SM&A Proprietary Information



Are We Stuck in the Past?

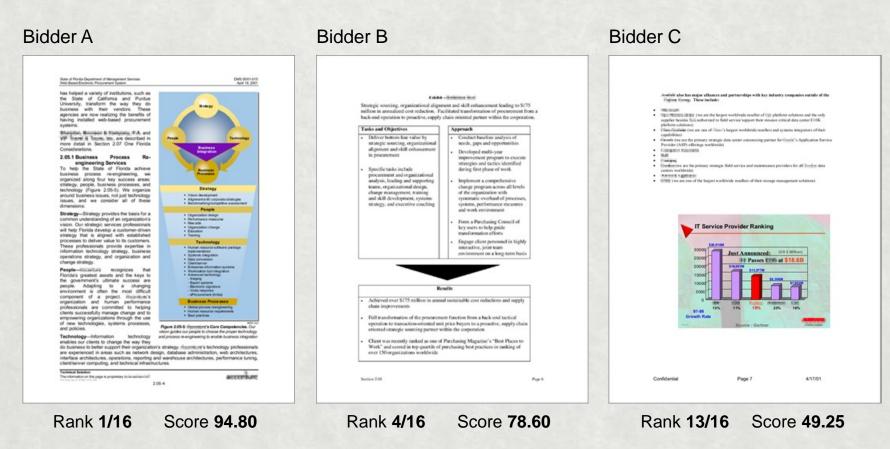
The Need for New Thinking

October 24, 2014

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DIFFERING LEVELS OF MATURITY ACROSS BIDDERS

3 responses to the same requirements, Florida eProcurement, 2001...



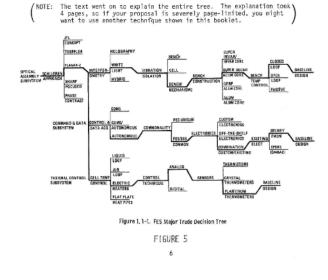
Source: Responses to State of Florida ITN DMS 00/01-015 for a Web-Based Electronic Procurements System ("Florida eProcurement), published on myflorida.com on 15 May 2001 with evaluation tabulation sheet (links are currently dead)

THE 1970s

Figure 1-1-1 summerizes the trade alternatives and the selected approaches (the heavy line traces our decision paths to the baseline design).

Optical Assembly Subsystem Trade. We first studied different approaches to implementing a schlieren system, including the JPL approach (Phase B study baseline) and a proprietary modification of it called planar-Z. The JPL approach was disoarded because of the need to maintain stability of optical elements located on a threedimensional optical bench. The toeppler system requires long path lengths; the other two systems do not readily allow the shadowgraph function to be included.

We examined three methods of implementing the interferometry requirement: classical white light planar-Z schlieren, otherent light holographic, and a hybrid white light/holographic (to include capability for absorption measurements). The classical system contains all the optics necessary to accomplish the RFP requirements for schlieren, interferometry, shadowgraph, optical absorption, and transverse microscopy.



- Technical report format
- "River-raft" technique common: graphic rafts on a river of text
- No widespread use of thesis statements
- However, STOP in use at Hughes
- Single column
- Simple layout
- Not easy to revise
- Hand-drawn illustrations
- Simple covers
- Typewriters
- Carbon paper and mimeographs
- X-Acto knives and Magic Tape

THE 1980s

UNCLASSIFIED			-						
GFY	1989	1990	1991	1992		1993	1994		995
CY 1988	1989	1990	1991	1	992	1993	. 199	4	1995
Program Months	3 6 9 1	2 15 18 21 2	4 27 30 33 3	6 39 42	45 48	51 54 57	60 63 66 6	72 75	78 81 84
Reference Award A	SSRR	88	APDR	A CDF	1	1s De		Co	IOC A
Equipment Types Terminals Fixed Command							First	4	
 Mobile Command 		-	-	_			First		∆ Last
 Portable Command 		-		_	_		1	irst	∆ Last
Portable Force							First A		∆ Last
Integrated Force							First		∆ Last
COMSEC Modules				First			Last		
Rapid Msg Processors								First	∧ Last
Micro-TPS Units				First A			ΔLa		
Mockups		2 4	ea	A Upd	lates			- I	
Breadboards		A		Mass		1			
Micro-TPS Design Evaluation Components		100 ea							
MMI Demonstration Units	2 /		As Avai		lates	1			
Comm Interface Simulators and Modules				2 ea					
S/W Development Systems_					A1				
Figure 2-2. Equipment	deliveries								900478
levels of security. Tab	le 2-2 de	picts the	fa-	Table	2.2.	Appro	priate fac	ilities	exist
cilities committed to			he L	ocation	A	tivity	Level of security	Size (ft ²)	Available

