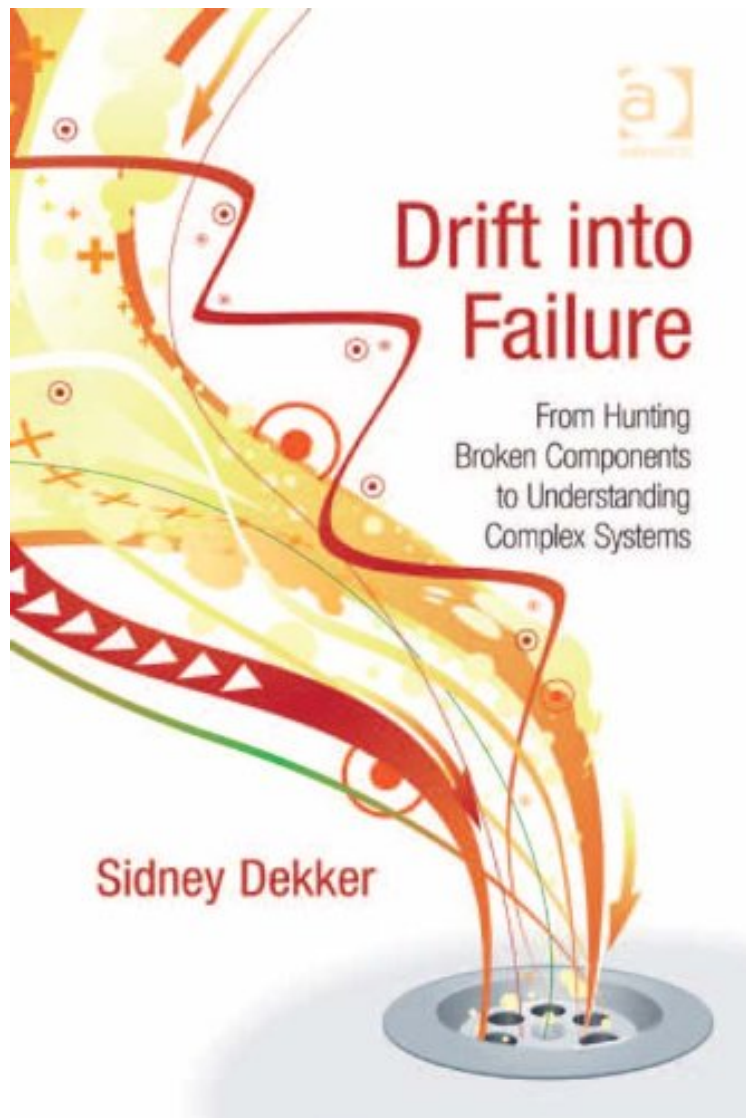


(Pdf free) Drift into Failure: From Hunting Broken Components to Understanding Complex Systems

# Drift into Failure: From Hunting Broken Components to Understanding Complex Systems

*Sidney Dekker*

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**Sidney Dekker : Drift into Failure: From Hunting Broken Components to Understanding Complex Systems**

before purchasing it in order to gage whether or not it would be worth my time, and all praised Drift into Failure: From Hunting Broken Components to Understanding Complex Systems:

10 of 10 people found the following review helpful. Informative and Thought-ProvokingBy White WolfThis book is a noteworthy effort to provide new insights into how accidents and other bad outcomes occur in large organizations. Dekker begins by describing two competing world views, the essentially mechanical view of the world spawned by

