ITIL®, COBIT®, and CMMI®:
Ongoing Confusion of Process and Function

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Abstract

IT management is strongly influenced by the major process frameworks ITIL®, COBIT®, and CMMI®.[1] However, these frameworks are inconsistent with important tenets of Business Process Management thinking. Examples of this inconsistency are provided, including an analysis of ITIL®'s Value Network advocacy. Implications and consequences and an alternate approach are discussed.

Introduction

ITIL®, COBIT®, and CMMI®

As large scale applied computing (aka "Information Technology") nears its eighth decade of practice, practitioners have generated a great deal of guidance on all its aspects. Some of this guidance has been developed under the imprimatur of governments, major research universities and pre-eminent professional organizations. There is the Information Technology Infrastructure Library (ITIL®), sponsored by the United Kingdom via official publication channels [1-5], and the Control Objectives for Information Technology (COBIT®), sponsored by the IS Audit and Control Association (ISACA) [6]. There is also the Capability Maturity Model-Integrated, developed for twenty years now by the Software Engineering Institute at Carnegie-Mellon [7].

ITIL®, CMMI®, and COBIT® have profound influence and reach in the IT industry globally, serving as defining frameworks for wide sections of IT practice. The frameworks are often utilized as stringent criteria for awarding contracts and assessing maturity, risk, and performance. Training ecosystems have arisen, and books, conferences, and research revolve around them. All essentially serve to define and stabilize much IT terminology and direct it towards a common description of IT practice.

IT is under perpetual scrutiny and the industry is rife with criticism of IT's ability to deliver consistently and manage itself well. It's therefore appropriate to pay critical attention to these frameworks' assumptions and implications.

Business Process Management

There is an extensive literature associated with Business Process Management (BPM), including how to identify or establish, formally document, and improve business processes [8-11]. This literature is highly aligned with broader concerns of general business management, performance management, and the organization as system. There is also substantial overlap between BPM and continuous improvement techniques such as Lean and Six Sigma. However, this Article will cover the narrower topic of defining "process" usefully for operational purposes, especially in creating IT industry frameworks.

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[1] ITIL® is a Registered Trade Mark of the Cabinet Office (UK), and is registered in the U.S. Patent and Trademark Office.

COBIT® is a trademark of the Information Systems Audit and Control Association and the IT Governance Institute.

CMMI®, or Capability Maturity Model-Integrated, is a trademark or registered trademark of Carnegie Mellon University in the U.S. and other countries.

BPM can be and is applied to IT management. ITIL®, COBIT®, and CMMI® all use the term "process" pervasively, and are commonly referred to as "process" frameworks. Thus, they position themselves for scrutiny from a BPM perspective.

BPM Definition of Process

This Article will use Sharp and McDermott's rigorously reasoned, state of the art definition of business process:

> "A business process is a collection of interrelated activities, initiated in response to a triggering event, which achieves a specific, discrete result for the customer and other stakeholders of the process" ([11], p. 56)[2].

The history of BPM is characterized by a core distinction: that between *function* and *process.* The BPM literature is replete with quotes like the following from the seminal *Improving Performance,* by Geary Rummler and Alan Brache:

> "work actually gets done…through processes that cut across functional boundaries" ([10], p. 9).

A better known author to some may be Michael Hammer:

> "Reengineering requires looking at the fundamental processes of the business from a cross-functional perspective. Ford discovered that reengineering only the accounts payable department was futile. The appropriate focus of the effort was what might be called the goods acquisition process, which included purchasing and receiving as well as accounts payable" [12].

Quotes like these are myriad in the BPM literature and strongly define it. **Processes typically cross functions, are measurable and countable, have clear, valuable outcomes, and tend to be relatively few in number,** if well understood and integrated horizontally.

BPM thought leaders generally recommend the the "verb-noun" naming standard ([11], p. 39). Processes also should hit a certain sweet spot of business criticality – while this can be subjective, they do need to be distinguished from mere tasks and procedures. Sound examples of processes might include:

- Originate Mortgage
- Acquire Customer
- Fulfill Order

At the highest level, a primary process or lifecycle for a business may be termed a value chain (a concept coined by business theorist Michael Porter [13]). Functions, on the other hand, essentially are the organizational hierarchy[3]. They represent ongoing activities with no clear beginning or end, and can be as numerous as the number of organizational units in an enterprise.