2.7

cilities committed to performance of the AEPDS program. The team has existing facilities near **Contract** award a facility specifically devoted to the AEPDS program will be obtained. The combined value of the team's committed facilities is more than \$130 million.

	e 2-2. Appro			
Location	Activity	Level of security	Size (ft ²)	Available date
	Fabrication and terminal assem- bly	Secret	46,700	Exists
	Engineering and software devel- opment	SCIF*	20,000	Exists
	Final assembly and systems in- tegration labora- tory	SCIF	15,000	Exists
8. au	Customer inter- face	SCIF	4,000	Lease existing space
30.	COMSEC sys- tem develop- ment/test	Secret/ Crypto	2,500	Exists
	Bulk CMOS LSI/ IC production	Secret/ COMSEC		Exists
10.0	CMOS-SOS LSI/ IC production	Secret/ COMSEC		Exists
eth.	S/W develop-	NSA/DIS approved	10,000	Exists

in . The software development activities

the second second second

- Some double column formats
- Foldouts
- Word processor-based revisions, e.g. WordStar, WordPerfect, Word
- Tables made with IBM character set special characters
- Laser printers with monospaced fonts
- Simple vector graphic programs, e.g. GEM Draw Plus
- Desktop publishing using mainframes and workstations, e.g. LaTeX, Interleaf
- Color covers using photographic montages

THE 1990s

STREET, SQUARE, SQUARE,

1.0 INTRODUCTION

The Team offers a highly-commercial leveraged solution to Phillips Lab's (...) program that meets all, and exceeds many requirements of the Statement of Objectives (SOO) and the System Requirements Document (SRD).

System Approach – Our team brings the best mix of commercial space technology and industry practices to resulting in a program with manageable risk. We qualify an existing and integrate it with a proven telescope.

Our Best Value approach allocates a significant portion of available funds to the payload because we have reduced the funding needed for non-developmental items.

- Modifying a production line bus provides reliability at low cost;
- Using a scheduled replenishment launch for on the reliable Delta II (along with two replenishment satellites) saving over \$15M in launch costs;

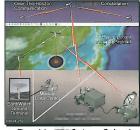


Figure 1-1. System – On-board processing for real time target detection IRIDIUM is a registered trademark and service mark of Iridium LLC.

Volume I Tech/Mgmt - 1 Use or disclosure of data contained on this sheet is subject to the restriction on the tille page of this proposal or publicity

Our Team has a long history in remote

Team

 C pital Science Confur-30 years of optical system design, devel, and test timege Avail. Lab-DiAL.
 Proved Starborston Design Pathonted apace Starborston Design electronice design and tabrication Operational HSI imaging mayload phathone and provides phathone and provides phathone and provides District apgeriance oral inter a starborston commercial and produces District an

 Modifying our meets requirements at reduced cost while providing proven tactical equipment;

 Our existing facility provides low-cost satellite control.

On-board data processing ensures timely information to warfighters (Figure 1-1). Target location, identification, and terrain typing, *in addition to hyperspectral data*, is downloaded to the encrypted target data worldwide from via the constellation.

's world-wide ground network receives, markets and distributes our commercial image products, leveraging their marketing infrastructure to ensure viable commercial imaging sales. • Color!

