

Securing participation in project risk management through the use of visual aids

The Bow Tie Method

Robert J Chapman PhD, FIRM, FAPM, FICM
Dr Chapman and Associates Limited

Introduction

A key activity in the risk management process is engaging with those who have been called upon to provide expert judgement (based on their knowledge and experience gained from their education and their participation in other projects). However those participating in the risk process are normally responsible for carrying out a function on the project specific to a knowledge area, as defined by the PMI¹ (such as cost, time and procurement management). They are judged by their performance in carrying out their function rather than participating in risk management. Hence their priorities will always lie with what they see as their 'day job' and not the 'ancillary' activity of risk management. Completing their function activities will in most instances take precedence over risk management. Particularly when presentations have to be made to the client team, compulsory reports have to be prepared or regular meetings have to be chaired or attended. Given that large projects commonly assemble together a team where many of the members will not have worked together before, developing a supportive risk management culture can take a considerable time.

Communication

Given the pressures on their time, discipline representatives providing expert judgement expect the risk management process to be clear and its implementation well-structured and systematic. This is particularly true when they have to make time to share their knowledge of the potential difficulties in implementing the project, in the full knowledge that their own tasks are mounting in the background unattended. The extent to which they engage in the risk management process it could be argued will depend on how risk information is captured, disseminated and reported. Unless risk information is clear, concise, unambiguous, current, consistent and relevant, team members will disengage. In addition the degree to which discipline representatives will engage and even be stimulated by the process will be how quickly they can absorb the information being presented; how readily they can see the ramifications if identified threats materialise (or how opportunities might be exploited); and whether relationships between events are depicted that they had not realised existed. Visual representation of the risk information greatly enhances team members' ability to review and comment on the risk information. In addition extensive spreadsheet presentation of risk information can make the reader weary and unreceptive.

While research in the health sector has shown that people differ substantially in their ability to understand graphically presented information or 'graph literacy', given project

¹ US Project Management Institute Project Management Body of Knowledge (PMBOK®Guide) Fifth Edition.

information is regularly presented in graphical form (such as on dashboards) this observation is not considered pertinent to project personnel. A graphical representation of risk information that is gaining popularity is the Bow Tie method (sometimes written as 'bowtie').

Origins of the Bow Tie Method

The precise origins of the Bow Tie method are unclear however in the mid-1990s the Shell Group adopted the Bow Tie method as a company standard for analysing and managing risks². Within the petroleum industry the approach became known as the Shell Bow Tie method³. Shell facilitated extensive research in the application of the Bow Tie method and developed a strict rule set for the definition of all parts, based on their ideas of best practice. Shell disseminated their approach within the petroleum industry⁴. The benefits of the methodology have since been recognised in numerous other industries including the defence, medical, finance and aviation industries. The UK CAA have endorsed and published a Bow Tie strategy. This identifies how the CAA and the aviation industry can maximise the use of Bow Tie models as an effective and proactive safety risk management tool, to inform decision making to enable the right actions to be taken, achieving the best safety outcomes⁵.

Bow Tie overview

A Bow Tie is a pictorial representation of a threat identified in just one, easy to understand diagram (see Figure 1 below - which forms part of a larger presentation). The Top Event in the centre of Figure 1 is the threat to the project which in Bow Tie language represents a 'loss of control'. In the figure, the risk language of Cause, Threat and Consequence are adopted here, where the Threat is the potential downside risk which may arise as the result of one or more Causes. In the event the Threat materialises then there may be one or more Consequences (or outcomes). The Consequences would have a detrimental effect on securing the project objectives. Barriers are identified to strive to prevent the Causes from triggering the Top Event in the first instance or if the Top Event occurs preventing the Consequences from occurring or mitigating their impact. The diagram is shaped like a bow-tie, creating a clear differentiation between proactive and reactive risk management. It depicts the multiple potential causes of a threat together with multiple potential consequences. Hence the power of a Bow Tie diagram is that it gives you an overview of multiple plausible scenarios, in a single graphic. In short, it provides a simple, visual explanation of a threat which would be much more difficult to communicate by any other means. Given that the potential Causes and the proposed preventative Barriers (pro-active

² Shell International Exploration & Production B.V., (1995) "Overview Hazards and Effects Management Process, EP95-0300 HSE Manual" 16 October

³ TIP (2002). The Institute of Petroleum report of 'Workshop on human factors in the petroleum industry' November.

⁴ Shell (1996) Primrose M. J.; Bentley P.D.; van der Graaf G.C. ; Sykes R.M.(all Shell International Exploration and Production B.V.) *The HSE Management System in Practice- implementation*. SPE Health, Safety and Environment in Oil and Gas Exploration and Production Conference, 9-12 June, New Orleans, Louisiana.

⁵ <https://www.caa.co.uk/Blog-Posts/Bowtie-risk-models/?catid=157>

risk management actions) are illustrated together, participants in the risk management process can gain a more informed opinion of the probability of the threat materialising.

Causes

Causes are whatever will cause the Top Event. There may be multiple Causes. As with risk registers and risk logs the Cause descriptions must not be generic and must clearly articulate the reason why a Threat may potentially arise, should no pro-active action take place.

Consequences

There may be one or multiple Consequences. The Consequences would adversely affect one or more of the project objectives, typically cost, time and quality but may also include for instance safety, environment and reputation. The intention of the Bow Tie process is that Consequences are either prevented from occurring altogether or their impact is mitigated by the use of what are termed Mitigation Barriers. However there may be Escalation Factors which cause a barrier to fail. As a consequence what might be called Secondary Barriers are introduced to combat Escalation Factors.

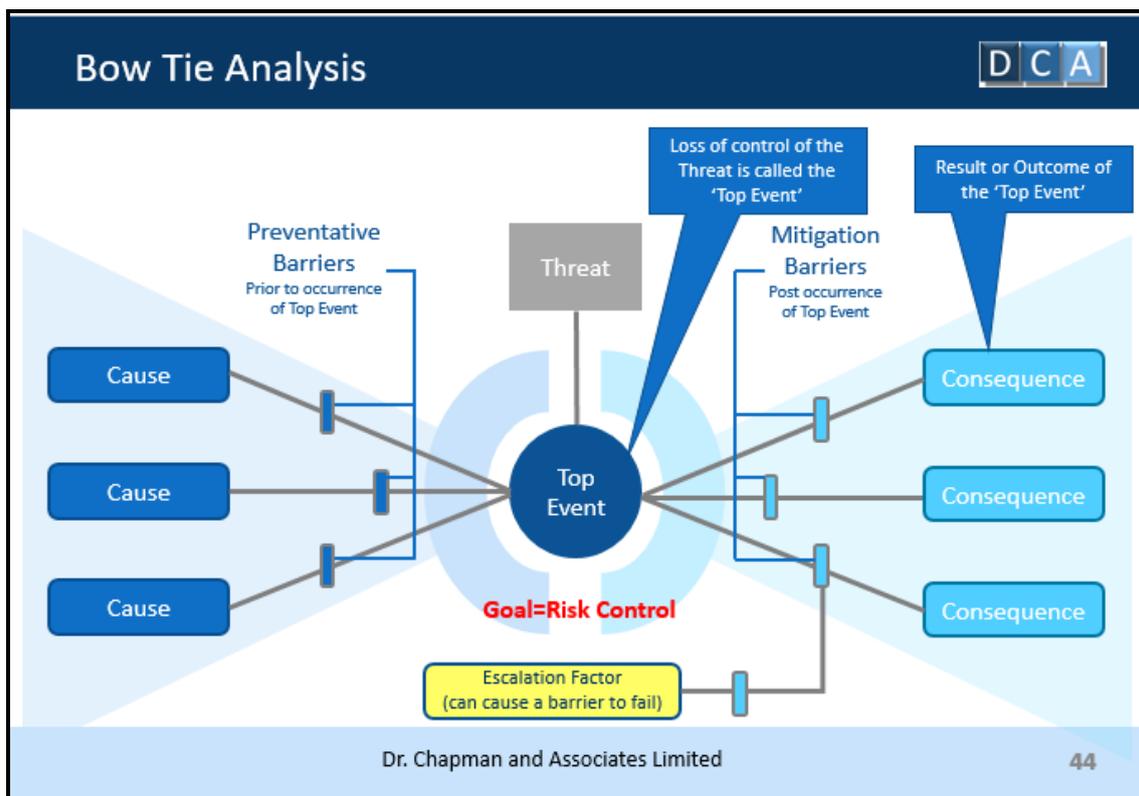


Figure 1: Bow Tie Analysis, illustrating the components of a Bow Tie diagram.

Example Bow Tie

Included below in Figure 2 is a completed Bow Tie for the situation where the Top Event is where a driver loses control of his car. The example is selected given how common the activity of driving a car is and that the vast majority of us can relate to the Top Event of loss of control where for example the road surface is icy or oily after a spill. In the festive season the potential cause of the Top Event might be driving while under the influence of alcohol. A preventative Barrier would be arranging in advance of a festive event a designated driver who would not drink alcohol. If it was considered that the top event could occur then a Barrier to the Consequence of an injury or fatality would be the wearing of a seat belt. However an Escalation Factor to the effectiveness of the Mitigation Barrier would be the driver not wearing a seat belt. The Barrier to the Escalation Event would be for instance a seat belt awareness campaign.

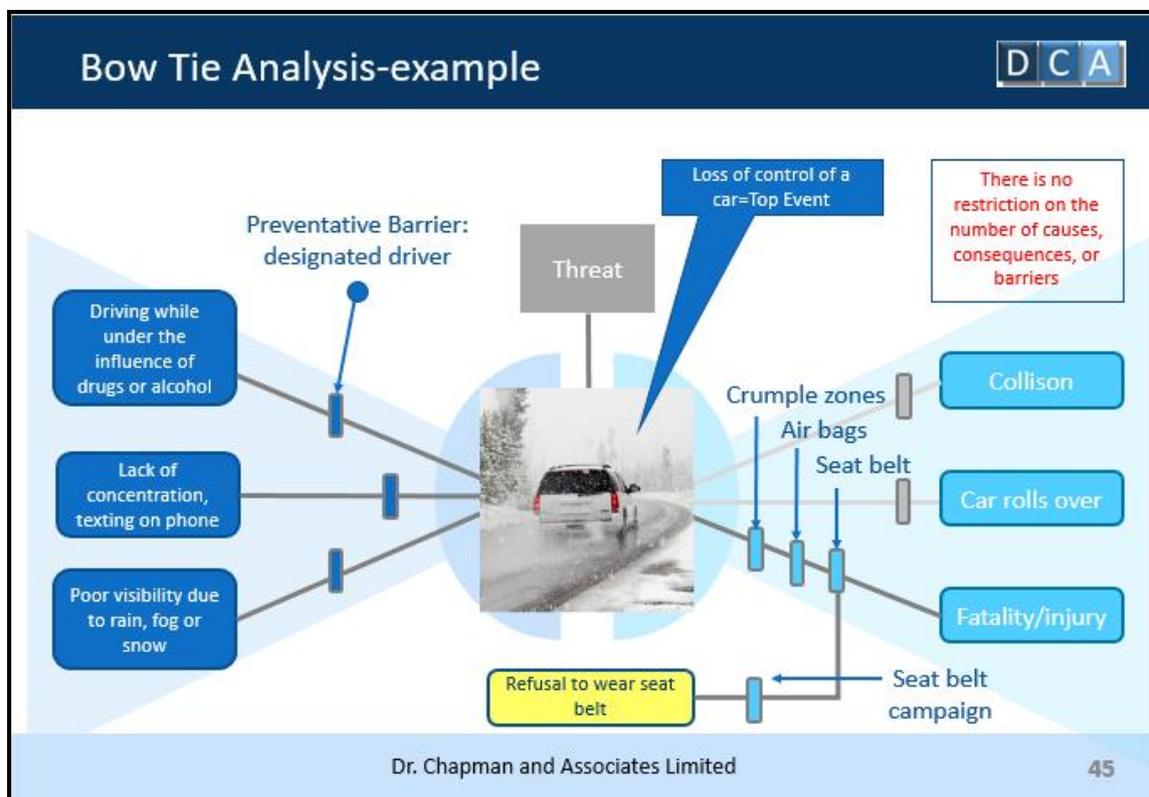


Figure 2: Bow Tie Analysis, using loss of control of a car as the Top Event.

Implementation of Barriers

For effective risk treatment actions the Bow Tie methodology must be supported by other more detailed records where the responsible individual (and organisation) are recorded along with the planned implementation date. These detailed records will be used during the Monitoring and Review step of the risk management process to understand if the

Treatments have been implemented, if they have been effective and if further Treatments are necessary.

Conclusion

It is suggested here that whenever it is possible, visual aids are used to capture and communicate risk information. This recommendation is based on the premise that project team members will be more receptive to engaging in the overall risk management process, (particularly in the identification of threats and SMART risk treatment actions), when working with visual aids than with spreadsheets and presentation summaries. The advantage of the Bow Tie technique is that the Causes to a Threat and the Consequences should they materialise can be illustrated together on a single page along with identified Barriers. The technique permits Project Managers to have a more engaging and productive dialogue with team colleagues as the threats and consequences can be assimilated far more quickly than searching dense text on spreadsheets. If one of the key goals of project risk management is to secure the sustained engagement of project team members in a productive collaborative working environment to support risk management processes, then all methods that can make this a reality should be explored.

About the Author



Robert J. Chapman, PhD

United Kingdom



Robert J Chapman is an international risk management specialist and Director of Dr Chapman and Associates Limited (www.drchapman-assoc.com). He is author of '*Simple tools and techniques for enterprise risk management*' 2nd edition, published by John Wiley and Sons Limited, '*The Rules of Project Risk Management, implementation guidelines for major projects*' published by Gower Publishing and '*Retaining design team members, a risk management approach*', published by RIBA Publications. He holds a PhD in risk management from Reading University and is a fellow of the IRM, APM and ICM and a member of the RIBA. He has provided risk management services in the UK, the Republic of Ireland, Holland, UAE, South Africa, Malaysia and Qatar on multi-billion programmes and projects. Robert has passed the M_o_R, APM and PMI risk examinations and provided M_o_R risk management training to representatives of multiple industries. He can be reached by email at robert.chapman@drchapmanassociates.co.uk