In the English language, certain linguistic forms appear as red flags to BPM professionals. A noun phrase like *Human Resource Management* signifies a function. *Hire Employee*, on the other hand signifies a true process, with its crisp verb start. Often, processes are horizontally integrated into end to end lifecycles, with pithy names:

- "Hire to Retire"

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[2] The critical reader is urged to obtain a copy of this reference.

[3] It is possible to distinguish "reference" functions or capabilities from an actual organization hierarchy; this might be done for example in the event of a merger to assist in combining two dissimilar organizational structures. This is beyond the scope of this Article.

- "Procure to Pay"

- "Quote to Cash"

Significantly, such lifecycles are all measurable and countable. We can count the employees, the invoices, the requests for quote. In general, they are event driven – there is a clear, unambiguous occurrence (Hire, Procure, Quote) that delineates the beginning of the process or lifecycle. Thinking in these broad, end to end terms is often uncomfortable and BPM practice includes a significant coaching aspect to encourage the "silo breaking" needed for teams to focus on the flow of value.

The focus on crisp, action verb oriented processes has been carried through into significant industry framework development in IT and non-IT spaces. For example, IBM's reference framework for the financial services industry, IFW, is very clear on the distinction between event-driven, countable processes versus the steady state functions they cross [14]. Similarly, the Value-Chain Group has developed extensive industry reference models based on exhaustively documenting long lived value flows (www.value-chain.org). Finally, architecture frameworks such as The Open Group Architecture Framework (TOGAF) [15] typically contain processes and functions as mutually exclusive and distinct core primitives for building architectures.

It seems that the sometimes-clarion trumpets of Business Process Re-Engineering have possibly resulted in a mistaken perception that process is simply good, while functional is simply bad.[4] That is not true, and not the point of this Article.As Rummler notes:

> "In most cases, organizing around processes is not practical . . . it merely creates a different kind of white space... between processes." ([10], p.169).

Both process and function are needed.

Misuse of the Term "Process" in the IT Frameworks

The above history and usage demonstrate that any discussion of business processes, even any usage of the term, should be attentive to the question of process versus function. It should reflect the overall flow of value for the end customer across organizational hierarchies that so often impede it. For IT, this may entail the "IT as a business" thought experiment, in which the IT capability is seen as a business-in-the-small, selling IT services such as Customer Relationship Management System and Supply Chain Management System to "customers" such as Sales and Logistics.[5]

Unfortunately, none of the major IT frameworks discussed in this Article follow these principles. While they all use the term "process" freely, **it is a loose usage not well aligned with established BPM principles**. This deficiency has negative implications for the successful implementation of these frameworks, and (given their influence) for IT practice in general.

ITIL®

ITIL® provides some of the clearest examples of function/process confusion, despite the fact it claims to have a "process-based approach" ([4], p. 3) and approvingly cites Rummler ([4], p. 74). It further states that "The reason a process exists is to deliver a specific result. This result must be *individually identifiable and countable*" ([4], p. 20). Unfortunately, ITIL® clearly does not follow its own framework principles. (It is perhaps notable that the terms BPM and "Business Process Management" appear nowhere in ITIL®.)

A subset of well-known ITIL® "processes" might include:

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[4] It's my conjecture that this has led in part to the confused use of the word "process" in the IT frameworks.
[5] Although occasionally controversial, the "business of IT" thought experiment has a forty-year history and many independently authored analyses (e.g. [16-22]).

- Incident management

- Capacity management

- Change management

- Problem management

- Availability management

- Service configuration and asset management

A business process analyst confronted with this list and attempting to apply the accepted definition of process may start by determining that Incidents, Changes, and Problems are indeed event driven and countable, usually managed in some sort of IT ticketing system. It is therefore not hard to translate their functional naming to strong verb processes:

- Resolve Incident

- Implement Change

- Correct Problem

Similarly, diagramming them as cross-functional process flows should be straightforward, as should be measuring and controlling these processes.

However, things become much murkier with "processes" like Capacity, Availability, and Configuration/Asset Management. **What is a Capacity? How many Capacities have we done today?** Does one "establish" Capacity, "adjust" it, "enhance" it, or "reduce" it? When was the last Availability finished? Who benefited? We can count Assets, but what about Configurations?

Obviously, these questions are somewhat nonsensical, but this is what happens when functions are confused with processes. ITIL® does define its own limited set of "functions," only in the Service Operation volume ([1], p. 153):

- Service Desk

- Technical management function

- IT operations function

- Application management function

This leaves ITIL® with 25 IT "processes," [6] and four IT "functions." This is exactly the inverse of much BPM guidance, which would suggest that the true, value-adding, enterprise-essential processes are relatively fewer than the functions.