• Cover tells the story

- Text "illustrates the graphics"
- Emphasis on graphical elements for ease of understanding
- Consistent use of themes
- Focus boxes for the hard sell
- Templates custom to the proposal
- Mandatory use of foldouts to tell the entire story
- Strategically-planned proposal widespread

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THE 1990s (WITH A BIT OF INNOVATION)

MEETING THE CHALLENGES WITH A PERFORMANCE-PROVEN, FULL CAPABILITY TEAM

The ()) gives the Army warfighter the competitive edge to rely on into the next century for rapid, all weather, 24-hour a day intelligence. It is the first significant intelligence capability to extend down to the brigade and fire support levels. In many respects, the represents a new approach to intelligence. Our push the edge of the envelope and produce a that provides a near-real-time, multisensor, integrated picture of the battlefield near before wallable.

All and a second se		Landon da	-
System management and integration	Imagery processing using / experience	P3I efforts • aircraft simulation	P3I efforts • Requirements definition
System supportability	system interface processing P3I efforts	Electronic technical manuals	CONOPS Compression algorithms
 /targeting 	Automatic target recognition for P3I		Automatic targe recognition

OUR APPROACH REFLECTS STREAMLINED ASARC PROCESS AND BEST VALUE TO GOVERNMENT

- Twelve years of outstanding performance by including that during Desert Storm (42 sorties; over 90% availability)
- Teamwork through empowered integrated product teams (IPTs) with government representation, using online communications and common databases to resolve issues early
- Baseline configuration with all newest features plus demonstrated
 (___) system capability
- Open, hub-based architecture meets C4I Technical Architecture requirements and emphasizes commercial state-of-the-art technologies
- ✔ Comprehensive, five-year performance warranty
- Powerful P3I technologies already analyzed for exceptional military utility
- ✓ Proven, responsive integrated logistics support (ILS)/capabilities
- Two prototypes to demonstrate critical capabilities before award
 We leverage a combined \$7M investment in
 related technologies (
) and
) to ensure a low-risk program

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"What you saw in the jungles and cities of Panama and in the desert of Iraq was a window on the future of warfare. We essentially told the Panama Defense Forces and the Republican Guard, 'I know where you are and where you are not. I know where I am, and I'm coming after you, day and night, in all weather. And I will not let up until I take you down. That's what we did.

Took 'em down.''' General Gordon R. Sullivan



Configuration

Using two company-funded for prototypes, we...

Verify the architecture prior to contract start
 Provide new

multiple window screens

1

- imagery processing/
- Provide Imagery processing
- (,)

- Innovative template design
- Use of pull quotes

THE 2000s

SM&A

PART A: SYSTEM DESIGN AND DEVELOPMENT APPROACH

Our Hardware Modernization Kit solution, leverages our proven history and in-depth knowledge of the TOC Program, is low risk, best-value solution for attaining 100% TOC compliance and modernization of the TOCs, today and into the future.

A.1 Heading 2

The Tactical Operations Center (TOC) Program challenges faced by the USMC are many 208 fielded BBD systems, continued technology obsolescence, emerging threats, and constantly evolving capability needs—all within the era of a diminishing defense budget.

Our TOC hardware modernization approach directly addresses these challenges by using our understanding of all 17 fielded TOC variants from our TOC production experience, our industry-leading Team of Lockheed Martin, Northrop Grumman, General Dynamics, Raytheon and Boeing, and our experience with Marine Corps Systems Command's (MCSC) ECP processes during the successful delivery of TOC ECP kits on TOC.

Marines Page

Our common, modular hardware modernization approach and proven execution processes ensure low risk modernization of fielded TOCs

- Complete TOC PMO and Atlantic visibility and control throughout ECP execution
 Detailed analysis addresses all SSS requirements
- against capabilities of 100% TOC variants and models • We meet 100% threshold requirements at low cost
- Common, modular ECP design minimizes impact to fielded systems and Mannes in the fight
 Maximized reuse of components proven in today's
- fielded TOCs, aligning with existing TOC training, sparing, and supportability • Our pre-contract benchmarking activities and capital
- investment Operational Trailer (OT) enable low-risk ECP and kit deliveries 5 months after contract award • Our kit design is open, enabling insertion of future ECP candidates at low risk and cost

Our common, modular hardware modernization kit, installable in the field, brings all fielded TOCs up to 100% threshold requirements compliance to the 28 April 2009 SSS via a low-risk execution approach. We use common modules, all the same form factor, that apply across all fielded TOCs to minimize cost and lower execution risk. To reduce performance risk, we retain 18 of the same personnel from our previous TOC programs, named later in the management section of this proposal.



