

# Book Review Essay

## Managing the Unexpected: Six Years of HRO-Literature Reviewed

Q1

This essay reviews research and application efforts from various high-reliability organizations projects for the time period 2001–2007. This interval was chosen because it is the period between publication of the first edition of *Managing the Unexpected: Assuring High Performance in an Age of Complexity* (Weick & Sutcliffe, 2001) and the second edition (Weick & Sutcliffe, 2007). Both books are 'how to' books and both discuss how high-reliability organizations (HROs) manage the unexpected by using five processes: preoccupation with failure rather than success, reluctance to simplify interpretations, sensitivity to operations, commitment to resilience, and deference to expertise. The second edition offers a valuable chapter on how small wins in all these areas can move one from less to more mindful functioning.

The period 2001–2007 was filled with HRO related activities:

- The theory blossomed despite the disruptive argument about the similarities and differences between high-reliability organizations theory and normal accidents theory (NAT, Perrow, 1984).
- The research extends the kind of organizations examined.
- Part of the work now extends HRO concepts into main stream organizational theory.
- There is a flurry of attempted applications, although the success of these attempts is still questionable.

Much of the work appears in organizational behavior journals. Some is in publications addressed to managers. A flurry is published in health care journals. A small number appears in education, communication and engineering outlets. A good deal of it is in book chapters rather than refereed journals. One study is book length (Roe & Schulman, 2008).

Q2

### 1. Theory development

In 1993, Scott Sagan said:

The scholarly literature about complex organizations is large and diverse, but two general competing schools of thought on this specific issue exist. The first is the optimistic view of what I will call 'high reliability theory,' whose proponents argue that extremely safe operations are possible, even with extremely hazardous technologies, if appropriate organizational design and management techniques are followed. The second school, what I will call 'normal accidents theory,' presents a much more pessimistic prediction: serious accidents with complex high technology systems are inevitable (Sagan, 1993, p. 13).

In his book about organizations, accidents and nuclear weapons, Sagan goes on comparing the two theories and finds HRO theory wanting in predicting misses and near misses. Initially, such a comparison was unwarranted because the two theories overlap in many ways. In 1994, this journal devoted a special issue to this comparison. Unfortunately, it continues to be made (e.g., Marais, Dulac, & Leveson, 2004; Scott, 2003; Rijpma, 2003), taking needed attention away from more productive pursuits. Rijpma said:

Q3

The debate between NAT and HRT was at first about the singular question whether disasters can be prevented or not. By now, it includes the question what the true causes of accidents and disasters are. Add to this the developments within NAT and HRT, and it becomes clear that the time has come to again draw up the balance sheet. Where do we stand now?

... one has to seriously question the use of the debate for the advancement of accident research and theory. I think the debate is not only at a deadlock, but has actually reached a dead end in itself. Any progress within the two perspectives is possible, but progress along the lines of this debate is further away than ever. (Rijpma, 2003, pp. 42–42)

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In addition to further developing concepts inherent in high-reliability theory such as mindfulness (e.g., Weick & Putnam, 2006), coordination (e.g., Faraj & Xiao, 2006) and latent errors (e.g., Ramanujam & Goodman, 2003), the theory itself has been extended. One interesting example is Myers and McPhee's (2006) multi-level investigation of the effect of group interaction and its influence on individual-level membership variables and group assimilation. A model of group socialization was modified to investigate the development and maintenance of highly interdependent workgroups in a high-reliability organization (a municipal fire department). The authors examined individual and crew level influence on four assimilation outcomes; involvement, trustworthiness, commitment and acceptance. At the individual level, acculturation predicted all four assimilation outcomes. At the crew level, crew performance affected commitment. Implications are drawn for the influence of group interaction on member assimilation. The study underscores the importance of multi-level research.

## 2. The kinds of organizations studied

HRO research began by investigating reliability-enhancing processes in US Navy carrier aviation (e.g., Rochlin, LaPorte, & Roberts, 1987), the Federal Aviation Administration's air traffic control operations (e.g., Schulman, 1993) and commercial nuclear power plants (e.g., LaPorte & Lasher, 1988). The early research was criticized because of its reliance on studies of organizations that have command and control over their technical cores and are highly regulated.