COBIT®

The Control Objectives for Information Technology, or COBIT® [6], takes a somewhat different tack in establishing its "processes."[7] First, there is a clear attempt to start with a verb, as we can see from this subset:

- Determine Technological Direction

- Manage Service Desk and Incidents

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[6] There are various attempts to "count" the ITIL processes. There are 25 listed in the various tables of contents in the 2011 version, but some of them decompose further in their discussions. The topic frequently is discussed on www.itskeptic.org.

[7] COBIT 4.1 is used here. The author also has reviewed the exposure draft of CoBIT 5, which is stylistically similar, although the process inventory has changed.

- Ensure Continuous Service

- Manage Changes

- Enable Operation and Use

- Manage Quality

However, these processes are often not crisp or countable. **One is never done "managing," "ensuring," or "enabling."** As Sharp and McDermott state, "Name with Action Verbs, Not Mushy Verbs" ([11], p. 43). In actual IT practice, many COBIT® processes seem more akin to steady state IT functions, such as a Business Continuity Planning organization (for Ensure Continuous Service).

The reader at this point may think the critique unfair, in that a functional area like Business Continuity Planning may well have smaller grained, crisply countable processes. However, this is often true of functional silos, and leads to the problems of IT process proliferation, value obscurity, and unmanaged demand, which will be addressed below in "Consequences of process confusion." Again, we need to hit a sweet spot of business visibility and criticality. Does the end user derive value from Business Continuity Planning per se, or is this better seen as a component or quality attribute of a more fundamental value concept, such as delivering an Application or Infrastructure Service?

CMMI®

We leave CMMI® for last, as it is in some ways a meta-process and set of quality criteria that can be generically applied to any process. Even in this sense, it falls short in not fully embracing BPM criteria of countability as a quality criteria. This observation is based on the CMMI® Generic Goals and Practices section ([7], pp. 65-126), which in general for any given process calls for defining it and talks of execution, but stops short of using the terms "countable" or "countability" or any synonyms. This may seem to be a fine point, but it places CMMI® at some variance from accepted BPM definitions and opens the door for process/function confusion.

The "process areas" themselves have many similarities to ITIL® and COBIT® (again, a subset):

- Organizational Performance Management

- Organizational Training

- Configuration Management

- Measurement and Analysis

- Supplier Agreement Management

Again, some things may be countable, but others suggest ongoing functional activity. CMMI® is also notable for having abstract objectives as well appearing as process areas, e.g.:

- Validation

- Verification

It is hard to see either of the above as *either* a process or a function; they are better understood as quality or acceptance criteria (the work product has been validated and verified) on some other process. The dual nature CMMI® has as both a process framework and quality standard can lead to confusion. Some of the CMMI® process areas may have actual organizational examples, while others are more abstract. **However, if maturing a CMMI® process area is deemed essential (e.g. to securing a contract), does that not constitute temptation to marshal resources around it, perhaps leading to the creation of a functional area?**

Finally, it's interesting that a total of four process areas reference the word "project":

- Integrated Project Management
- Project Monitoring and Control
- Project Planning
- Quantitative Project Management

If the countable concept of interest is "project," clearly all four of these must in some sense be sub-components of an overall project lifecycle. The BPM professional grappling with CMMI® will undoubtedly encounter other questions along these lines.

There is a further concern with the overall concept of Capability Maturity from a BPM or value chain perspective. The concept of end to end value is distinct from capability maturity. If the CMMI® "process areas" are more function than true process, maturing them individually is by definition focusing on silos. Improving "capabilitie s" may improve the ability to deliver value, but is an indirect contribution at best when decoupled from the actual value chain.

The CMMI® approach does not seek to highlight constraints to value, rather it assumes that the pattern of constraints is roughly consistent from organization to organization, and that constraints will magically fall if the capabilities are matured per the guidance.

Consequences of Process Confusion

Process proliferation

In any process definition effort, we cannot escape the need to ground our work in the actual language of the community. Processes in IT management are logical, consensus constructs embedded in a social and linguistic context. We **agree** to call a service outage an "incident."

The International Foundation for Information Technology (if4it.org) has compiled a list of Information Technology terms (mostly noun phrases) that at last count is up to 51,000. In even a casual scan, one can see numerous candidates for IT functions (or "processes" in the sense of the frameworks), for example:

- Calendar Management
- Technical Resource Management
- Operating Environment Management

and hundreds more.

