

Measuring the Impact of Information Technology and Electronic Business Systems in Government Settings: Lessons Learned in Support of E-Government Initiatives

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Background

- Client: Defense eBusiness Program Office (nee Joint Electronic Program Office), Defense Logistics Agency
- Client's interest: Assess Impact of eBusiness systems
 - Congressional oversight
 - GPRA
 - Rational planning
 - Negotiating for funding

Deployed Programs Should Have Measurable Consequences

- Focus on Impact, i.e. Indicators of
 - Cost
 - Quality
 - Time
 - Readiness
- De-emphasize process, e.g.
 - % time system up and running
 - # of users
 - Time to resolve user complaints

Questions Addressed

- *Specific*: Have particular programs done any good?
- *Broad*: Can we assess impact of operational eBusiness systems?
 - Obtain data
 - Draw conclusions about past performance
 - Provide insight for improvement
 - Recommendations to make future evaluation easier and more powerful

Programs Evaluated

- Electronic Document Access (EDA)
 - Single source for contracts, bills of lading, etc.
- Central Contractor Registration (CCR)
 - Single data base to ID all vendors
- DoD Email
 - Single entry point for off-the-shelf commercial items

To Anticipate the Answers...

- Yes, we can evaluate the specific programs
- Based on this experience, we are confident many other eBusiness programs can be evaluated in operational settings
- The evaluation won't be comprehensive, but it will provide enough information to
 - Assess the value of an eBusiness program
 - Guide productive change

Overview of Lessons Learned

➤ Metrics

- Needed at the right level of detail
- Ownership and IT constraints
- Few people have usable knowledge about data

➤ Methodology

- Metrics can't help unless the right comparisons can be made
- Multiple sources of data needed
- Useful empirical analysis often available to help

➤ Program Logic

- If the program works, what will be different?
- Answer affects metrics and methods

➤ Adaptive Systems

- Impact cannot be completely specified in advance

➤ Realistic Expectations

- Obligation to provide accurate information
- Guiding improvement requires understanding limits
- Setting a program up for failure cripples further evaluation

Metrics

- At a high level metrics are obvious:
 - Cost
 - Quality
 - Time
 - Readiness
- Metrics not obvious at level of data one can
 - Find
 - Trust
 - Analyze
 - E.g. "cycle time" is not the same as "time from a contract being finalized to its arrival at DCMA"

Good Impact Are Metrics Hard to Find: Lack Incentives to Cooperate

➤ owners = *users*

evaluation clients = *developers*

- E.g. EDA should affect DFAS payment cycle time. EDA knows # of users, but DFAS has the payment data

➤ Users have disincentive to show productivity.
Efficiency = smaller organizations

➤ Even when willing, time and effort are required

Good Impact Are Metrics Hard to Find: Very Few People Really Know

- Detail matters
 - E.g. data element definition (which can evolve), work-arounds, ability to detail by location or time frame
- There are probably only 2- 5 mid-level civil servants who work with a data base well enough to know the answers
- Identities of the experts hard to come by
 - Far removed from evaluators' POC
 - People change jobs
 - Functions keep changing

Good Impact Are Metrics Hard to Find: IT System Limitations

- IT systems are inflexible, can't provide data at needed level of granularity.
- As legacy systems are replaced, only aggregated data is brought over

Methodology

- Methodology
 - Logical structure in which metrics are embedded
 - Required to extract information from metrics
- Evaluation design requires iterations history/functioning of eBusiness program and opportunities afforded by data



- Logic models are used to work out these iterations.

Need to Combine Multiple Data Sources: Example From EDA Impact on Contract Processing Labor

Data	Use	Source
Historical data on DFAS workload	Contextual understanding	DFAS
Per-contract impact of EDA, time and \$	Base numbers for assessment	FOSSAC
Contract volume for DLA, Air Force, Army, Navy	Scale –up local impact to DoD	1- OSD CIO Office, 2- DD350 data base
% paperless transactions	Scale –up local impact to DoD	1- OSD CIO Office, 2- DD350 data base

Useful Empirical Work Can Often Be Found

➤ EDA

- FOSSAC micro-level analysis of impact on contract labor.
- Could be scaled-up to DoD by combining with transaction volume information from other sources.