In 1999 and again in 2001, the Institute of Medicine of the National Academies conducted two studies of the quality of health care in the United States (Kohn, Corrigan, & Donaldson, 1999; Committee on Quality of Health Care in America, 2001). These studies unleashed a plethora of publications about health care settings (not highly regulated) as high- or low-reliability organizations. Most of the articles about reliability enhancement in health care are simply polemics (e.g., Carroll & Rudolph, 2006; Clarke, Lerner, & Marella, 2007; Welch & Jensen, 2007; Wilson, Burke, Priest, & Salas, 2005). Among the solid empirical studies in that industry is that of Klein et al. (Klein, Ziegert, Knight, & Ziao, 2006) qualitative study of 'leadership of extreme action teams – teams whose highly skilled members cooperate to perform urgent, unpredictable, interdependent, and highly consequential tasks (p. 590).' Klein and her colleagues find that 'dynamic delegation' in such teams enhances their performance. There are a number of other high-quality HRO studies in health care. Xiao and his colleagues at the University of Maryland conducted well-crafted research (e.g., Xiao, Moss, Mack-

enzie, Seagull, & Faraj, 2002; Xiao, Plasters, Seagull, & Moss 2004). They added to high-reliability theory by introducing and assessing the notion of a transactive responsibility system.

Kathleen Sutcliffe and Tim Vogus have teamed up to carry out several studies in health care settings. In a well-designed study, they found that 'the benefits of safety organizing on reported medication errors were amplified when paired with high levels of trust in manager or use of care pathways' (2007, p. 1).

A longitudinal study of a school reform effort in Great Britain showed that high-reliability processes could successfully increase student test scores (Reynolds, Stringfield, & Schaeffer, 2006). A more recent 'longitudinal analysis' of outcome data from 12 Welsh secondary schools indicates that four years after the effort was initiated, the results at all sites were strongly positive. Additional quantitative and qualitative data, gathered 4 years after the end of the intervention, indicate that the majority of the schools continue using high-reliability principles and continued strong progress (Stringfield, Reynolds, & Schaffer, in press).

Possibly the most extensive study of a high-reliability organizations is Roes and Schulman' (2008) multi-year study of the California Independent System Operator (CAISO), the transmission manager of California' electrical grid. Here, we have an organization that does not have command and control over its technical core. These authors put their analyses of issues in high-reliability management into a strategic perspective and discuss the implications of their findings for the high-reliability management of infrastructures in other social and organizational settings.

High-reliability processes have also been examined in other kinds of organizations, including aviation (e.g., Burke, Wilson, & Salas, 2005); the Columbia space shuttle (e.g., Starbuck & Farjoun, 2005); manufacturing (Clarke & Ward, 2006); a military armoured brigade (Zohar, 2008); offshore platforms (e.g., Bea, 2002); a police force (Roberts, Yu, Desai, & Madsen, 2008); Scandinavian civil aviation, commercial nuclear power, and oil production (Svenson, Salo, Oedewald, Reiman, & Skjerve, 2006); submarines (e.g., Bierly, Gallagher, & Spender, 2008; Roberts & Tadmor, 2002); UK train operations (Jeffcott, Pidgeon, Weyman, & Walls, 2006); and wildland and urban fire fighting (e.g., Bigley & Roberts, 2001; Christenson, De Grosky, Black, Fey, & Vidal, 2006).

## 3. HRO theory and mainstream organizational theory

Many authors are beginning to link HRO theory to other often well-studied issues in organizational research and other areas. Most frequently, these studies

link HRO theory to leadership (e.g., Bellamy, Crawford, Marshall, & Coulter, 2005; Clarke & Ward, 2006; Klein et al., 2006; Vogus & Sutcliffe, 2007), organizational learning (e.g., Carroll, Rudolph, & Hatakenaka, 2002; Quinn, 2005; Zhao & Olivera, 2006), organizational change or transformation (e.g., Burke et al., 2005; Vogus & Sutcliffe, 2007), innovation (Bierly, et. al., 2008) and institutional theory (Burke, et. al., 2005). One study links mindfulness in HROs to the vast literature on less mindful behavior (Levinthal & Rerup, 2006). Another investigation relates sensemaking to the growing literature on voice and silence (Blatt, Christianson, Sutcliffe, & Rosenthal, 2006), and yet another to bandwagon effects (Fiol & O'Connor, 2003).