The trouble with formalizing too many constructs like this is silo proliferation – little pockets of concern and activity that are poorly aligned at best with enterprise value. **Organizations cannot effectively distribute attention and resources in such a way.** Which is priority? Availability Management, Capacity Management, Service Level Management? Security? How do they fit together? What is value from the end customer's perspective?

Poor measurability

Processes should be measurable. Business improvement hinges on measuring performance. Yet how does one measure vague processes? Without clear initiating and terminating events, elapsed times, and inputs and outputs, processes degenerate into mere unmanaged activity, with obscure value.

Unmanaged demand

Poor process management does not mean people are goofing off; instead, it may be a dramatically opposite case of overburden. Silos often have internal workflow, perhaps even event driven and countable, but are limited to the boundaries of the silo. Silos seek to justify their existence, and also may take on "initiatives" to "improve" their area of focus.

All of these activities are part of the aggregate demand the IT organization experiences (much of which may be internally generated). Governance, risk, compliance, audit, capacity, availability, security, all represent demand for IT attention competing with project work and service tickets. A functionally oriented IT organization cannot manage this and risks devolving into an opaque black hole of expenditure and seeming activity, with little ability to account for itself. Again, does the end customer of IT derive value from Capacity Planning per se?

Ultimately, without a clear, best-practice process framework, IT demand cannot be quantified.

Value Networks?

When examining ITIL® from the perspective of process management, one finds that there is some discussion of BPM fundamentals in the ITIL® *Service Strategy* volume. However, this discussion is problematic as it is clearly dismissive of value chain and process thinking. This ITIL® volume, in both Versions 3 and 2011, references the concept of Value Network as a tool superior to Value Chains and even process flows, noting that "the creation and realization of value in organizations … is far more complex … [and] better represented by using the concept of value networks… "([4], p. 59).

This is one of the most troubling aspects of the ITIL® *Service Strategy* volume, which in this regard appears largely unchanged from ITIL® v3 to ITIL® 2011. Value networks are deemed necessary because "much of the value of service management . . . is intangible and complex . . . Linear models have shown themselves to be inadequate for describing and understanding the complexities of value for service management . . ." These assertions are not presented with any supporting citations ([4], p. 125).

Service Strategy continues this line of thought, which essentially boils down to the argument that business gets complex and there are often many to many relationships and feedback loops with unclear causalities. The section is characterized by a straw man representation of value chains and dismissal of process thinking, e.g. the above implication that processes are "linear." This is a puzzling statement; linearity is a quality of mathematical functions, not process modeling. Certainly, non-linear behavior can be seen in process execution (if for example the task duration were to be exponential to the number of tasks in queue.)

Perhaps "linear" is meant to imply a simple stepped start/terminate model with no looping, branching, or feedback. This would clearly be another straw man critique; real world processes are complex and even the simplest examples of flowcharting show looping and branching. **BPM has never ruled out the existence of feedback loops**, and even the earliest process modeling standards show this, with the traditional "control" input coming in at the top of a process icon as far back as the 30-year old IDEF0 standard.

Value chains arguably are "linear" in this usage. However, they operate at a higher level of abstraction, with a teleological[8] bent – as advocated by the late Eli Goldratt, with his Socratic question "what is the goal of this factory"? [23] (Notice that Goldratt did not entitle his best selling business novel, *The Goals*.) There must be some end in mind, in order to optimize.

It's surprising that *Service Strategy* implies that the often-remarked difficulties humans have with non-linear dynamics are exacerbated by the BPM and the value chain concept. As a notable counter example, Peter Senge in *The Fifth Discipline*, a bestselling examination of these issues, contrasts "process thinking" favorably with "snapshot thinking" [24]. On a practical level, the

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[8] For the sake of an end.

advanced discrete event simulation capabilities found in state of the art BPM tooling[9] certainly can model non-linear dynamics [25].

The ITIL® discussion contains a number of remarkable implied claims for value networks (adopting the approach will help to "marshal external talent, reduce costs, change the focal point of distinctiveness," and more…) Ultimately, however, the book seeks to support its case for Value Networks not by a high level study of enterprise value, but rather by dismissing the fundamental tenets of BPM as applied to a simple Service Desk workflow.

A clean reference process flowchart is presented, and then dismissed because the value network "reality" (deliberately drawn in a messy, multiple-interaction visual style based on no known industry standard notation) differs from the flowchart. (([4], pp. 128-129, figures 3.47 vs. 3.48). Weak proof indeed for such extraordinary claims, since the alternative "reality" is just an alternative depiction, another model with its own set of abstractions – not "reality" at all.