Figure A-1. Low-Risk, Low Life Cycle Cost Approach to TOC Hardware Modernization Our technical approach is based on common, modular hardware kits that meet requirements for all TOC variants and models resulting in a common baseline

- Consistent application of themes
- Improved crosswise integration of win themes through graphics, text and cost
- Big improvement in cost volumes
- Big improvement in IMP/IMS
- Visually, not much changed from the 1990s
- Use of the same tools (Word, PowerPoint, Illustrator) – just on faster PCs with different aesthetics

Volume IV: Technical - A-1 Use or disclosure of data contained on this sheet is subject to the restrictions on the title page of this proposal or quotatio

WHEN DID WE START DOING PROPOSALS THIS WAY?

Ideas we accept as Best Practice have early origins:

.....

.....

.....

.....

Thesis sentences	writing the rechnical Report, Ne
Modular proposals Fext and graphics Thematic unity within modules Page allocations Storyboards Wall-based storyboard reviews Proposal theme	'Sequential Topical Organization of Proposals (STOP),' Tracey, Rugh & Starkey, 1962
Ist person, active voice No superfluous words Discriminators, Aha's, Ghosts	'The Anatomy of a Win,' Beveride
Benefits, not just features	'Creating Superior Proposals,' Beveridge & Velton, 1978

() A / e Technical Report,' Nelson, 1940

al Topical Organization osals (STOP),' Tracey,



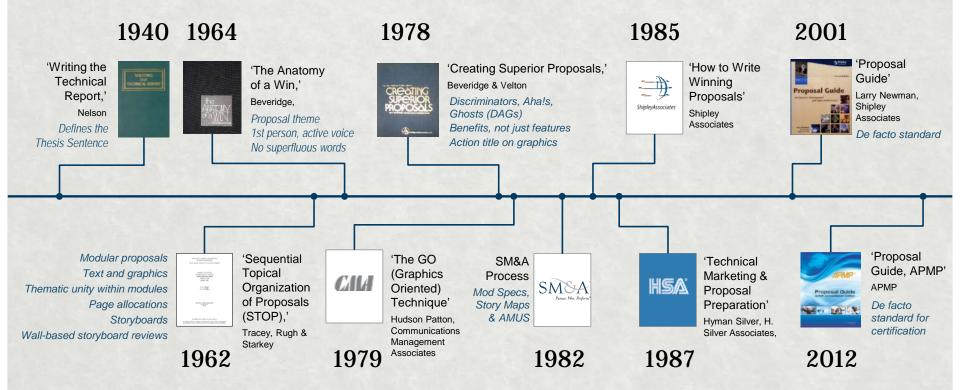
omy of a Win,' Beveridge, 1964





IDEAS WE ACCEPT AS BEST PRACTICE HAVE EARLY ORIGINS

...and have since become codified into command media



A slow evolution over 40 years...

THROUGH THE DECADES, SIDE BY SIDE

Figure 3-1-1 subveriess the trado alternatives and the selected operaties (the here live there are decision apths to the baseline design).

<u>Splicel Accepts Subgroup Trade</u>. We first studied different experiented to believening a schiltree system, including the 30, spontan Diane 3 study baseline and a univertationy socification of it colled planar-2. The UK approach was discorded because of the real to maintain $g_{ij}(2)$ by all obtained obtained for a linear dimensional optical banch. The comparison requires long and lengths the same teo soulers do not readily allow the state-tript forether to be included.

We exacted three ratheds of feplementing the 'riorformanity requirement: characted white Tayle starward schlarers, unbowert Tayle talegraphic, and a hybrid while highly hiltographic (to include capability for showydian menarements). The chapping system and all the motion and an all the motion meansary to accomplish the SF requirement $\$ for selfforce, interformation, sharphonesh, solical also ption, and transmis-

explain the reliev leve. The exploration tec proposit is severally paperimited, you might technique above in this backlet.