➤ CCR

- Treasury data on cost of data entry
- Combined with paperless contracting transaction volume for overall analysis

Example Of How Evaluation Plan Can Change

Round 1 Interviews

- System should affect metrics *a*, *b*, and *c*
- Users collect this data
- System implemented incrementally
- Implementation timeline known
- Plan: multiple interrupted time series, compare within and across divisions

	Implementation Schedule					
	Time	1	2	3	4	5
Division 1	X					
Division 2		X				
Division 3			X			
Division 4					X	
Division 5						X

Upon closer scrutiny, ugly reality intrudes

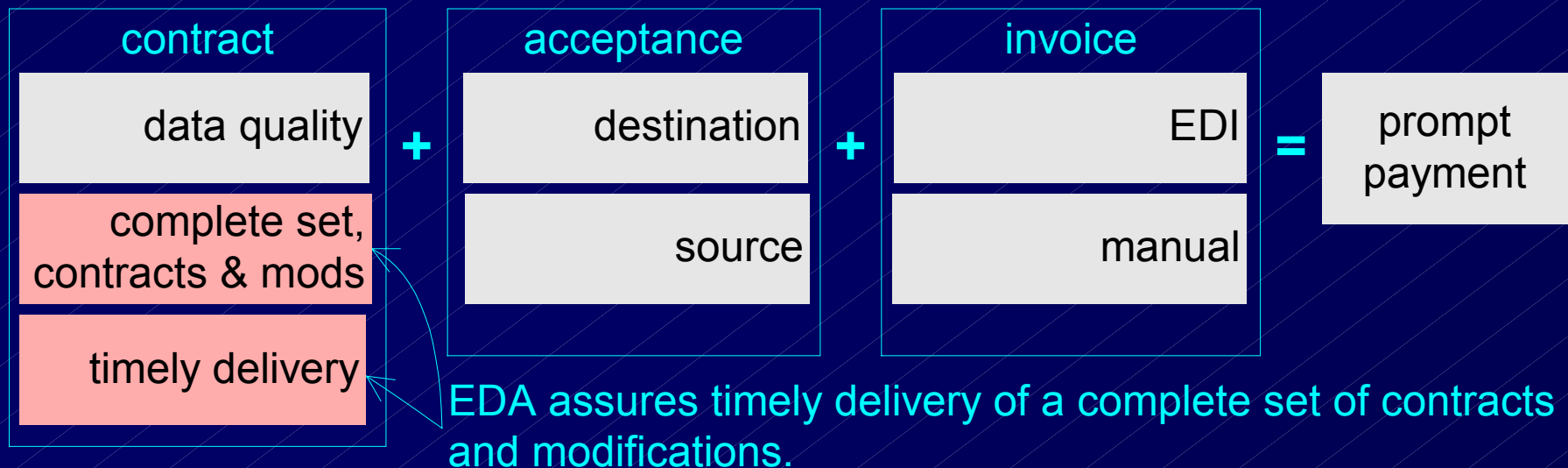
- Organizational change: Divisions merged, reorganized
- IT systems: Systems upgraded. Detailed data not carried over
- People: Not many experts in the old system left
- Data: Data could be extracted, but not by month

Logic Models Are Visual Representations Of Why An eBusiness Program Has Particular Consequences

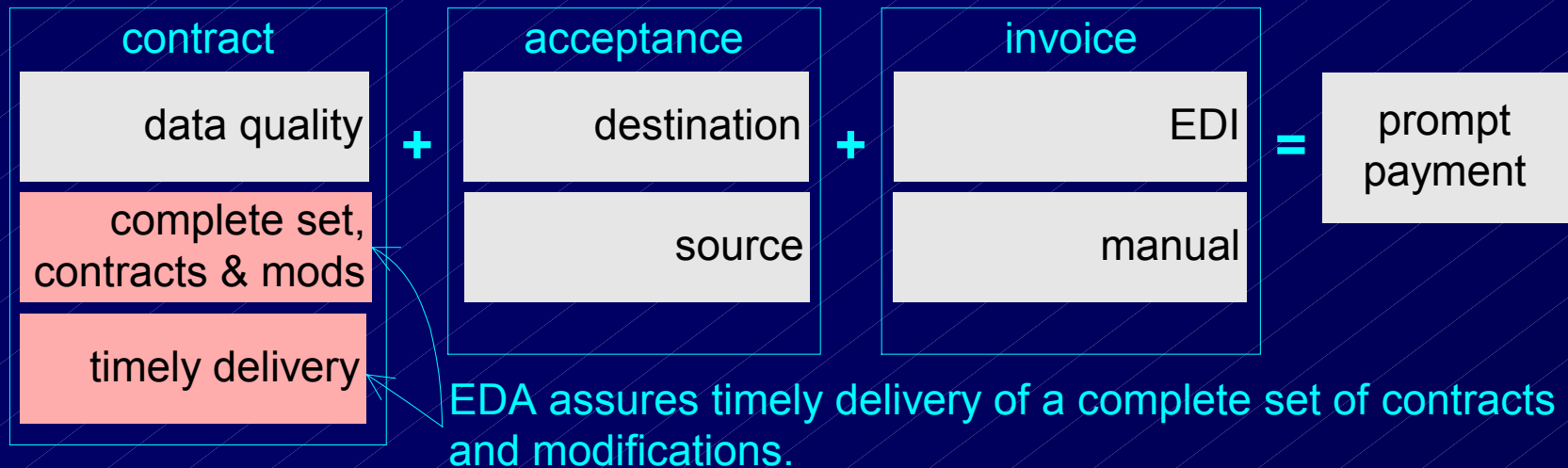
- Impact can be broader than indicated by meeting specific requirements for well defined users
- Proximate change may induce secondary change
- Timing of impact may vary, immediate to long term
- Outcomes may interact with each other
- Exogenous factors which affect impact should be identified
- Relationship diagrams help stakeholders reach consensus