Value Networks are still not a formalized modeling approach and they are not recognized by any standards body I am aware of. An independent search for methodological guidance on Value Networks returns little of any use for practical diagramming, modeling, and analysis. One source advises "DO NOT BE CONCERNED that this doesn't follow any rigorous modeling methodologies" ([26], emphasis supplied). At a metamodel level, they appear to be simply an undifferentiated "many to many" graph structure – hardly innovative. Such simple conceptual interaction diagrams are an approach that (with or without the name "value network") architects and analysts intuitively use when initially scoping a problem. This weakness and obviousness is surprising, if value networks are as important and innovative as ITIL® has seen fit to claim over two editions and six years.

It is true that reality is multi-causal, characterized by complex dynamics. No BPM professional should dispute this. But even simple graph theory gives us directed versus undirected graphs, and networks versus trees. The Unified Modeling Language gives us both sequence (ordered) and interaction (unordered) diagrams. Yet we do not therefore say that determining direction and isolating tree structures is too "linear" and therefore everything should be seen as a network, or that UML sequence diagrams should be discarded in favor of interaction diagrams. **Deriving causality and at least partial orderings from a simple network is in fact the important and hard work of analyzing a problem.[10]** And IT (like any business area) does have many basic "linear" precedence steps that always apply: you can't install the software until you have the server provisioned, for example.

A process architecture built up from clear, countable primitives is exactly how we can begin to understand such complexity. And accidental complexity (such as the "reality" of a process execution differing from its documented flowchart) is different from the essential complexity of whether a process can be managed and measured. Process documentation is inherently an abstraction; it needs to simplify messy realities. This is not a weakness but a strength of BPM.

ITIL® has been taken to task in other forums for confusing "emerging" with true "best practice" guidance.[11] This is a serious matter for a framework as influential as ITIL®. The poorly vetted *Service Strategy* guidance on value networks and implicit dismissal of BPM is at least irresponsible, given ITIL®'s influence. Accepting the insights of systems theory does not require discarding the concepts of Value Chain and the well-established professional discipline of Business Process Management.

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[9] The capability sometimes referred to as BPA, or Business Process Analysis.

[10] Directed acyclic graphs are more tractable, and therefore more valuable.

[11] See www.itskeptic.org

ITIL® does, however, present a useful abstraction: the concept of a Service Lifecycle. This lifecycle is implicit in the titles of the ITIL® volumes: Strategy, Design, Transition, Operation, Improvement. Such a sequence has often been proposed as the essence of an "IT value chain" from a product lifecycle perspective (e.g. [16], p. 154 and *passim*). This leads to our suggested alternative approach.

An Alternate Approach

In defining a solution, **understanding the language of the user community is paramount**. ITIL®, COBIT®, and CMMI® are all of keen interest to the BPM professional (and enterprise architects, for that matter) working on IT process improvement, because they all represent the domain language. A deep understanding of such domain terminology has been shown to be essential to constructing solutions and platforms to support the domain experts' work [27]. This becomes harder in IT, because of the self-reflexive nature of the exercise. It is difficult to "stand outside" of the IT community and ask questions like "Why call it that? Doesn't X mean the same thing as Y?"

However, such rigor is necessary if the problem is to be solved with definite methods, regardless of whether they are automated or not. In fact, the translation of ambiguous and overlapping terms into a consistent model can be termed a "logical design" (or "platform-independent model" in the parlance of the Object Management Group). Such a logical model is an essential precursor to full automation, and is required for the measurement and management of any process.

In defining the domain of IT discourse, a practitioner might notice the following nouns and noun phrases keep recurring in domain discussions:

- IT Service
- Application (or Application Service)[12]
- Infrastructure Service
- Asset
- Technology Product (Hardware & Software)
- Person
- Support Group
- Contract
- Vendor

- Demand Request
- Project
- Release
- Change
- Service Request
- Incident
- Problem
- Improvement
- Transaction

Notice that all these nouns are crisp and countable. Through elimination of HR and supply chain concerns, and application of conceptual modeling and entity lifecycle analysis [28, 29], one can derive four major lifecycles that last years:

- Application Service (computation applied to a business problem, e.g. a payroll application)

- Infrastructure Service (computation applied to an IT problem, e.g. hosting an application)

- Asset (tangible investment supporting an IT service, e.g. a server or database software license)

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[12] "Business Service" is also encountered, but I find this an ambiguous construct. This ontology sees IT Service as containing subtypes of Application and Infrastructure Service.