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Vectoral Brackweite Versit 115 Die de Diekatier	244 440 740	10 mm	-		I		
VIII Derivating transmost			ware				
075 Development Robert		-	A1 -	_	14		89-TS
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Volume i Teolo Vigno – 1 na manifestation da sido da de provincia en el

1990s



160.0

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Modifying our Jaim (Dollar) C

low-cost satellite control

at reduced cost while providing prover tactical equipment; Our existing instant facility provides

to the Will-I Schedule Connect Instance (WORK) and to the Mission Data Center. We transmi encrypted target data worldwide from via the constellation. 's world-wich

SMOA PART A: SYSTEM DESIGN AND DEVELOPMENT APPROACH

A.1 Heading 2

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10



2000s

Volume IV: Technical - A-

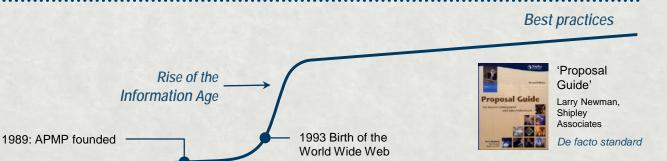
1970s

Large gaps

in proposal

tradecraft

1980s



First graphical web browser

PERSUASION ON THE CHEAP

Conventional wisdom now widely adopted in our profession as a best practice is that "a picture is worth a thousand words"¹, yet there is a visual persuasion gap

What We are Taught in School (K-to PostDoc)

Where the World is Heading

What We Need is Visual Literacy



Since the advent of Gutenberg's printing press, our culture of learning is about reading and writing

We are discouraged to learn how to read pictures (comics) in school



Five exabytes (one billion gigabytes) of content were created between the birth of the world and 2003. In 2013, 5 exabytes of content were created each day², the vast majority of this as a visual representation of information We are flooded by information in images, from photographs to illustrations to flow charts to tables and information graphics, yet we were never taught how to read a picture in school

11

Is this skill so innate in our genetic makeup that it does not need to be taught?

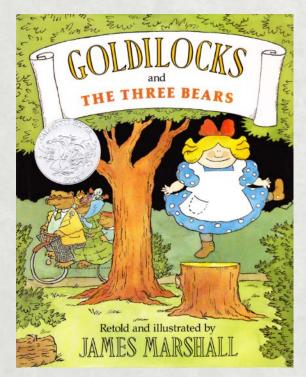
Sources: 1) Arthur Brisbane, 1911 (exact reference cannot be cited with certainty) 2) Newstex, <u>The Data Explosion in 2014 Minute by Minute – Infographic</u>, October 21, 2014

WHAT IS THIS?

Trade Study						
Product F	eature		Defining Trait			
A Te						
B Width						
С			Length			
Company	Defining Characteristic	Product Maturity	Confidence	Cost		
Company Alpha	Light	8	High	Low		
Company Beta	Dark	12	High	High		
Company Gamma	Medium	11	Moderate	Medium		
Company Delta	Exotic	3	Low	Medium-Low		

USE OF NARRATIVE TO COMMUNICATE COMPLEXITY

Reference



Memorable

nce upon a time, there was a little girl named Goldilocks. She went for a walk in the forest. Pretty soon, she came upon a house. She knocked and, when no one answered, she walked right in. At the table in the kitchen, there were three bowls of porridge. Goldilocks was hungry. She tasted the porridge from the first bowl.

"This porridge is too hot!" she exclaimed...

Not Memorable

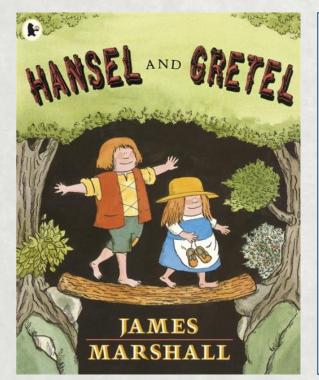


WHAT IS THIS?

	Supply Strategies						
Strategy	Competitor	Critical Competency					
Monopolize supply	Company Alpha	Profitability					
Find adjacent sources	Company Beta	Reliability					
Eliminate competitors	Company Gamma	Innovation					
Find new sources	Company Delta	Past Performance					

USE OF NARRATIVE TO COMMUNICATE COMPLEXITY

Reference



Memorable

nce upon a time, there lived a poor woodcutter with his wife and two children. The little boy called Hansel, and the girl named Gretel. There was never much to eat in their home...

