

## Appendix D—Memory: The Uncertainty of Recalling the Past—An Commentary on the Phenomena of Perceiving, Forgetting, and Fabricating

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*“It’s a poor sort of memory that only works backwards”*  
Spoken by the White Queen in *Through the Looking Glass*<sup>1</sup>

Most people assume that their memory is reliable, and it is an accurate record of their looking back at past events and experiences. In fact, memory is unreliable and faulty. It not only looks backward, but it also exists in the present and looks forward.

Recollections of past events are a prime source of data for historical and social science research. Yet there is strong evidence in the social science literature that reports based on memory are subject to biases and errors, and any memory-based reports might prove to be the least reliable for documenting past experiences and events. The kind of memory that we use to recall events or episodes from our personal experiences is labeled, episodic memory, as compared with semantic memory. Semantic memory refers to memory about facts in the world, e.g., the name of the President, the capital of a state, a math formula, while episodic memory is the source of recollections of our past experiences, and, therefore the information drawn out during oral history and other social science research interviews.<sup>2</sup> (Means & Loftus, 1991, p. 297; Corballis, 2013, p. 63).

It is not only social scientists who have concluded that memory becomes a challenge to the objective of learning realities from the past. Those who teach writing of autobiographical narratives acknowledge that memory is faulty, and recognize that this defect is a key challenge in writing memoirs and related accounts that are drawn from memory. In creating, or perhaps we might say “fabricating” the story from memory, some explain that this fabrication in the writing of memoirs is neither lying nor the creation of fiction, but merely the experience of challenging the limits of our memory. Regrettably, the challenge to the reader (especially one who is a social scientist trying to validate the authenticity of the narrative) is to determine when the limits of reality in the story have been exceeded (Roorbach & Keckler, 2008, p.28).

Unfortunately, most of us generally believe that our memories preserve precise accounts of what we perceived and experienced. At the same time, we are unaware of the errors in our

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1 Chapter V, “Wool and Water”

2 Episodic memory appears to be centered in the hippocampus part of the brain. In one case a patient, Clive Wearing, suffered damage to the hippocampus as a result of a viral infection. That deprived him of episodic memory and recollections of his past life experiences, although his semantic memory appeared to remain intact, e. g., he could still play the piano (Corballis, 2013, p. 63).

memory—we simply do not know how much of our past experiences we have forgotten. As a result, we assume that our memory is reliable and accurate, and we believe that the representations of the past that are stored in our memory are experiences we can recall with great detail and precision—and we believe the recalled experiences accurately can reproduce the reality of the past episodes. Unfortunately, the reality that we construct in our memory is unreliable and faulty. What we perceive as our experience is imprecise; what we retain as memory is scanty; what we remember can become distorted by conflicting information; what we recall from our memory often is based on inference. For the following discussion I have organized some of the more significant error sources into three broad general categories: input error, contamination error, and recall error (Chabris & Simons, 2009, p. 62; Corballis, 2013, p. 60).

## Input Error

For there to be any memory, there first needs to be the input of information. The environment, however, presents the senses with much more information than is required for decision making or action, and more than can be retained. After perceiving the broad spectrum of information in the environment, the brain selects and retains only those data that seem to be important and discards the data that appear to be uninteresting or irrelevant. In other words the brain only retains information that is necessary to respond to environmental stimuli, essentially ignoring and forgetting the rest. This process introduces errors during the input of information (Aamodet & Wang, 2008, pp. 2-4, 151; Corballis, 2013, p. 60).

These input errors that are introduced while experiencing an event and perceiving information in the particular scene associated with that event are varied and can include such factors as inattentive blindness, unconscious cognitive bias, and pattern fabrication.

**Inattentive Blindness.** One of the most fundamental input errors is inattentive blindness. This results when there is a lack of attention to the unexpected. Simons and Chabris (1999, pp 1059) conducted what has become a classic study where the subjects watched a video of two teams moving around and passing basketballs. The experimenters asked the subjects to watch the video and count the number of passes made by the players wearing white and to ignore any passes made by the players wearing black. Halfway through the video, a young woman wearing a full-body gorilla suit walked across the scene stopping in the middle and thumped her chest, then exited the scene. When the experimenters questioned the subjects after watching the video, about half of them did not see the gorilla. The study demonstrated that when individuals attend to a particular aspect of a scene, they tend not to see something that is unexpected, even when they are looking directly at it, and it is something most prominent (Chabris & Simons, 2009, p.6-7; Simons and Chabris, 1999, pp1059).

