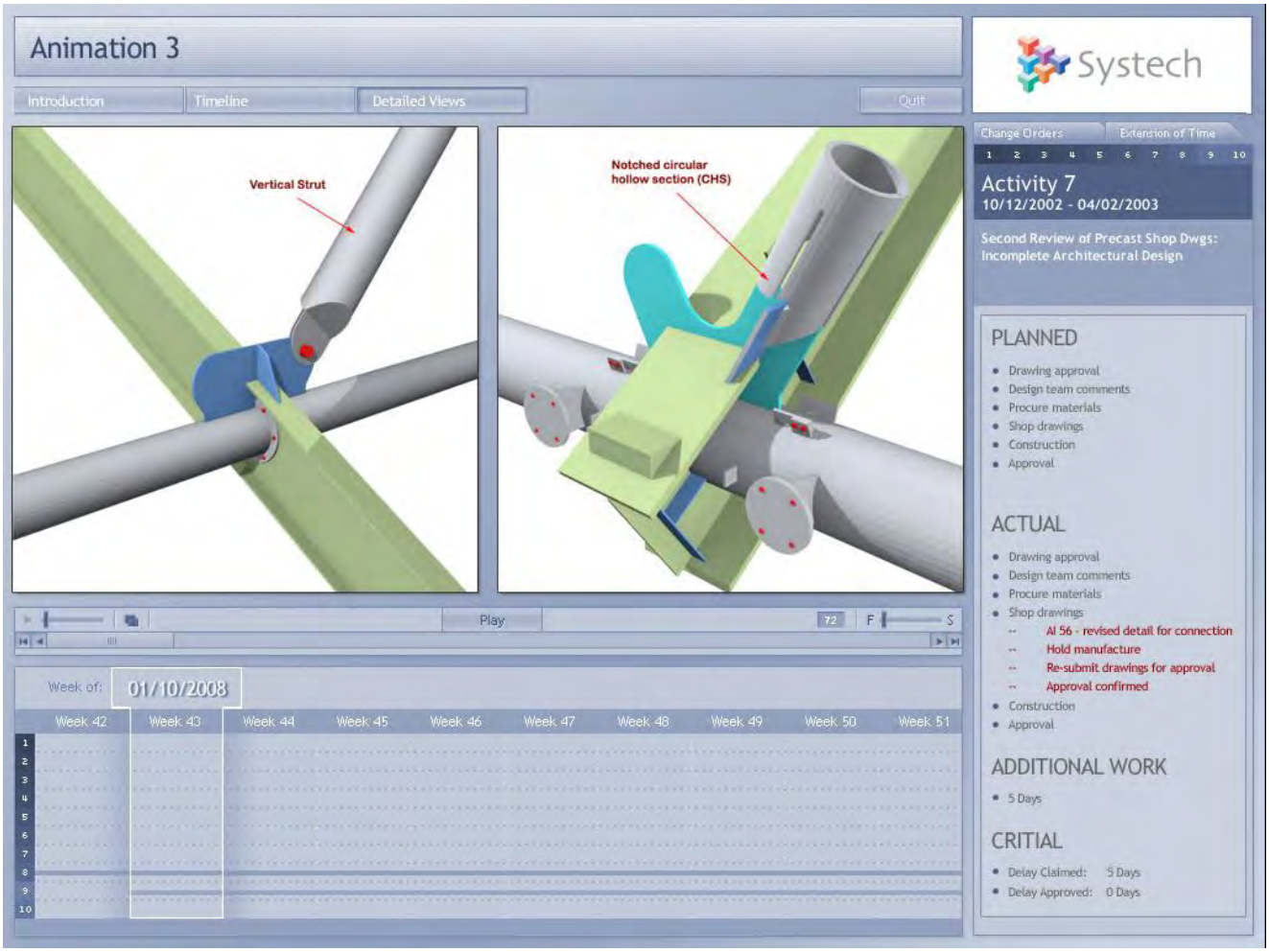

Figure 5. Animation 3 Design Changes

Animation 3 further demonstrates the versatility of animation. The right hand panel details a specific design change activity and its effect. Therefore, after being taken through an animation which provides an overview of the project and an as-built v as-planned analysis (Animation No. 1), one is able to look into the detail in terms of variations, architect‟s instructions etc (Animation No. 2). Animation No. 3 completes the visual presentation by providing the all-important detail. In many large and complex construction disputes, this level of detail will be dealt with in a paragraph in a claim narrative, pleadings