"At the crack of dawn, let's take the children down into the deepest part of the forest. We'll make a fire for them out there and give them each a crust of bread...they'll never find their way back home, and we'll be rid of them..."

Not Memorable

S	Supply Strategies							
Strategy	Character	Critical Competency						
Monopolize supply	Stepmother	Greed						
Find adjacent sources Eliminate competitors	Hansel	Faith						
	Gretel	Cleverness						
Find new sources	Witch	Duplicity						

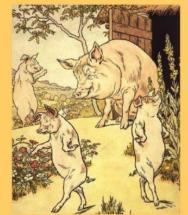
WHAT IS THIS?

E	Evaluation of Competing Approaches					
Main Choice	Company	Traits	Outcome			
Bid at threshold KPPs	Bid at threshold KPPs Company Alpha		Lose			
Bid above objective KPPs	Company Beta	Overpromising	Lose			
Bid at threshold with credible plan for objective	Us	Practical & clever	Win			
Bid below threshold KPPs	New Entrant	Overconfident	Embarrassed			

USE OF NARRATIVE TO COMMUNICATE COMPLEXITY

Reference

THE STORY OF THE THREE LITTLE PIGS



GOOD READINGS

Memorable

... Presently came along a wolf, and knocked at the door, and said, "Little pig, little pig, let me come in."

To which the pig answered, "No, no, by the hair on my chiny chin ."

The wolf then answered to that, "Then I'll huff, and I'll puff, and I'll blow your house in." So he huffed, and he puffed, and he blew his house in and ate up the little pig.

The second little pig met a man with a bundle of furze, and said, "Please...

Not Memorable

Evalua	Evaluation of Competing Approaches							
Main Choice	Name Key Traits		Outcome					
Mud (straw)	Browny	Wallowing, but disobedient	Rescued from imprisonment					
Cabbage (Sticks)	Whitey	Greedy & insatiable	Rescued from imprisonment					
Brick	Blacky	Practical & clever	Savior					
Deceit, Huff and Puff	Wolf	Deceptive beyond own good	Scalded to death					

USE OF NARRATIVE TO COMMUNICATE COMPLEXITY

Narratives are Second Only to First-Hand Experience

Direct experience produces "experiential knowledge"

Analysis produces "evidentiary knowledge"

Narratives bring both alive for readers not at the creation

Captures complexity while communicating insights clearly

Moves others to understanding and motivates behavior

Provides the arc from mystery to discomfort to curiosity to credibility to empathy to solace to inspiration

Raison d'être for graphics to convey facts, data and evidence, processes and frameworks and abstract concepts

REASONED, COMPELLING AND MEMORABLE

FACTS AND REASONING = UNDERSTANDING AND PERSUASION

We have a very hard job to perform

Our Audience	What We Want of the Audience	What Gets in Our Way
Mental capacity for processing information for most of us is 7,	Greater Knowledge transfer	Overly specified structure and other constraints imposed by
plus or minus 2 (2.5 bits)	Higher level of understanding	the customer
Most evaluators have a day job with more things to do than time	Relief from boredom	Complexity of subject and numerous subtleties
All proposals are greeted with	Longer retention	Unclear burden of proof in sufficiency of data
skepticism, cynicism, lassitude, or derision (pick one)	Fewer interpretative errors	Conventional wisdom and over- reliance on best practices

Source: Miller, George, "The Magical Number Seven, Plus or Minus Two: Some Limits on our Capacity for Processing Information, Psychological Review, 63, 81-97, 1956

ROLE REVERSAL

Time to re-examine the role of text in proposals, and incorporate new methods of the "art of narrative"

For the past 20 years we've incorporated state of the art thinking and tools in the creative act of graphics in our proposal tradecraft, but have not paid much attention to new methods for narratives now in common use for other purposes