Besides the organizational literature, there have been attempts to relate HRO concepts to other concepts. For example, in education HRO has been linked to the fail-safe school framework (Bellamy et al., 2005). There is also an attempt to extend strategic human resource management thinking to theory and research in HROs (Ericksen & Dyer, 2005).

#### 4. Application

Many attempts at applying HRO theory in real organizations were implemented in the 2001–2007 time period. Most notable are attempts in the health care industry. Leonard, Graham, and Bonacom (2004) describe their clinical experience in applying surgical briefings, HRO properties to perinatal care, the value of critical event training and simulation, and the benefits of standardized communication in the caring of patients transferred from hospitals to skilled nursing facilities. Van Stralen, Calderon, Lewis, and Roberts (2008) and Madsen, Desai, and Roberts (2006) describe an effort to implement HRO processes that ultimately failed in a sub-acute health care facility serving profoundly damaged children. In 2006, Dixon and Schoffer reported an investigation by the Agency for Health Care Research and Quality (AHRQ) that found that most health care workers are not versed on HRO processes. Further, most programmes reported that they were at the just at the beginning of the safety journey.

Application of HRO in health care is problematic for several reasons. First, medicine evolved from a mechanical, deterministic model where diagnosis determines treatment and treatment determines outcomes. Second, HRO is a process rather than an implementable structure. Both these are incompatible with the underlying assumptions of medicine. Third, HRO is a decentralized system trying to operate in a centralized world (Dr. Daved Van Stralen, personal communication).

The US Department of Energy (DOE) recently provided requirements and guidance for DOE contrac-

tors to ensure the development and implementation of effective integrated safety systems that include HRO processes (United States Department of Energy, 2006). Both BP and B&W Pantex provide their field personnel with guidelines for incorporating HRO processes into their organizations (BP, 2006; B&W Pantex, 2008). How these have worked is not clear. HRO processes are discussed at NASA, Alaska Airlines, StatOil/Hydro, the Italian Air Force, the Risk Management Association (which provides training for the financial sector), and a number of other organizations.

The US Navy submarine and carrier aviation services have long been successful at implementation efforts. Commercial aviation claims the same success – worldwide.

#### 5. Conclusions

A flurry of activity relevant to HRO research and application has been undertaken since 2001. In the research area the theory itself is better developed, and the research has evolved from solely case study work to quantitative investigations. HRO concepts are now better embedded in the mainstream organizational behaviour literature and have extended to other literatures, such as engineering and education. Considerable implementation efforts have been made. Their success or failure rides on the fact that HRO is not 'one size fits all.' It is a tool box from which discerning managers must pick the tools best suited to their own situations, modify those tools and be perceptive to the changing nature of their situations and to the tools that will fit those situations. As one of the proponents of HRO in the engineering domain remarked, "it's just one damned thing after another" (Robert Bea, personal communication). Kathleen Sutcliffe mirrored this when she said 'this is very hard work' (personal communication).

#### References

- Bea, R. (2002), 'Human and Organizational Factors in Risk Analysis and Management of Offshore Structures', *Risk Analysis*, Volume 22, pp. 29–45.
- Bellamy, G.T., Crawford, L., Marshall, L.H. and Coulter, G.A. (2005), 'The Fail Safe Schools Challenge: Leadership Possibilities for High Reliability Organizations', *Educational Administration Quarterly*, Volume 41, pp. 383–412.
- Bierly, P., Gallagher, S. and Spender, J.C. (2008), 'Innovation and Learning in High Reliability Organizations: A Case Study of the United States and Russian Nuclear Attack Submarines', *IEEE Transactions in Engineering Management*, Volume 35, pp. 393–408.
- Bigley, G.A. and Roberts, K.H. (2001), 'Structuring Temporary Systems for High Reliability', *Academy of Management Journal*, Volume 44, pp. 1281–1300.