Newton and Descartes (among others), and a view based on complexity in socio-technical organizations and a systems approach. He shows how each world view biases the search for the "truth" behind how accidents and incidents occur. The Newtonian-Cartesian world is ruled by invariant cause-and-effect; it is, in fact, a machine. If something bad happens, then there was a unique cause or set of causes. Investigators search for these broken components, which could be physical or human. It is assumed that a clear line exists between the broken part(s) and the overall behavior of the system. The explicit assumption of determinism leads to an implicit assumption of time reversibility--because system performance can be predicted from time A if we know the starting conditions and the functional relationships of all components, then we can start from a later time B (the bad outcome) and work back to the true causes. Root cause analysis and criminal investigations are steeped in this world view. In contrast, a complex system is open (it interacts with its environment), has components that act locally and don't know the full effects of their actions, is constantly making decisions to maintain performance and adapt to changing circumstances, and has non-linear interactions (small events can cause large results) because of multipliers and feedback loops. Complexity is a result of the ever-changing relationships between components. The most important feature of a complex system is that it adapts to its environment over time in order to survive. And its environment is characterized by resource scarcity and competition. There is continuous pressure to maintain production and increase efficiency (and their visible artifacts: output, costs, profits, market share, etc) and less visible outputs, e.g., safety, will receive less attention. The cumulative effect of multiple adaptive decisions can be an erosion of safety margins and a changed response of the entire system--a drift into failure. Drift by a complex system exhibits several characteristics. First, as mentioned above, it is driven by environmental factors. Second, drift occurs in small steps so changes can be hardly noticed, and even applauded if they result in local performance improvement. Third, complex systems contain unruly technology (think deepwater drilling) where uncertainties exist about how the technology may be ultimately deployed and how it may fail. Fourth, there is significant interaction with a key environmental player, the regulator, and regulatory capture can occur, resulting in toothless oversight. "Drifting into failure is not so much about breakdowns or malfunctioning of components, as it is about an organization not adapting effectively to cope with the complexity of its own structure and environment." (p. 121) Drift and occasionally accidents occur because of ordinary system functioning, normal people going about their regular activities making ordinary decisions "against a background of uncertain technology and imperfect information." Accidents can be viewed as an emergent system property, i.e., they are the result of system relationships but cannot be predicted by examining any particular system component. This book is not a quick read. Dekker spends a lot of time developing his theory, then circling back to further explain it or emphasize individual pieces. He reviews incidents (airplane crashes, a medical error resulting in patient death, software problems, public water supply contamination) and descriptions of organizational evolution (NASA, international drug smuggling, "conflict minerals" in Africa, drilling for oil, terrorist tactics, Enron) to illustrate how his approach results in broader and arguably more meaningful insights than the reports of official investigations. One star off for repetitiveness, occasional Carl Sagan-like pedantry and poor proof-reading of the final couple of chapters. 2 of 2 people found the following review helpful. Brilliant, but will managers read it? By Bluebottle I originally read this book and was thoroughly impressed. I had spent many years studying complexity science, and whilst this book was no real surprise, it was fascinating. I have since purchased many copies in the hope of educating mindless managers of the futility of their safety systems. I work in the mining industry in Australia and this industry is paranoid about safety. There are many many initiatives, innumerable systems, endless tick-boxes, boring mindless safety meetings and really to no avail. I presented my immediate managers these books. Very few considered reading them, and most obviously didn't. The safety approach was being driven at a higher level. "Let's get out CSTRT5b figure below 0.9" because executive management dictates it! So I presented books to the executive level. At that level there is no consideration that they and their methods should be questioned. All in all a futile exercise on my part. That aside the book is great, but unfortunately if it doesn't have pictures, isn't a comic, can't be distilled into a safety index, or presented concisely on a PowerPoint presentation, upward looking Managers and self preservation arrogant Executives just do not have the will to read such books, and dare I say it, the IQ to understand it. 0 of 0 people found the following review helpful. Ought to be required reading for all legislators, investigators, and elected officials. By Building in PA Loved the book. It's a great companion to "The Logic of Failure." The concept of complex systems vs complicated systems, vs simple systems and the implications for management, government, legislators and failure investigation are profound and little appreciated or understood. I had a 35 year career as an Aerospace Engineer. I first saw the principles in this book when I read the first two paragraphs of the Feynman Appendix to the Space Shuttle Challenger report. It was the first appendix not included in the widely reproduced copies of the report because it pointed at the real cause of the failure. That NASA didn't learn from it was evident when Columbia disintegrated from the same basic causes. It's important to get to the second half of the book because that's where it really starts to hit home. Highly recommended.

What does the collapse of sub-prime lending have in common with a broken jackscrew in an airliner's tailplane? Or the oil spill disaster in the Gulf of Mexico with the burn-up of Space Shuttle Columbia? These were systems that drifted into failure. While pursuing success in a dynamic, complex environment with limited resources and multiple

goal conflicts, a succession of small, everyday decisions eventually produced breakdowns on a massive scale. We have trouble grasping the complexity and normality that gives rise to such large events. We hunt for broken parts, fixable properties, people we can hold accountable. Our analyses of complex system breakdowns remain depressingly linear, depressingly componential - imprisoned in the space of ideas once defined by Newton and Descartes. The growth of complexity in society has outpaced our understanding of how complex systems work and fail. Our technologies have gotten ahead of our theories. We are able to build things - deep-sea oil rigs, jackscrews, collateralized debt obligations - whose properties we understand in isolation. But in competitive, regulated societies, their connections proliferate, their interactions and interdependencies multiply, their complexities mushroom. This book explores complexity theory and systems thinking to understand better how complex systems drift into failure. It studies sensitive dependence on initial conditions, unruly technology, tipping points, diversity - and finds that failure emerges opportunistically, non-randomly, from the very webs of relationships that breed success and that are supposed to protect organizations from disaster. It develops a vocabulary that allows us to harness complexity and find new ways of managing drift.