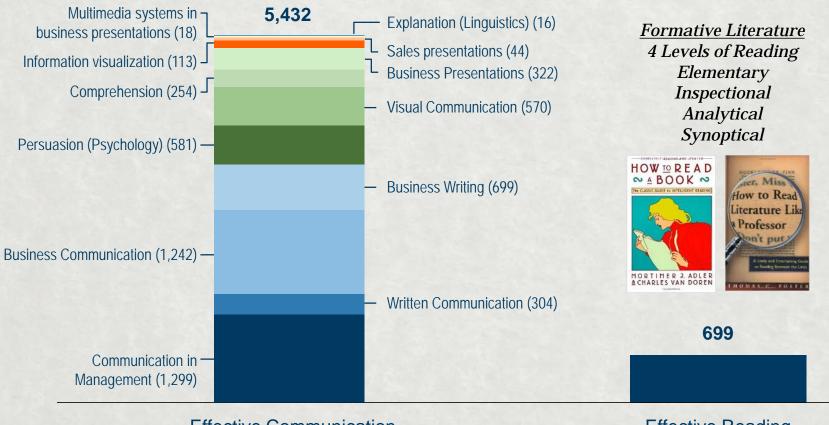
Lacking visual literacy as an innate skill, surplus of data in graphics and proliferation of meaning creates a burden on the reader to reason for him/herself.

Tracey and others in 1965 set out to solve this same problem with STOP to shift the burden of logical coherence back to the author.

Have We Come Full Circle?



BOOKS BY SUBJECT (LIBRARY OF CONGRESS)



Effective Communication

Effective Reading

Five Models of Non-Fiction Storytelling

Think of these as models for: Communication, Persuasion, Engagement and of course... information sharing (but in many cases, that's not really the most important function)

THE ICONIC SOCIAL SCIENCE ARGUMENT TRAJECTORY

- What's the question/problem?
- Where does the question come from?
- What's the (hypothesized) answer?
- How did we arrive at that 'answer'?
- So what? If our answer is correct, what else of interest happens?

SAMUEL P. HUNTINGTON

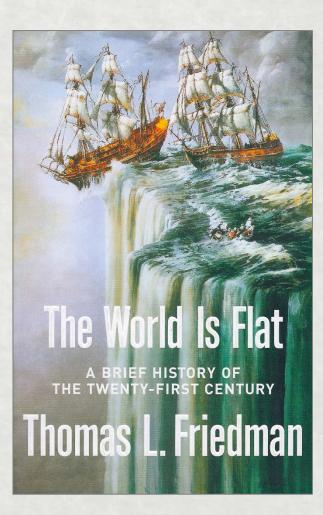
THE NEW YORK TIMES BESTSELLER THE CLASH OF CIVILIZATIONS and the Remaking of World Order

"Dazzling in its scope and grasp of the intricacies of contemporary global politics." -- FRANCIS FUKUYAMA, The Wall Street Journal



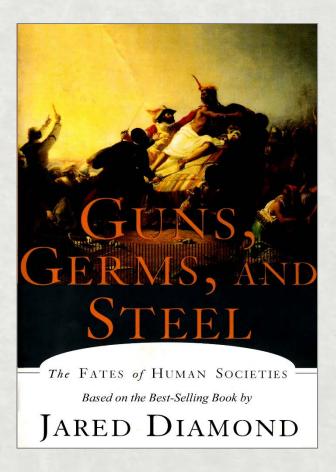
MEDICAL ROUNDS

- Presenting Snapshot, then SOAP
- Subjective
- Objective
- Assessment
- Plan



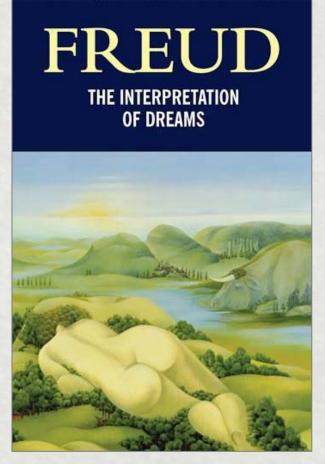
ICONIC INDUCTIVE REASONING PATH

- From Data Points, to Generalizations
- No 'theory' per se, at least not as guiding principle for the story
- The story emerges from the details
- The more data, the better