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- Blatt, R., Christianson, M.K., Sutcliffe, K.M. and Rosenthal, M.M. (2006), 'A Sensemaking Lens on Reliability', *Journal of Organizational Behavior*, Volume 27, pp. 897–917.
- Burke, C.S., Wilson, K.A. and Salas, E. (2005), 'The Use of a Team Based Strategy for Organizational Transformation: Guidance for Moving Toward a High Reliability Organization', *Theoretical Issues in Ergonomic Science*, Volume 6, pp. 509–530.
- BP (2006), *Refining and Pipelines Leadership Fieldbook*.
- B&W Pantex (2008), *High Reliability Operations: A Practical Guide to Avert the System Accident*.
- Carroll, J.S. and Rudolph, J. (2006), 'Design of High Reliability Organizations in Health Care', *Quality and Safety in Health Care*, Volume 15, pp. 14–19.
- Carroll, J.S., Rudolph, J.W. and Hatakenaka, S. (2002), 'Learning from Experience in High Hazard Organizations', in Staw, B. (ed.), *Research in Organizational Behavior*, Elsevier, Amsterdam, pp. 87–137.
- Christenson, D.A., DeGrosky, M., Black, A., Fey, B. and Vidal, R. (2006), *High Reliability Organizing Implementation at Sequoia and Kings Canyon National Parks*, Wildland Fires Lessons Learned Center, Tucson, AZ.
- Clarke, J.R., Lerner, J.C. and Marella, W. (2007), 'The Role of Leaders of Health Care Organizations in Patient Safety', *American Journal of Medical Quality*, Volume 22, pp. 311–318.
- Clarke, S. and Ward, K. (2006), 'The Role of Leader Influence Tactics and Safety Climate in Engaging Employee's Safety Participation', *Risk Analysis*, Volume 26, pp. 1175–1185.
- Committee on Quality of Health Care in America (2001), *Crossing the Quality Chasm: A New Health System for the 21st Century*, National Academics Press, Washington, DC.
- Dixon, N.M. and Schoffer, M. (2006), 'Struggling to Invent High Reliability Organizations in Health Care Settings: Insights from the Field', *Health Services Research*, Volume 41, pp. 1618–1632.
- Ericksen, J. and Dyer, J. (2005), 'Toward a Strategic Human Resource Management Model of High Reliability Organization Performance', *International Journal of Human Resource Management*, Volume 16, pp. 907–928.
- Faraj, S. and Xiao, Y. (2006), 'Coordination in Fast Response Organizations', *Management Science*, Volume 52, pp. 1155–1169.
- Fiol, M. and O'Connor, E.J. (2003), 'Waking Up: Mindfulness in the Fact of Bandwagons', *Academy of Management Review*, Volume 28, pp. 54–70.
- Jeffcott, S., Pidgeon, N., Weyman, A. and Walls, J. (2006), 'Risk, Trust, and Safety Culture in U.K. Train Operating Companies', *Risk Analysis*, Volume 26, pp. 1105–1121.
- Klein, K., Ziegert, J.C., Knight, A.R. and Xiao, Y. (2006), 'Dynamic Delegation: Hierarchical, Shared, and Deindividualized Leadership in Extreme Action Teams', *Administrative Science Quarterly*, Volume 51, pp. 590–621.
- Kohn, L.T., Corrigan, J.M. and Donaldson, M.S. (1999), *To Err is Human: Building a Safety Health System*, National Academies Press, Washington, DC.
- LaPorte, T.R. and Lasher, T. (1988), *Cold Turkeys and Task Forces: Pursuing High Reliability in California's Central Valley*. Working Paper 88-25, Institute of Governmental Studies, University of California, Berkeley, CA.
- Leonard, M., Graham, S. and Bonacom, D. (2004), 'The Human Factor: The Critical Importance of Effective Communication in Providing Safe Care', *Quality and Safety in Health Care*, Volume 13, pp. i85–i90.
- Levinthal, D. and Rerup, C. (2006), 'Crossing an Apparent Chasm: Bridging Mindful and Less-Mindful Perspectives on Organizational Learning', *Organization Science*, Volume 17, pp. 502–513.
- Madsen, P., Desai, V. and Roberts, K.H. (2006), 'Designing for High Reliability: The Birth and Evolution of a Pediatric Intensive Care Unit', *Organization Science*, Volume 17, pp. 239–248.
- Marais, K., Dulac, N. and Leveson, N. (2004), *Beyond Normal Accidents and High Reliability Organizations: The Need for an Alternative Approach to Safety in Complex Systems*. Paper Presented at the Engineering Systems Division Symposium, MAT, Cambridge, March 29–31.
- Myers, K.K. and McPhee, R.D. (2006), 'Influences on Member Assimilation in Work Groups in High-Reliability Organizations: A Multilevel Analysis', *Human Communication Research*, Volume 32, pp. 440–468.
- Perrow, C. (1984), *Normal Accidents: Living with High Risk Technologies*, Basic Books, New York.
- Ramanujam, R. and Goodm, P.S. (2003), 'Latent Errors and Adverse Organizational Consequences', *Journal of Organizational Behavior*, Volume 24, pp. 815–836.
- Reynolds, D., Stringfield, S. and Schaffer, E. (2006), 'The High Reliability Schools Project. Some Preliminary Results and Analyses', in Crispeels, J. and Harris, A. (eds.), *School Improvement: International Perspectives*, Routledge, London, pp. 56–76.
- Roberts, K.H. and Tadmor, C.T. (2002), 'Lessons Learned from Non-Medical Industries: The Tragedy of the USS Greenville', *Quality and Safety in Health Care*, Volume 11, pp. 355–357.
- Roberts, K.H., Yu, K.F., Desai, V. and Madsen, P. (2008), 'Employing Adaptive Structuring as a Cognitive Decision Aid in High Reliability Organizations', in Hodgkinson, G.P. and Starbuck, W.H. (eds.), *The Oxford Handbook of Organizational Decision Making*, Oxford, New York, pp. 194–210.
- Rochlin, G.I., LaPorte, T.R. and Roberts, K.H. (1987), 'The Self Designing High-Reliability Organization: Aircraft Carrier Flight Operations at Sea', *Naval War College Review*, Volume 40, pp. 76–90.
- Sagan, S. (1993), *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons*, Princeton University Press, Princeton, NJ.
- Schulman, P. (1993), 'The Analysis of High Reliability Organizations: A Comparative Framework', in Roberts, K.H. (ed.), *New Challenges to Understanding Organizations*, Macmillan, New York.
- Scott, W.R. (2003), *Organizations: Rational, Natural, and Open Systems*, Prentice-Hall, Upper Saddle River, NJ.
- Starbuck, W.H. and Farjoun, M. (2005), *Organization at the Limit: Lessons from the Columbia Disaster*, Blackwell, Malden, MA.
- Stringfield, S., Reynolds, D. and Schaffer, E.C. (in press), 'Improving Secondary Students' Academic Achievement Through a Focus on Reform Reliability: Four and Nine Year Findings from the High Reliability Project', *School Effectiveness and School Improvement*.