Example: Model to Guide EDA Impact on Prompt Payment

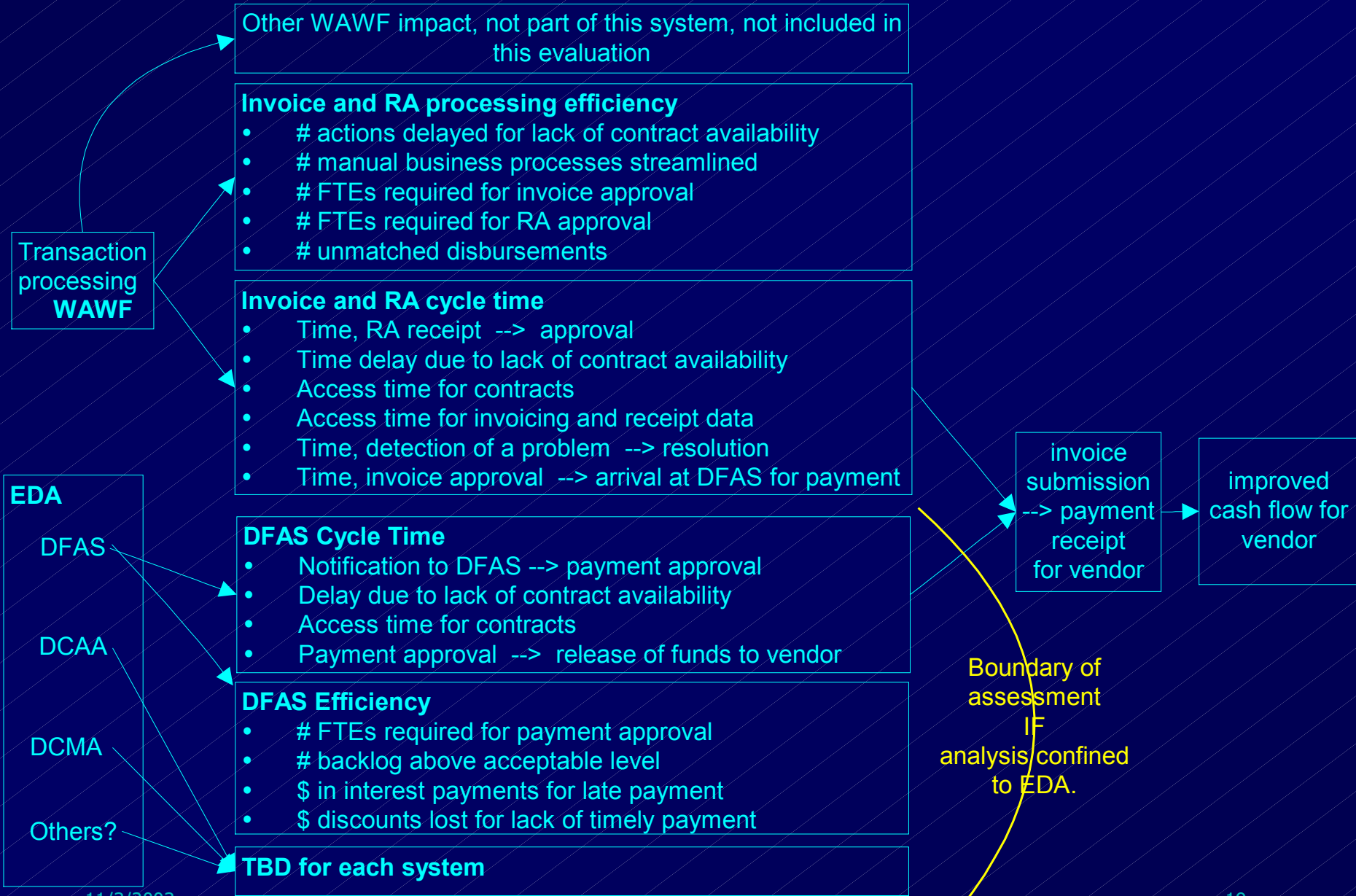
- Suggestion to use “prompt payment” as a metric for EDA
- Payment requires reconciliation of provisions in contract, acceptance notice, invoice
- EDA has direct impact on only two parts of this process