ICONIC DEDUCTIVE REASONING PATH

- From Theory to Hypotheses
- A big 'story' generates expectations about what you will see in the world
- The details follow from the theory
- The more generative and precise the theory, the better

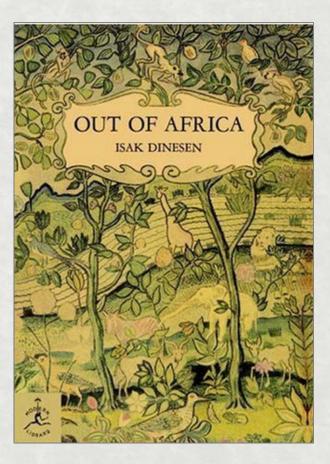


• 'Embedded' storytelling — the story teller

ETHNOGRAPHY

• 'Deep' narrative

- puts herself in the position of the subject
- Capturing 'Culture' is more important than explicating causality



SOME BASIC COMPARISONS

Model	Optimized For	Weakness	Exec Sum	Technical	Mgmt & PP	Cost
Social Science Argument	big claims	Overly reliant on systemic arguments	1			
Medical Rounds	specific cases	hard to learn from comparative cases		~	~	~
Induction	data mining	garbage in, garbage out, plus over fitting of data		~		1
Deduction	prediction	taking weak theories far too seriously		~		~
Ethnography	gestalt	unfalsifiable mush			1	

HOW COMMUNICATION AND PERSUASION HAS CHANGED



Memorable and Compelling



WHAT'S NEXT FOR OUR PROFESSIONAL COMMUNITY?

Typical proposal for the last 10+ years

Tomorrow's proposal



3.0 SYSTEMS ENGINEERING APPROACH [SOW 3.3]

We tailored our proven, comprehensive engineering process to directly align with the established USMC <u>Imab Program Office's</u> processes. We provide a low-risk path to a successful CDR, DT events, and resulting Milestone C decision.

Our CMMI⁹ qualified engineering processes are tailored using the **Systems** Engineering Plan to cover all facets of the program. In addition, this same approach is flowed to all subcontractors to ensure a unified and collaborative process.

During the **set**, we streamlined and tailored these processes to produce the tested configuration, the transportability study and the architecture study, all in a rapid development cycle.

Our system capitalizes on maximum reuse of Configuration Items (CIs) from Phase 1. These CIs include the Track Manager, the Display, and the data link manager.

To these, we add our Software and Component Products, as described in Section 5.0, Figure 5-5, our Transportability Package (or "Software"), as described in Section 6, elements from the

Our systems engineering capability ensures a design that leads to a successful Milestone C decision and Limited Rate Initial Production

continue their successful Phase 1 intercompany teamwork into Phase 2

- Reduction Effort continue into Phase 2
- Our tailored systems and specialty engineering processes provide continuous collaboration with the customer to drive out risk
 Our specialty engineering disciplines are
- integrated throughout the development cycle to ensure a holistic solution that meets all threshold requirements and provides customer satisfaction • Our IA approach is tailored, based upon
- customer feedback, to reduce IA risk and ensure 100% compliance

such as the product, and improvements based upon the Government response to our studies and onsite testing (see Figure 3-1). Our pre-proposal efforts combined these various inputs into the solution provided in this proposal.

Consistent and rigorous application of these principles ensures a successful Milestone C for the proposed system.

Our Systems Engineering (SE) approach, described in the SE Management Plan (SEMP) in Appendix 3-1, covers the entire

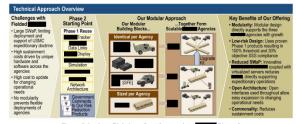


Figure 3-1. Low-Fisk, Low-Cost Approach to **Internet** Phase 2 Our modular approach builds upon the key configuration items of the Government's Phase 1 design to meet 100% of the threshold SSS requirements

Part IV: Technical Volume - 3-1



INTERESTING BOOKS

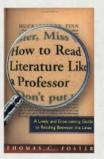
(Not a comprehensive catalog of worthwhile reading)



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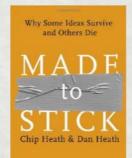
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