"Accidents come from relationships, not broken parts." Sidney Dekker's meticulously researched and engagingly written *Drift into Failure: From Hunting Broken Parts to Understanding Complex Systems* explains complex system failures and offers practical recommendations for their investigation and prevention from the combined perspectives of unruly technology, complexity theory, and post-Newtonian analysis. A valuable source book for anyone responsible for, or interested in, organizational safety.' Steven P. Bezman, Aviation safety researcher 'Dekker's book challenges the current prevalent notions about accident causation and system safety. He argues that even now, what profess to be systemic approaches to explaining accidents are still caught within a limited framework of 'cause and effect' thinking, with its origins in the work of Descartes and Newton. Instead, Dekker draws his inspiration from the science of complexity and theorises how seemingly reasonable actions at a local level may promulgate and proliferate in unseen (and unknowable) ways until finally some apparent system "failure" occurs. The book is liberally illustrated with detailed case studies to articulate these ideas. As with all Dekker's books, the text walks a fine line between making a persuasive argument and provoking an argument. Love it or hate it, you can't ignore it.' Don Harris, HFI Solutions Ltd 'Dekker's book contributes to the growing debate around the nature of retrospective investigations of safety-critical situations in complex systems. Both provocative and insightful, the author shines a powerful light on the severe limits of traditional linear approaches. His call for a diversity of voices and narratives, to deepen our understanding of accidents, will be welcomed in healthcare. Dekker's proposal that we shift from going "down and in" to "up and out" suggests a paradigm shift in accident investigation.' Rob Robson, Healthcare System Safety and Accountability, Canada 'Professor Dekker explodes the myth that complex economic, technological and environmental failures can be investigated by approaches fossilized in linear, Newtonian-Cartesian logic. Today nearly 7 billion people unconsciously reshape themselves, their organizations, and societies through the use of rapidly-evolving, proliferating and miniaturizing technologies powered by programs that supersede the intellectual grasp of their developers. Serious proponents of the next high reliability organizations would do well to absorb *Drift into Failure*.' Jerry Poje, Founding Board Member of the U.S. Chemical Safety and Hazard Investigation Board 'Today, catastrophic accidents resulting from failure of simple components confound industry. In *Drift into Failure*, Dekker shows how reductionist analysis - breaking the system down until we find the "broken part" - does not explain why accidents in complex systems occur. Dekker introduces the systems approach. Reductionism delivers an inventory of broken parts; Dekker's book offers a genuine possibility of future prevention. The systems approach may allow us to Drift into Success.' John O'Meara, HAZOZ 'Dekker is a specialist in things going wrong. He is the world's leading thinker on airline safety. He is concerned about drift into failure in hospitals, on oil drilling platforms, in financial services, on NASA missions. But my hope that the book would somehow be about the human condition in a more intimate way was not disappointed' Australian Library , May 2011 'Dekker wants investigations to go up and out, not down and in, because understanding comes from knowing how the system fits into a larger network of other systems, of tracing the relationships with those, and how those spread out to interact with factors that lie far way in time and space from the moment things went wrong. This thought-provoking book is highly recommended.' Ergonomics 2012 'In this beautifully written and absorbing book, Professor Dekker takes as his starting point the notion that most of us have trouble grasping the complexity coupled with the sheer normality that can give rise to catastrophic events...This book explores complexity theory and systems thinking to understand better how complex systems drift into failure...a work which has to read from first to last if the thrust of Professor Dekker's meaning is to be understood.' RoSPA Occupational Safety Health Journal, July 2012 'Drift Into Failure is not a quick read. Dekker spends a lot of time developing his theory, then circling back to further explain it or emphasize individual pieces. He reviews incidents (airplane crashes, a medical error resulting in patient death, software problems, public water supply contamination) and descriptions of organization evolution (NASA, international drug smuggling, "conflict minerals" in Africa, drilling for oil, terrorist tactics, Enron) to illustrate how his approach results in broader and arguably more meaningful insights than the reports of official investigations. Standing on the shoulders of others, especially Diane Vaughan, Dekker gives us a rich model

for what might be called the "banality of normalization of deviance".' SafetyMatters blog

About the Author Sidney Dekker is Professor and Director of the Key Centre for Ethics, Law, Justice and Governance at Griffith University in Brisbane, Australia. Previously Professor at Lund University, Sweden, and Director of the Leonardo Da Vinci Center for Complexity and Systems Thinking there, he gained his Ph.D. in Cognitive Systems Engineering from The Ohio State University, USA. He has worked in New Zealand, the Netherlands and England, been Senior Fellow at Nanyang Technological University in Singapore, Visiting Academic in the Department of Epidemiology and Preventive Medicine, Monash University in Melbourne, and Professor of Community Health Science at the Faculty of Medicine, University of Manitoba in Canada. Sidney is author of several best-selling books on system failure, human error, ethics and governance. He has been flying the Boeing 737NG part-time as airline pilot for the past few years. The OSU Foundation in the United States awards a yearly Sidney Dekker Critical Thinking Award.