There are real-world instances that can be explained by inattentive blindness. Two examples: In 2006 Martha Fleishman, who had a perfect driving record, was driving her Chrysler New Yorker on Second Ave in Pittsburg. While turning left she hit a Suzuki motorcycle that professional football player Ben Roethlisberger was riding. Even though the motorcycle was in front of Fleishman, she did not see Roethlisberger, and drove directly into

him. In 1977 KLM flight 4805 began its take-off role down the runway and collided at full speed with Pan Am flight 1736 taxiing down the same runway in the opposite direction. This is another case of an individual not seeing what the actor was looking at. In both cases, what those involved hit was unexpected and “unseen,” even though it was in front of the actors. This inattentional blindness places into question the reliability of recall elicited during research interviews (Chabris & Simons, 2009, p.6-7, 14, 20; Simons and Chabris, 1999, pp 1059).

**Unconscious Cognitive Bias.** Another fundamental input error is unconscious cognitive bias. Individual beliefs and attitudes are shaped by automatic and unconscious cognitive processes, where we store and retrieve information that is influenced by unconscious cognitive processes. Without deliberate thought and awareness, we interpret people, behavior, and situations oftentimes inaccurately, and then store the information as recollections of the episode. There is a growing body of research across a variety of disciplines, including social work, public health, law, and medicine that supports this view. For example, Haider, et. al., (2011) found that in a survey<sup>3</sup> of medical students at Johns Hopkins School of Medicine about 70% to 85 % of the students had an implicit preference toward those in the upper social class. The implicit bias recorded in the survey was significantly different from the students’ stated preferences (Teal, Gill, et. al., 2012).

Unconscious biases are ingrained in our cognitive processes where we use social categories to acquire, process, and recall information about our environment. This unconscious stereotyping helps us organize complex information. These processes permit us to use social categorization to reduce what can be a complex social world into manageable chunks of information. The stereotyping fills gaps in meaning, especially when the implications of the episode are unclear or ambiguous. When there is a heavy cognitive load, such as when we are under time pressure or suffering from fatigue, the cognitive processing relies more heavily on stereotyping to process incoming information from the environment. This cognitive bias is outside our consciousness, but the meaning assigned to the experience appears to us to be objective, rational, and justified. This process calls into question the quality of information that is being perceived and stored in memory (Haider, et. al., 2011; Hart and Jaccard, 2008; Teal, et. al., 2012; van Ryn and Saha, 2011).

**Pattern Fabrication.** Because we tend to rely on pattern perception to recognize patterns that give us insight, we may inaccurately interpret a series of random indicators as meaningful patterns even when no meaningful pattern exists. On the one hand, experts are trained to look for patterns that fit their expectations, and this can be helpful. Physicians look for patterns that are helpful in matching symptoms to specific diseases; military commanders look for patterns that are helpful in the tactical deployment of forces; teachers look for patterns that are helpful in developing teaching methods. On the other hand, the expectations of individuals, including experts, can lead individuals to see patterns that do not exist. (Chabris & Simons, 2009, p. 154-159)

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3 The Implicit Association Test (IAT) is a survey instrument that assesses a range of biases that include factors such as age, religious affiliation, ethnicity, immigrant status, race, obesity, sexual orientation (Teal, et. al., 2012, p. 83).

Redelmeier and Tversky (1966) reported on experiments that support this view. In one experiment the experimenters showed subjects pairs of numbers, one set purported to be indicators of patients' pain level on a particular day and the other purported to be the barometric pressure for that day. Up to 87% of the subjects saw a positive relationship, yet the data were fake. Much of what is stored in memory actually can be distorted assessments that match our conception of what we believe we saw rather than the reality. Our understanding, and therefore our memory of a particular episode, can be of the recollection of a pattern that actually is a biased fabrication rather than an awareness of the randomness of the actual events that occurred (Chabris & Simons, 2009, p. 154-159; Redelmeier and Tversky, 1966).

## Contamination Errors

Information acquired during an episodic experience is stored as chunks of data in our memory. These chunks of data can become contaminated after the initial experience while they are stored in memory. The contamination errors that are introduced after data are stored in memory can come from a number of sources and can include such factors as the override from new information, source memory failure, melding of similar events, and creation of false memories (Aamodet & Wang, 2008, pp. 151).