or form part of a schedule. However, bringing an individual activity to life can illustrate the impact of an otherwise complex scenario. This is particularly the case when it is part of a larger trend.

Animation 3 compares the planned sequence of Activity 7 with how it was actually carried out. The text panel on the right details the reasons for the delay (i.e. AI 56) and its impact in terms of additional days. It is possible to go much further. One can click on a particular reference and be hyperlinked to the relevant project documentation.

5 The use of animation before courts and tribunals

5.1 Admissibility

The case for using animation before a court or tribunal in support of a claim can be made positively if the parties have sanctioned its use or adopted during the currency of the project, either at tender stage or as part of a planning process or both. In order not to be accused of taking an opposing party by surprise, the animation should be served with the Statement of Case or appended to an expert witness report. A party‟s objections to the admissibility of animation is likely to be similar to those relied on when a pleading or part of a case is being attacked. The central argument will be that the animation presents the opposing party with insuperable difficulty in dealing with, and responding to it, thereby being prejudiced as a result.20 The party using the animation needs to persuade the court or tribunal that they are not putting forward a new or different case or one that cannot be dealt with. The main argument here is that the animation is based on existing materials and facts common to the parties and the project. This can be established by cross-referencing the animation with statements of case, agreed facts and project documentation. This approach seeks to establish that there is no new case to answer or material that is not already in play between the parties.

A party opposing the use of animation may additionally argue animation is not a conventional means of advancing a claim and the time taken to understand and deal with it would be disproportionate and costly. A response to this is to ask what is conventional? Technology is developing quickly and with it, new ways to present information. If animation assists a party in the presentation of their claim, then there is no reason why it cannot be used. If the steps taken and the information used to produce the animation are fully disclosed, then it is the underlying documentation which requires the analysis , a task the court or a tribunal will nevertheless have to carry out. Parties should be free to put their case as they choose, so long as the opposing party has the opportunity to meet and answer it. This might include an opposing party wanting to use animation to demonstrate their perspective that a particular process or scenario did not take

[20] See British Airways Pension Trustees Ltd v Robert McAlpine & Sons Ltd (1994) 72 BLR 26: “The basic principle of pleadings is to enable the opposing party to know what case is being made in sufficient detail to enable that party properly to prepare to answer it”, per Saville at pages 33-44.

place in the manner alleged. In this regard, the court in *The Pelopidas*[21], a case concerning a collision between two container ships stated as follows

> *"I am anxious to stress this point because there is a danger of losing sight of the true value of reconstructions. Of course they enable the Court and the parties to have a broad bird's eye view of the events leading up to the collision. But their true probative value is that they may sometimes enable the Court to determine, not what may have happened, but could not possibly have happened."*[22]

6. Conclusions

Although no consensus has emerged as to how such animation technology is to be used, animation is here to stay. As the use of multimedia technology increases, the benefits of envisioning complex information will find its way into the dispute context. With the complexity of large-scale projects and the sheer quantity and diversity of the documentation involved, animation can assist in illustrating a party"s case with precision. Like Minard"s statistical chart, animation can be used to communicate a wide variety of information whilst telling a powerful story.

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[21] [1999] 2 Lloyd's Rep 675 at 683
[22] ibid at 682

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The Pelopidas [1999] 2 Lloyd"s Rep 675

*The Royal Brompton Hospital NHS Trust v Hammond (No. 7) [*2001] 76 Con. L.R 148, QBD (TCC).

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