- Technology Product (**types** of assets, e.g. a choice of server make/model or database vendor/version)

The lifecycles operate with different timings, and much of the work of enterprise IT boils down to synchronizing them for correct transactional delivery. This is done via nine true processes, all consistent with BPM best practices, each with a distinct granularity and definition, which crosscut the above lifecycles (as well as myriad IT functions) and seek to align them:

- Accept Demand

- Execute Project

- Deliver Release

- Complete Change

- Fulfill Service Request

- Deliver Transactional Service

- Restore Service [aka Resolve Incident]

- Improve Service

- Retire Service

Notice the rough service lifecycle sequence, from Demand through Retire. Services do follow this lifecycle (perhaps iteratively), and it's essentially an elaboration of what ITIL® suggests. Figure 1 provides a visual depiction.
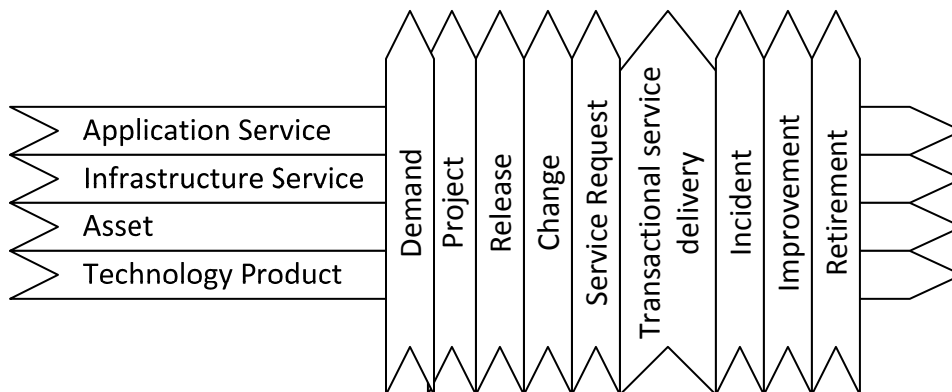

Figure 1. IT lifecycles and processes

One process in particular this author favors is **the concept of a generic "Improve Service" process.** This would be a countable, crisp process that could serve as a vehicle for efforts such as problem, capacity, availability, security, architecture, audit, risk, and many other "initiative" type activities that tend to fall in the cracks between project and process management. The reader may ask, "how is this different from the various continuous improvement approaches proposed by the existing frameworks?". The additional insight here is that **continuous improvement must be crisply enumerated and is itself understood as a form of IT demand**, competing for resources with other processes. From a systems perspective, a dedicated system of record for such initiatives is advisable. To this end, *BPTrends* author Dee Carri proposes an "Integrated Compliance, Quality, and Process Management System" [30], ITIL 2011 calls for a "CSI Register" ([5], 36), and I call for the concept of a Continuous Improvement System in my updated systems architecture [31]. Clearly, this is an idea whose time has come.

While still complex, this is a more concise model than any of the major frameworks, and yet, as a true process architecture, covers the critical activities of enterprise IT. (Again, supply chain management and HR are seen as external to IT in this model.) While each lifecycle and process is seen as a sequential set of state changes on a core entity, they may interact with each other in richly dynamic ways; it is not a simple model and I believe it capable of illustrating complex emergent behavior.

It's not the purpose of this Article to detail this model further. (See [31] for its full derivation and matrixing to companion functional, data, and system models.) Other representations could be proposed, but would have to be similar in important respects. The parsimonious combination of established IT terminology with a best practice business process management approach does not leave many degrees of freedom.

Conclusion

IT remains in a chronic crisis of poor image and performance, and so deep critiques of the major frameworks are appropriate, given their influence. Currently, they unfortunately are obscuring end to end IT value and encouraging IT transformation initiatives less focused on a holistic system of value, and more focused on strengthening silo walls. Their concept of "process" is inconsistent with well-established industry best practices, and in the case of ITIL® significant missteps have been made that need correction.

ITIL®, COBIT®, and CMMI® also contain an inestimable amount of valuable and hard won industry insight. Any of them could be re-engineered to be more consistent with BPM approaches, while retaining their previous value, and it's my hope that their authors will consider this. Doing so would make them both simpler and more powerful, as well as easier to implement. This in turn could lead to improved IT performance and success for its practitioners and partners.

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