**Override from New Information.** The exposure of new information after an experience or event can modify the information held in the memory. Loftus (1996) reported on a study where subjects were shown a video recording of eight student demonstrators. As part of a post-viewing questionnaire, Loftus gave one half of the subjects false information that there were twelve demonstrators, and gave the other half of the subjects false information that there were four demonstrators. One week later Loftus asked the subjects how many demonstrators they saw. Loftus found that, in general, the false information influenced the subjects' answers to the question about the quantitative fact. The average response by the first group was 8.50, and the second group was 6.67 (Loftus, 1975, p 566).

**Source Memory Failure.** Failure of source memory is when we are unable to accurately have knowledge about how we came to have the memory. We can forget the source of a memory and even may appropriate another person's story, mistakenly attributing someone else's encounters with our own experiences. Source memory failures can be quite common and easily can be demonstrated. Wade, Garry, et. al. (2002) presented subjects with altered photographs showing each subject as a child enjoying a hot air balloon ride; even though the subjects never had taken hot air balloon rides. During recall some of the subjects incorporated information from the photograph into memories of their personal experiences; 50 % of the subjected created a false memory of experiencing a balloon ride—some even embellishing the recollection beyond what they had seen in the photographs (Chabris & Simons, 2009, p. 63-64).

**Melding of Similar Events.** There is a tendency for us to meld together similar events in our memory and create a variation of the actual experience. Press reports are replete with reports of politicians and celebrities who reported what turned out to be false information. In 2008 Hillary Rodham Clinton, when Secretary of State, claimed to have been under sniper

fire in Bosnia in 1996, but press reports and photographs from that time showed that not to be the case. In 2012, former Massachusetts Governor Mitt Romney recounted a story about witnessing an automobile jubilee celebration in Detroit, but he hadn't been born at the time of the celebration. In 2015 Brian Williams, while NBC News anchor, told a story he had been telling for years about an attack against a helicopter he was in over Iraq some twelve years earlier, but he retracted the story when crew members told *Stars and Stripes* that the attack never happened (*The Boston Globe*, 2012; Flint, 2015; Linton, 1986; Means & Loftus, 1991, p. 298; *The Washington Post*, 2008).

**Creation of False Memories.** Hyman and Pentland (1996) reported that research supports the premise that individuals can create false memories of complete, emotional, and self-involving events. Eyewitness memory research has reported that memory is reconstructive. Because memory is a constructive process, it combines the content of self-knowledge with external suggestions. Therefore, a recollection may be the combined product of information stored in our memory combined with suggestions from external sources. Hyman and Pentland (1996) conducted a study where participants who were unable to recall an event were asked to form a mental image of the event. They then were more likely to “recover a memory,” but a memory that created a false event. Braun, K. A., Ellis, R., & Loftus, E. F. (2002) reported on an experiment where exposure to an autobiographical advertisement altered the subject's recollection of a past childhood experience and even created a memory of an experience that never happened. The subjects viewed a Disney ad that suggested that they shook hands with a non-Disney character (e.g., Bugs Bunny). Exposure to the ad increased the subjects' belief that they personally shook hands with the character, which in this case was an impossible character. The suggested autobiographical referencing in this case lead to the creation of distorted or a false memory (Hyman & Pentland, 1996, p 111).

## Recall Errors

When the data chunks stored in memory are recalled, the recollection process can introduce additional errors. The recall errors that are introduced during the recall process are influenced by a number of causes and can include such factors as temporal changes, age-related deficits, re-creation distortions, and re-remembering modifications.

**Temporal Changes.** The length of time between an experience and the recollection of that experience is a crucial interval, and the length of that interval, and the events that take place during that interval affect the content of the recall. The findings in the social science literature generally agree that memory is less complete and less accurate after a longer retention interval than a short one. More of the data in our memory appears to be lost or unrecoverable the longer the interval (Loftus, 1996, p. 53).

The literature does not offer good explanations as to why some episodes in our past experiences are retained in memory and why others do not. Sigmund Freud (1938) offered the hypothesis that we repress memories of trauma; however, more recent research fails to support this. It now appears that memories of emotional experiences are more strongly retained

than other experiences that are more mundane<sup>4</sup>. From an evolutionary perspective, this makes more sense because those events related to survival more often have an emotional component (Corballis, 2013, p. 60-61).

The accuracy of these emotionally-related memories may be questionable. During recall the brain invents the details to fill the gaps in order to create a more coherent story. The left side of the brain seems to seek logic and order. This is so intense that when something doesn't make sense, the brain will invent a plausible explanation (Aamodet & Wang, 2008, pp. 2-4. 151).