- 1 Svenson, O., Salo, I., Oedewald, P., Reiman, T. and Skerve, A.  
 2 (2006), *Nordic Perspective on Safety Management in High*  
 3 *Reliability Organizations: Theory and Application*, NKS Secre-  
 4 tariat, Roshilde, Denmark.
- 5 United States Department of Energy (2006), *Integrated Safety*  
 6 *Management Systems Manual*. <http://www.directives.doe.gov>
- 7 Q17 Vogus, T.J. and Sutcliffe, K.M. (2007), 'The Impact of Safety  
 8 Organizing, Trusted Leadership and Care Pathways on  
 9 Reported Medication Errors in Hospital Nursing Unites',  
 10 *Medical Care*, Volume 45, pp. 1–6.
- 11 Weick, K.E. and Putnam, T. (2006), 'Organizing for Mind-  
 12 fulness: Eastern Wisdom and Western Knowledge', *Journal*  
 13 *of Management Inquiry*, Volume 15, pp. 275–287.
- 14 Weick, K.E. and Sutcliffe, J. (2007), *Managing the Unexpected:*  
 15 *Resilient Performance in an Age of Uncertainty* (2nd edn), Eiley,  
 16 New York.
- 17 Weick, K.E. and Sutcliffe, K. (2001), *Managing the Unexpected:*  
 18 *Assuring High Performance in an Age of Complexity*, Jossey  
 19 Bass, San Francisco.
- 20 Welch, S. and Jensen, K. (2007), 'The Concept of Reliability in  
 21 Emergency Medicine', *American Journal of Medical Quality*,  
 22 Volume 22, pp. 50–58.
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- Wilson, K.A., Burke, C.S., Priest, H.A. and Salas, E. (2005),  
 'Promoting Health Care Safety through Training High  
 Reliability Teams', *Quality and Safety in Health Care*, Volume  
 14, pp. 303–309.
- Xiao, Y., Moss, J., Mackenzie, C.F. and Seagull, F.J. (2002),  
*Transactive Responsibility Systems and High Reliability Teams a*  
*Tentative Formulation*, Proceedings of the Human Factors  
 and Ergonomics Society 46th Meeting, pp. 1428–1439. Q18
- Xiao, Y., Plasters, C., Seagull, F. and Moss, J. (2004), *Cultural*  
*and Institutional Conditions for High Reliability Teams*, IEEE  
 International Conference on Systems, Man, and Cyber-  
 netics, pp. 2580–2585. Q19
- Zhao, B. and Olivera, F. (2006), 'Error Reporting in Organiza-  
 tions', *Academy of Management Review*, Volume 31, pp.  
 1012–1030.
- Zohar, D. and Luria, G. (2008), 'Organizational Meta Scripts as  
 a Source of High Reliability: The Cas of an Army Armored  
 Brigade', *Journal of Organizational Behavior*, Volume 24, pp.  
 837–859.