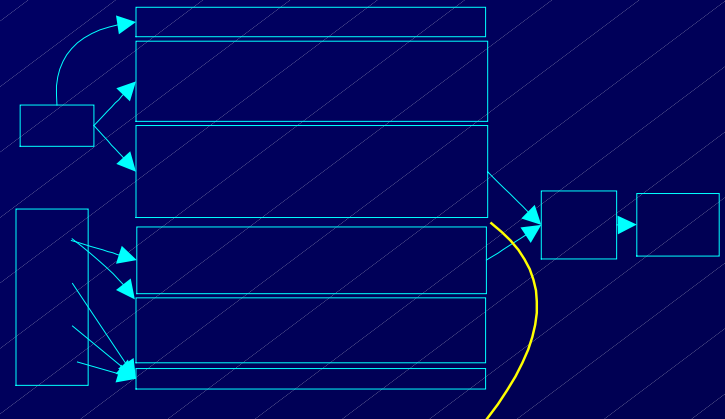
- No matter how good EDA is, payment will improve only if change also occurs in other parts of the system
- Assessing EDA impact on payment requires methodology to tease out contribution of EDA from other factors
- Payment *alone* would not be a fair criterion to judge EDA
- We can expect a direct impact of EDA on the contract process



Example: Higher Level View of EDA



- Developed earlier, when a greater # of evaluation possibilities were under consideration
- EDA affects many user groups
- Specific metrics for each group will differ E.g. "interest \$" specific to DFAS
- Metrics can be combined. E.g. \$ saved across all user groups
- EDA part of an eBusiness infrastructure
- Limits on impact if only part of the infrastructure is evaluated



Metrics + Methods + Models

	Data	Methods	Conclusions / Recommendations
Entire eBusiness Infrastructure	Standard output. Little special manipulation.	"Main effect" monitoring.	Assess overall functioning. No guidance for investment.
...			
Discrete eBusiness System	Fine level. Lots of special manipulation.	Need to ID, measure dependencies & interactions.	Direction for specific systems. No data on overall performance.

Adaptive Systems

- Complete set of metrics cannot be specified in advance because organizations adapt to innovation.
 - CCR role in Past Performance Information Retrieval System
 - Email role in bidding system at the Naval Facilities Engineering Command
 - EDA role in contract information quality
- Implications for evaluation
 - Balance need for stable methodology and requirement to assess unanticipated change
 - Need to stay in close touch
 - As with data, it's hard to find the people who really know

Logic Models Help Explain Why A System Facilitates Change

Pre-CCR

System 1		System 2		System 3		Even with information on the same entities, no way to cross reference
Referent	Information	Referent	Information	Referent	Information	
A	1, 2, 3	α	4, 5	A	6, 7, 8	
B	1, 2, 3	β	4, 5	B	6, 7, 8	
C	1, 2, 3	Γ	4, 5	C	6, 7, 8	