**Age-related Deficits.** The length of time between perception and recall also is related to the aging of the individual making the recall. While aspects of cognition that are based on accumulated knowledge and experience actually may improve with age, memory—along with other cognitive functions such as attention, processing speed, and the ability to switch between tasks—declines over time with age. That results in errors of omission in the remembrance that ultimately is recalled, and puts into question the reliability of those memories that are from episodes that occurred at a younger age (Chabris, C. & Simons, D., 2009 p. 26).

**Re-creation Distortions.** The length of time the memory is stored and the aging of the individual recalling the memory interact with each other during the re-creation process to generate distortions in the accuracy and completeness of the recollection. We not only see what we expect to see, but we also remember what we expect to remember by making sense of the memory during recall. Brewer & Treyens (1981) conducted an experiment where they asked the subjects to wait in a graduate student's office for a short while before having them move to another room where they asked them to write down what they saw in the office. Almost all the subjects listed desk chairs, shelves—items that were in that office and most other typical graduate student offices. About 30% of the subjects recalled seeing books, and about 10% recalled seeing file cabinets—both of which were not in the office. During recall, the memory reconstructed objects in the room based on both what actually was there, as well as what the subjects expected should be there. What we recall is not a replica of reality, but rather a recreation of what we expect that reality to be (Chabris & Simons, 2009, pp.48-49).

**Re-remembering Modifications.** The experience of recall and re-remembering also can modify the facts in the memory. During a series of recalls, there appears to be variability in the content of information that is recalled. In one case from World War I, a soldier's succession of accounts written between 1914 and the 1970s changed significantly over the years. One explanation could be that the remembering of certain kinds of experiences, especially highly emotional-experienced events, such as war time experiences, can be part of an individual's search for ways to deal with the feelings experienced during the initial events; it therefore becomes necessary to modify the story in the memory to more easily deal with the feelings. As the individual recalls the experience to resolve emotional conflicts, the result is a blurring

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4 An interesting observation is that in cases of amnesia. It is the episodic memories that more severely are affected, while the semantic memories may be undamaged. Episodic memories generally also are more intensely affected by Alzheimer's disease. Does this suggest that episodic memories are more fragile, and, therefore, at much greater risk of being lost or distorted? (Corballis, 2013, p. 63-64)

of distinctions between ‘fact and fiction,’ and ‘real and imaginary’ (Dawson, 1994; Roper; 2000, p 181).

When the *Challenger* exploded on 28 January 1986, Neisser and Harsch (1992) used it as an opportunity to demonstrate recall errors. They asked the students in their class at Emory University to write a description of how they learned of the explosion and to answer a series of questions about the accident. This immediate documentation of the details should provide an accurate baseline description of the event. Two and a half years later Neisser and Harsch asked the same students to complete another detailed questionnaire. The memories that the former students reported at this time were dramatically different from the details initially reported. They incorporated “facts” into their responses that were plausible, but never actually happened. In these later responses some former students remembered hearing about the accident from different people, at a different time, and in a different situation (Chabris & Simons, 2009, p77; Neisser and Harsch 1992).

A classic real-world example of the variability in recall is in the recollections of British World War I soldier, Colonel Thomas Edward Lawrence (T.E. Lawrence, known as “Lawrence of Arabia”), who dramatically led Arab forces across the desert to numerous battlefield successes. The Turkish army captured him in Deraa and subjected him to torture. In at least three different autobiographical accounts of this particular emotionally-laid episode in his life, Lawrence recalled three different narratives (Anderson, 2013, p 400-401; Lawrence, 1991).

Lawrence, with the accounts of his various exploits, has become an iconic figure, and biographers and historians highjacked his story to make it their own. This has resulted in ever changing, and sometimes mythical and conflicting accounts of his exploits with the Arabs against the Turkish military. As a result, he has become a legendary and enigmatic figure in the history of World War I. He has become a twentieth century icon who is seen to have led an Arab army in pivotal encounters against the Turkish military. He has become a hero who contributed to ending World War I and influencing the creation of what would become a complex Middle East, the Middle East that would have to be dealt with over the next century and beyond (Anderson, 2013, p 2; Dawson, 1994; Lawrence, 1991).