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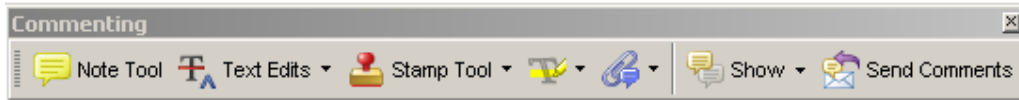


## USING E-ANNOTATION TOOLS FOR ELECTRONIC PROOF CORRECTION

### Required Software

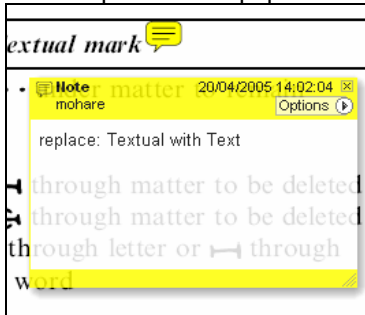
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Once you have Acrobat Reader 8 on your PC and open the proof, you will see the Commenting Toolbar (if it does not appear automatically go to Tools>Commenting>Commenting Toolbar). The Commenting Toolbar looks like this:



### Note Tool — For making notes at specific points in the text

Marks a point on the paper where a note or question needs to be addressed.

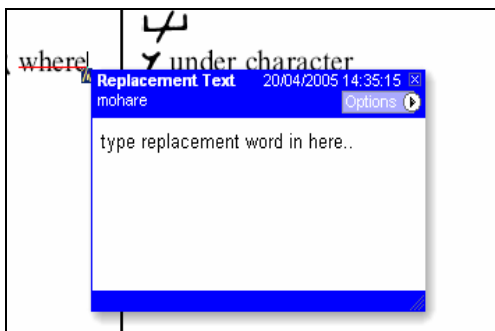


#### How to use it:

1. Right click into area of either inserted text or relevance to note
2. Select Add Note and a yellow speech bubble symbol and text box will appear
3. Type comment into the text box
4. Click the X in the top right hand corner of the note box to close.