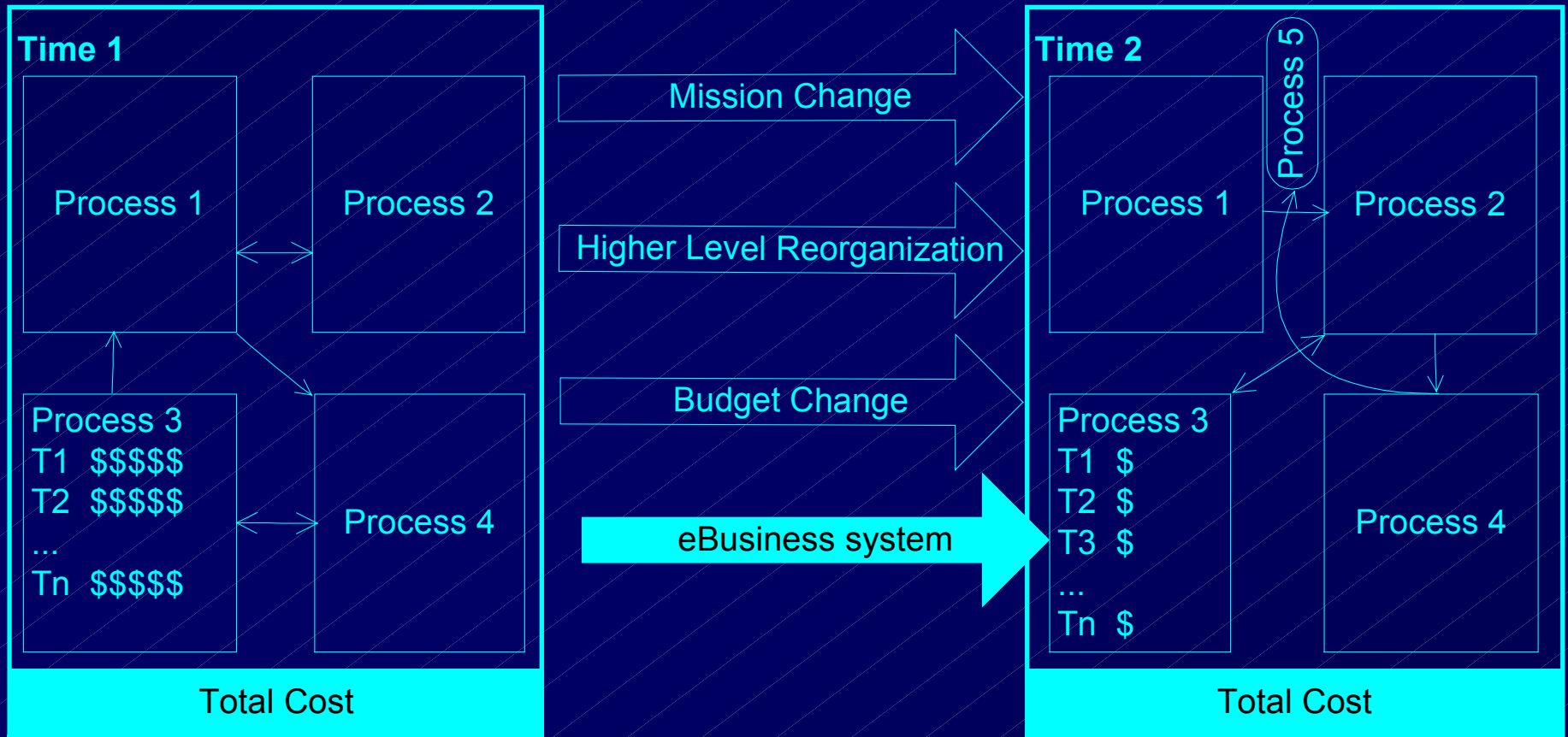
Post-CCR

System 1		System 2		System 3		Single index, data can be integrated across systems
Referent	Information	Referent	Information	Referent	Information	
A	1, 2, 3	A	4, 5	A	6, 7, 8	
B	1, 2, 3	B	4, 5	B	6, 7, 8	
C	1, 2, 3	C	4, 5	C	6, 7, 8	

Realistic Expectations

- eBusiness systems have boundaries of impact
- Decreased task cost/time may bring small overall change
 - Imperfect correlation, calendar time and cost
 - Complex dependencies and relationships among multiple contributors to resource consumption
 - Many powerful forces besides an eBusiness system
- Labor savings do not lead directly to reduction in budget or workforce
 - Work reallocated to other tasks
 - Overtime vs. regular hours
 - People spread across tasks
 - Contractual and political constrains

A Useful Picture To Illustrate These Points



- Obligation to provide honest, accurate assessment
- Success requires a delicate balance
 - Evaluation over the long term requires cooperation from the people being evaluated
 - Counterproductive to ignore impact boundaries and set programs up for failure
 - Programs should be accountable for what they promised to do
 - Information needed to
 - Make fundamental decisions – existence, mission, funding
 - Guide incremental improvement