## Conclusion

From the above discussion it is clear that the evidence in the psychological and medical literature strongly supports the view that memory is highly unreliable. Nevertheless, there continues to be an illusion that through careful elicitation and recall, we can tap an accurate record of the past that resides in our mind. At the same time, most of us generally have a high degree of confidence in both our and other’s memory. In one survey 47% of the respondents believed that memory does not change, and 63% of the respondents believed that memory accurately records events experienced or observed in an episode for accurate recall and review in the future. The reality is that we are unaware of what we have forgotten because that information is lost. We cannot separate those aspects of our memory that are an accurate reflection of the past from those aspects that are based on new information that we may have

acquired, and subsequently altered. The altered information is the only information about the past episode that is in our memory (Chabris & Simons, 2009, p. 63).

Despite the strong evidence that memory is flawed, there is a range of common practices—conducting police investigations, taking medical histories, conducting oral history interviews—that continue to rely on individual memories as reliable sources of information gathering. The record of evidence, argues for a reality that is to the contrary. All the disciplines that elicit information from memory must be very cautious in how they use the data acquired from individuals' memories, i.e., data acquired from research interviews where the subjects describe events as recalled in their episodic memories. These data are not facts, but stories. Tobias Wolff (1989), a memoir author, explained early in one book that his memoir was a story from his memory, and in writing it he did his best to tell a truthful story from that memory, but he pointed out that memory does not always tell a truthful story because “memory has its own story to tell.” At best memory is a vague impression or explanation of the past; at its worst it is a distorted description of a past experience or observation. In all cases it is a questionable source for social science and historical research.

*“I have been through some terrible things in my life, some of which actually happened.”*

Author Unknown<sup>5</sup>

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5 This quote often is attributed to Mark Twain, but Fred Shapiro, the editor of *The Yale Book of Quotations* (Yale University Press, 2006) has concluded that the statement cannot be verified as having been written by Mark Twain. Nevertheless, the quote sums up the reality of memory, its ambiguous source citation is an example of the difficulty in documenting episodes from the past.



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# Table of Contents

Foreword .....	v
Preface .....	vii
Introduction .....	1
Case Study Framework for Lessons Learned .....	3
Case Study Compared With Case History .....	4
Alternative Case Study Models .....	5
Applicability of Case Study Methodology to IC Lessons-Learned Analysis .....	5
The General Systems Paradigm—A Model for Lessons-Learned Data Collection .....	7
Flaws in Traditional Approaches to Collect Organizational Data .....	8
The Advantage of Using the General Systems Paradigm Approach .....	9
Conceptualizing the Collection of Systems Data .....	10
Applying General Systems Theory for Data Collection .....	12
Congruence Theory—A Technique for Lessons-Learned Analysis .....	16
Assessing Congruence of the Domains in the Process Component of the System ..	17
Questions for Assessing Congruence .....	18
Considering Congruence with Other Components .....	20
Labeling the Dyadic Relationships .....	21
Integrating the General Systems Paradigm and Congruence Theory into The Case Study Framework .....	23
Phase I—Developing the Research Design .....	25
Phase II—Collecting Data and Preparing the Case Description .....	27
Phase III—Conducting the Lessons-Learned Analyses .....	30
Inherent Flaws in Lessons-Learned Research and its Methodologies .....	33
Data Collection Errors .....	33
Avoiding Data Collection Errors .....	36
Cognitive Errors .....	36
Causes of Cognitive Error .....	39
Avoiding Cognitive Error .....	40
Conclusion .....	42
References .....	44
Appendix A—Research Design Template (With Questions to Consider) .....	48
Appendix B—Data Collection Framework and Examples of Questions .....	50
Appendix C—Interview Protocol .....	66
Appendix D—Memory: The Uncertainty of Recalling the Past.....	75
Appendix E—Outline and Checklist Questions for Case Description .....	85
Appendix F—Outline for Lessons-Learned Case Assessment .....	97
Index .....	98

CSNR LESSONS LEARNED SERIES

# A METHODOLOGY FOR IDENTIFYING LESSONS LEARNED

AN INTEGRATION OF  
CASE STUDY TECHNIQUES WITH GENERAL  
SYSTEMS PARADIGM & CONGRUENCE THEORY<sup>1</sup>

Robert A. McDonald, Ph.D.



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Richard Tarnas  
*Cosmos and Psyche: Intimations  
of a New World View*, 2006

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2. The general systems paradigm.
3. Congruence theory.
4. Integrating the general systems paradigm and congruence theory into the case study framework.
5. Inherent flaws in lessons-learned research and methodologies.

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