### Replacement text tool — For deleting one word/section of text and replacing it

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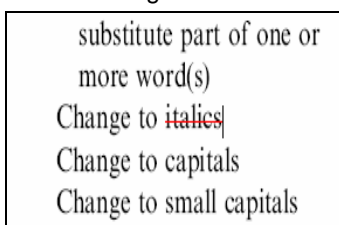


#### How to use it:

1. Select cursor from toolbar
2. Highlight word or sentence
3. Right click
4. Select Replace Text (Comment) option
5. Type replacement text in blue box
6. Click outside of the blue box to close

### Cross out text tool — For deleting text when there is nothing to replace selection

Strikes through text in a red line.



#### How to use it:

1. Select cursor from toolbar
2. Highlight word or sentence
3. Right click
4. Select Cross Out Text

### Approved tool — For approving a proof and that no corrections at all are required.



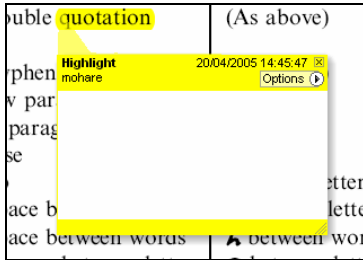
#### How to use it:

1. Click on the Stamp Tool in the toolbar
2. Select the Approved rubber stamp from the 'standard business' selection
3. Click on the text where you want to rubber stamp to appear (usually first page)



**Highlight tool — For highlighting selection that should be changed to bold or italic.**

Highlights text in yellow and opens up a text box.

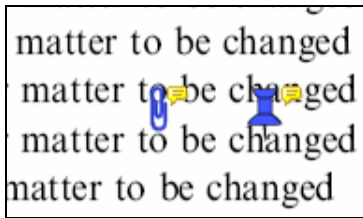


**How to use it:**

1. Select Highlighter Tool from the commenting toolbar
2. Highlight the desired text
3. Add a note detailing the required change

**Attach File Tool — For inserting large amounts of text or replacement figures as a files.**

Inserts symbol and speech bubble where a file has been inserted.

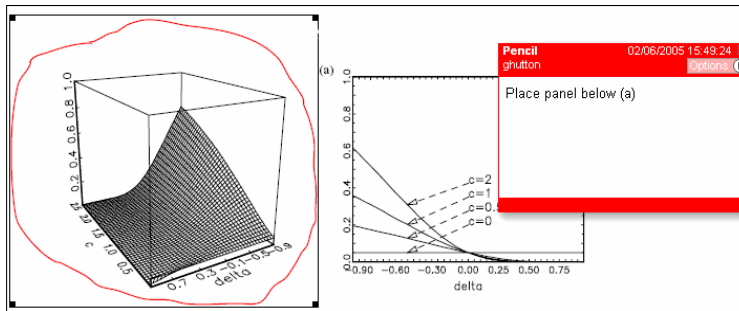


**How to use it:**

1. Click on paperclip icon in the commenting toolbar
2. Click where you want to insert the attachment
3. Select the saved file from your PC/network
4. Select appearance of icon (paperclip, graph, attachment or tag) and close

**Pencil tool — For circling parts of figures or making freeform marks**

Creates freeform shapes with a pencil tool. Particularly with graphics within the proof it may be useful to use the Drawing Markups toolbar. These tools allow you to draw circles, lines and comment on these marks.



**How to use it:**

1. Select Tools > Drawing Markups > Pencil Tool
2. Draw with the cursor
3. Multiple pieces of pencil annotation can be grouped together
4. Once finished, move the cursor over the shape until an arrowhead appears and right click
5. Select Open Pop-Up Note and type in a details of required change
6. Click the X in the top right hand corner of the note box to close.

**Help**

For further information on how to annotate proofs click on the Help button to activate a list of instructions:

