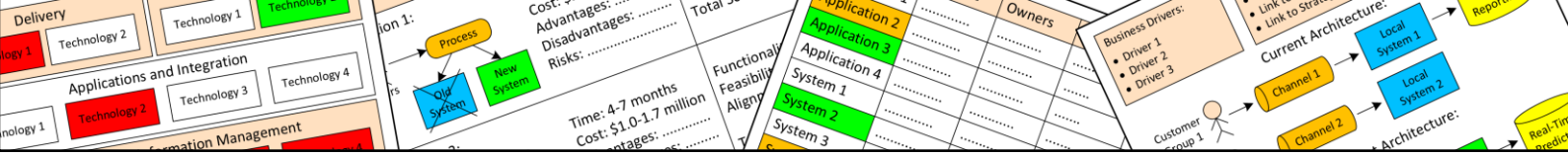

Enterprise Architecture Frameworks: The Fad of the Century

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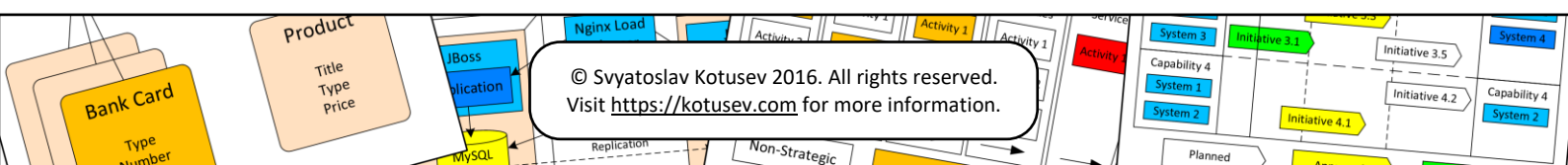
Introduction

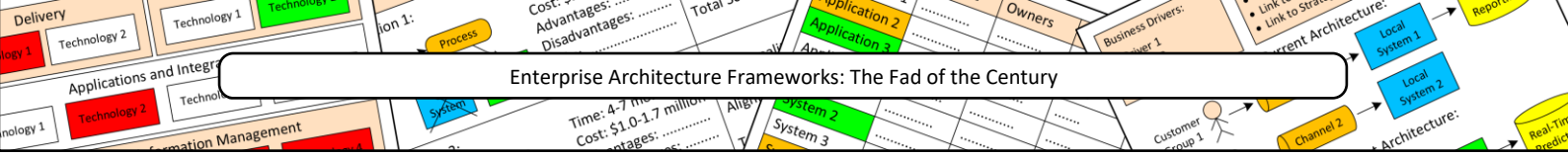
Enterprise architecture (EA) is widely used as an instrument for improving business and IT alignment in various organizations across the globe. However, as I previously reported[1, 2, 3], successful real-world EA practices have nothing to do with popular EA frameworks. Moreover, neither specific details nor even general ideas promoted by the most widely discussed EA frameworks can be found in real organizations successfully practicing EA[2]. How can it be that the most widely acknowledged EA frameworks inseparably associated with the very notion of EA turned out to be essentially unrelated to real EA practices? What does it all mean? My broad historical analysis of the EA literature shows that all popular EA frameworks, including Zachman[4], TOGAF[5] and FEAF[6], are nothing more than typical management fads[7, 8] aggressively promoted by consulting companies and gurus. They are useless at best and harmful at worst.

History of EA Frameworks

The common myth shared probably by thousands of people suggests that EA as a discipline emerged after the publication of the Zachman Framework[4] in 1987. However, the evidence-based historical review[9] shows that the idea of EA appeared much earlier and originates from the Business Systems Planning (BSP) methodology[10] initiated by IBM in the 1960s. The BSP methodology provided the initial foundation for all current EA methodologies and frameworks: the notion of information systems architecture, a top-down architecture planning approach, a formal step-wise architecture planning process as well as various diagrams and matrices for describing the architecture.

The subsequent long history of EA can be roughly separated into three distinct time periods[9]: pre-EA (BSP), early EA and modern EA. The pre-EA period in the history of EA lasted approximately from the 1960s to the 1980s. Pre-EA methodologies included the seminal BSP methodology offered by IBM[10, 11, 12], the analogous Method/1 methodology offered by Arthur Andersen[13, 14] and similar BSP-like methodologies offered by other consultancies[15] and gurus[16, 17]. The early EA period lasted between the 1980s and 1990s. During this period (1) first EA frameworks appeared including the PRISM framework in 1986[18, 19] (which was sponsored by IBM among other companies), the Zachman Framework in 1987[4] and the NIST EA model in 1989[20], (2) the term “enterprise architecture” started to be consistently used[20, 21] and (3) a new generation of EA methodologies appeared including Steven Spewak’s Enterprise Architecture Planning (EAP)[22] (which “has its roots in IBM’s BSP”[22, page 53]) and TAFIM[23]. The modern EA period started in the 1990s and introduced current EA frameworks including FEAF[6] (which is based on EAP) and TOGAF[5] (which is





based on TAFIM). All these three generations of EA methodologies are essentially based on the seminal ideas of the BSP methodology and advocate very similar formal step-wise architecture-based approaches to information systems planning.

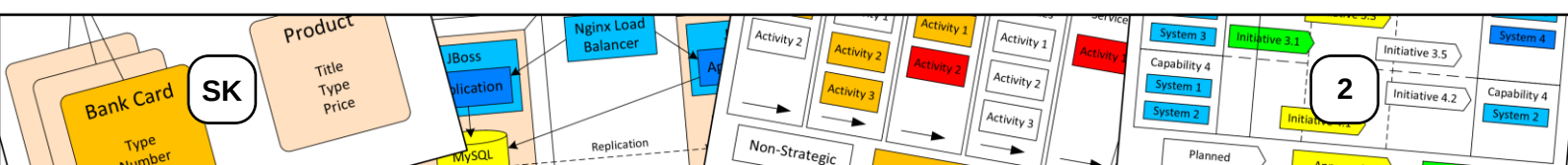
Problem with EA Frameworks

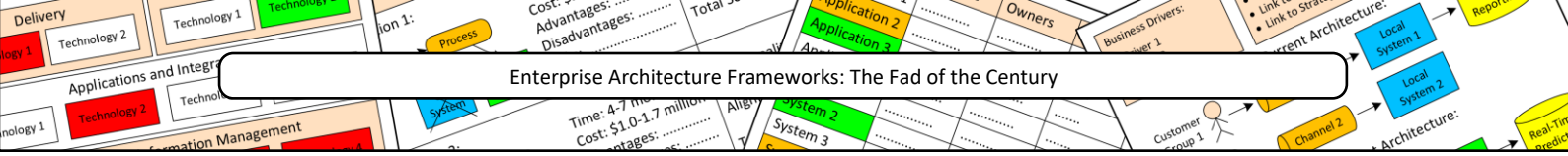
As research has consistently demonstrated over the long history of EA, the practical implementation of all the three generations of EA methodologies was associated with significant problems. For instance, for pre-EA (BSP-like) planning methodologies it was found that[24, 25, 26, 27, 28] (1) planning is very expensive and time consuming, (2) plans are hardly understandable, very abstract and require further analysis to be implemented, and (3) planning is organizationally difficult to implement, plans are carried out only partially or even shelved. The practical experience in the early EA period revealed that[29, 30, 31] (1) EA development efforts require too much time, money and staff, (2) EA documentation is too conceptual, inflexible, incomprehensible and obsolete to be useful, and (3) EA-related activities are poorly integrated into the organization, compliance to EA is often not achieved. The main identified problems with the modern EA include[32, 33, 34, 35, 36, 37] (1) huge efforts and resources are needed to develop and maintain EA documentation, (2) EA documentation has low quality, improperly detailed, overly complex and often outdated, and (3) EA-related activities happen in “ivory towers”, EA documentation is ignored. Therefore, the research has shown that all the three generations of EA methodologies required unreasonable efforts to produce an unusable documentation which is usually ignored or shelved.

Unsurprisingly, over the long history of EA numerous authors consistently concluded that recommended pre-EA and EA methodologies are ineffective. For instance, Goodhue et al.[26, page 383] concluded that “the approach is too expensive, its benefits are too uncertain, and it is organizationally difficult to implement”. Lederer and Sethi[24, page 455] concluded that “given their great expense and time consumption, [...] findings seriously challenge the utility of the [BSP-like] planning methodologies”. “In summary, strategic information systems planners are not particularly satisfied with [the BSP-like approach]. After all, it requires extensive resources. [...] When the [BSP-like] study is complete, further analysis may be required before the plan can be executed. The execution of the plan might not be very extensive”[38, page 76]. Kemp and McManus[39, page 20] are unsure they have “yet seen an EA strategy that is anything other than impractical, unachievable and, even if it could be achieved, unsustainable”. Holst and Steensen[40, page 19] conclude that “successful EA is difficult to create based on a large part of the established and commonly accepted mechanistic inspired EA literature”. Bloomberg[41, page 1] argues that “EA has achieved a surprisingly paltry level of success”.

What is more important, various authors consistently concluded that problems with all the three generations of EA methodologies are *fundamental* in nature. For instance, during the pre-EA period Goodhue et al.[25, page 28] concluded that “the evidence [...] presented here strongly supports the need for a *fundamental* rethinking of IS planning methodologies”. During the early EA period Hamilton[42, page 81] concluded that “findings from the study suggest strongly that the prescriptive approach to architecture-driven planning at the portfolio level is *fundamentally* flawed”. During the modern EA period Gaver[35, page 10] concluded that “EA often doesn't work well anywhere because the problems with Enterprise Architecture are *fundamental* in nature”.

To summarize, the evidence presented above clearly shows that all the three generations of EA methodologies (1) recommended essentially the same formal step-wise architecture-based





planning approach, (2) suffered from the same practical problems, and (3) proved impractical and fundamentally flawed.

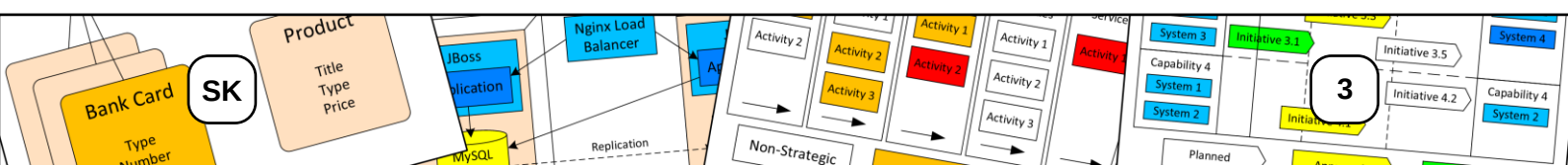
These conclusions reveal the deceitful story of popular EA frameworks: (1) all popular EA frameworks are based on the 50-years-old BSP methodology, (2) the entire family of pre-EA and EA methodologies starting from BSP and ending with TOGAF is fundamentally flawed, (3) despite their proven impracticability all the three generations of EA methodologies were successfully promoted and sold as "best practices" by various consultancies and gurus, (4) instead of learning from failures of the previous generation and improving methodologies, consultants merely repacked and resold the same "old wine in new bottles", and (5) the only fundamental "improvement" of TOGAF over BSP is the new rhetorical trick emphasizing the need to "adapt" the methodology before applying it, which essentially means "doing something else" as I discussed previously[3].

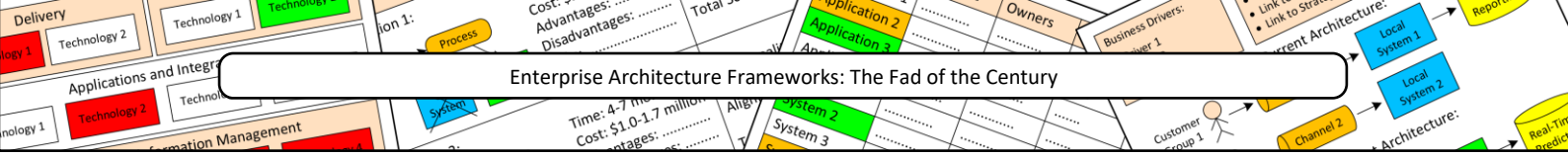
Therefore, regardless of abundant negative feedback, over almost a half of the century numerous consultancies and gurus have been making their fortunes selling the same flawed pre-EA and EA methodologies under different titles as "best practices" with significant marketing efforts and simplistic rhetorical tricks. Moreover, due to the aggressive promotion the very notion of EA is currently strongly associated with EA frameworks. However, as the analysis provided above clearly demonstrates, all popular EA frameworks and their conceptual predecessors are evident marketing-driven management fads[7, 8] with no demonstrated examples of successful implementation. While numerous marketing whitepapers consistently positioned EA frameworks as "best practices", the evidence-based research consistently demonstrated the opposite conclusions. EA frameworks essentially have no intrinsic value, except suggesting that some EA documents should be developed and used. From this perspective it becomes perfectly clear how the most "definitive" EA frameworks, including Zachman, TOGAF and FEAF, turned out to be essentially unrelated to successful EA practices as I reported previously[1, 2, 3].

Harm of EA Frameworks

The insistent promotion of ineffective "best practices" could hardly be harmless for organizations and society. Probably the most spectacular example demonstrating EA frameworks at work is the failure of the Federal Enterprise Architecture (FEA) program. The FEA program was initiated in 1999 after the enactment of the Clinger-Cohen Act in 1996 obliging the U.S. Federal Government to develop consistent architectures for all agencies to improve the usage of information systems[43]. The Federal Enterprise Architecture Framework (FEAF)[6] was developed to be the guiding EA framework for the FEA program.

From the very beginning all the well-known EA gurus and consultancies were heavily involved in the FEA program. For instance, John Zachman and Steven Spewak were involved in the FEAF development as "two of many recognized leaders in architecture conceptualization and enterprise architecture planning"[6, page 19]. To the Federal Bureau of Investigation (FBI) "the consultant [Arthur Andersen] recommended that the bureau develop a comprehensive EA to help reduce the proliferation of disparate, noncommunicating applications"[44, page 8]. IBM was involved as a contractor for developing EA as well, for instance, in the Department of Defense (DOD)[45] and NASA[46]. IBM's contract with DOD was especially lucrative: "To develop the architecture, DOD entered into a 5-year, $95 million contract with International Business Machines (IBM) in April 2002 [...]. In 2004, DOD increased the contract amount to $250 million [...]. As of September 2004, DOD reported that it had obligated approximately $318 million for the program, which is primarily for contractor support"[45, page 10]. Therefore, all the authors of the most prominent pre-EA and EA



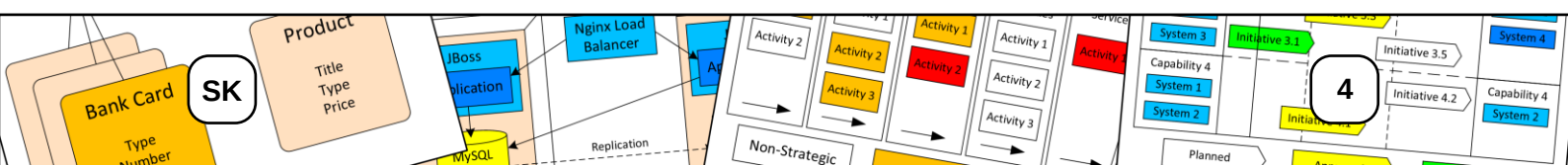


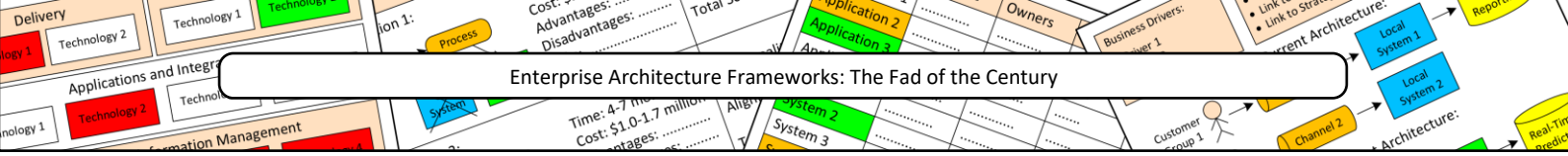
methodologies mentioned before were heavily involved in the planning and implementation of the FEA program.

The FEA program can hardly be called particularly successful[47]. Maturity assessments of the FEA program[48, 49, 50, 51, 52] according to the FEA assessment framework[53] consistently demonstrated that the vast majority of federal agencies did not mature higher than Stage 2 ("Building the EA Management Foundation"), while only a very small number of agencies matured to Stage 4 ("Completing the EA") and almost no agencies matured to Stage 5 ("Leveraging the EA to Manage Change"). The official report on the status of the FEA program to the U.S. Congress in 2002 concluded that "the current state of the federal government's use of EAs is mixed, but overall it is not sufficiently mature to support well-informed IT investment decision-making"[48, page 24]. In 2003 the similar report concluded that "the federal government's state of enterprise architecture management remains less than satisfactory, with little progress being made over the last 2 years"[49, page 52]. Eventually, the FEA program had largely failed and experienced a "hangover"[35, 54]. "Most departments and agencies reported they expect to realize the benefits from their respective enterprise architecture programs [...] sometime in the future. What this suggests is that the real value in the federal government from developing and using enterprise architectures remains largely unrealized"[55, page 64]. "Look at all the efforts that have been launched under the idea of architecture and all the money that has been spent under the umbrella of architecture that has all resulted in unusable shelfware", commented Paul Brubaker, one of the principal authors of the Clinger-Cohen Act[56, page 1]. Unsurprisingly, Vivek Kundra, the federal CIO of the United States, argued that EA frameworks "are worse than useless"[57, page 1]. "[Enterprise architects] focus on documenting the current state or what the future state should be. By the time they are done with their architectural artifact, a new technology has already killed whatever they are working on", described he[57, page 1].

The FEA program was not a cheap one. For instance, in 2003 it was reported that "$599 million being spent to date on the development of architectures"[49, page 62]. In 2006 "departments and agencies reported that they have collectively invested a total of $836 million to date on enterprise architecture development"[51, page 45]. By the end of 2010 "literally more than a billion dollars have been spent so far on Enterprise Architecture by the federal government, and much, if not most of it *has been wasted*"[35, page 52]. However, the government's wastes are its contractors' profits. "Agencies reported heavy use of contractor support for developing their respective architectures"[49, page 60] and "$188.9 million [of the money spent] were attributed to contractor personnel" [49, page 67]. The later report summarized that "the departments and agencies allocated the reported $621 million in contractor-related costs [and] architecture development activities accounted for the majority of costs - about $594 million"[51, pages 49-50]. Therefore, while the U.S. Federal Government had largely wasted the taxpayers' money, various consulting companies and gurus made enormous profits merely creating heaps of EA documentation instead of delivering any tangible results. "I kept pushing the person [in charge of the project], "What did we get, what did we get, what did we get?" And ultimately it ended up being this book [EA]", explained Vivek Kundra[57, page 1].

Among all the U.S. Federal Government's agencies the Department of Defense provides the most spectacular example of progressing time and money investments in EA, but getting the same unsatisfactory results: "despite 3 years of effort and over $203 million in reported obligations, DOD's architecture remains insufficiently defined, and the way in which the department makes business systems investments decisions remains largely unchanged"[58, page 19], "despite spending almost 4 years and about $318 million, DOD does not have an effective architecture program"[45, page ii], "even though DOD has spent more than 10 years and at least $379 million on its business enterprise architecture, its ability to use the architecture to guide



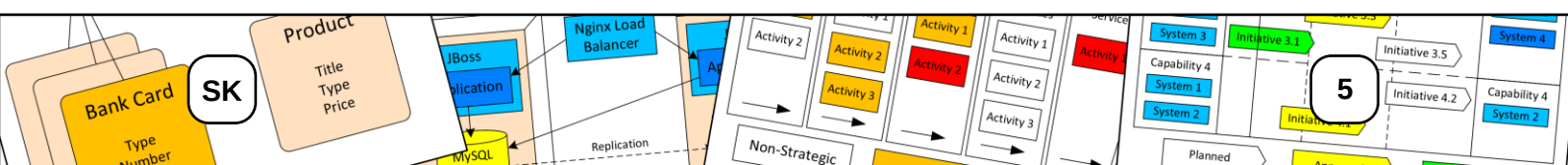


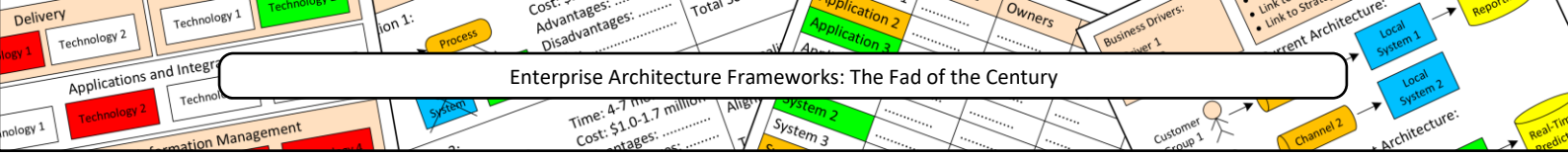
and constrain investments has been limited"[59, page ii]. In 2015 it was reported that "the architecture was not effective in constraining system investments or enabling DOD to produce reliable and timely information for decision-making purposes"[60, page ii], "the architecture has produced limited value"[60, page ii], "[the architecture] was generally not effective in achieving its intended outcomes and that its usefulness in achieving benefits, such as reducing the number of applications, was limited"[60, page 16], "the business enterprise architecture has not been effective in meeting its intended outcomes"[60, page 17], "the usefulness of DOD's business enterprise architecture in achieving various potential benefits is limited"[60, page 18] and "the architecture does not enable DOD to produce reliable and timely information for decision-making purposes"[60, page 28]. Among the specific problems with EA in DOD the following two were mentioned[60, page 18]: (1) "the architecture is overwhelming to review and is not integrated with other activities that occur throughout the remainder of the year" and (2) "the architecture is a standalone effort that does not drive comprehensive portfolio and business management through the various DOD components". Therefore, the experience of DOD in 2015 completely supports all the previous research results initially reported in the end of the 1980s[24, 26] and then consistently supported by all subsequent research: pre-EA and EA methodologies are impractical since they require unreasonable efforts to produce unusable documentation which usually ends up in "ivory towers". Since FEAF was initially based on the very same ideas as all the previous flawed pre-EA and EA methodologies, it naturally proved unsuccessful as well.

As Albert Einstein famously noted, "insanity is doing same things and expecting different results". Are people promoting the same 50-years-old ideas that ruined the FEA program insane? Absolutely not. Various consultants and gurus are making their money selling whatever can be effectively sold, regardless of whether it works or not. For instance, John Zachman, the "father" of EA, who previously promoted the flawed BSP methodology during his former 26-years-long marketing career in IBM, has recently acquired the Federal Enterprise Architecture Certification (FEAC) Institute[61] and is now actively selling certifications and trainings in FEAF[62], the EA framework largely responsible for a billion dollars of wasted taxpayers' money invested into the FEA program. Members of the FEAC Institute still promote certification programs in the very same EA frameworks representing flawed "best practices"[63]. Insanity here is that the EA community generally still does not recognize EA frameworks as yet another management fad and numerous EA practitioners are still eager to get certified in some of these EA frameworks. The fact that consultants are able to sell the same worst practices under the title of "best practices" for several decades even when the truthful information is publicly available clearly demonstrates the unlimited power of endless marketing promises and the total impotence of evidence-based common sense. This situation vividly illustrates another infamous saying: "a lie told a thousand times becomes the truth".

To summarize, the evidence presented above clearly shows that (1) FEAF is based on EAP (which is based on BSP) and, therefore, represents the third generation of EA methodologies, (2) the entire family of EA methodologies proved impractical and, unsurprisingly, the FEAF-based FEA program failed as well, and (3) the problems with FEAF are identical to the well-known problems of the entire family of EA methodologies and include high costs, unusable documentation and isolated nature of planning activities.

These conclusions reveal the horrible story of the FEA program: (1) the FEA program was essentially inspired, planned and implemented by EA consultancies and gurus who promoted the most prominent pre-EA and EA methodologies including IBM (author of BSP), Arthur Andersen (author of Method/1), John Zachman ("father" of EA) and Steven Spewak (author of EAP), (2) the very same EA consultancies and gurus who inspired FEA subsequently





earned more than 600 million dollars as contractors for the failed program, (3) the ineffectiveness of pre-EA (BSP-like) methodologies have been demonstrated empirically in the end of the 1980s - 10 years before the start of the FEA program, i.e. FEA was doomed from the beginning, its failure was predicted by research long before the program has started, (4) the very same problems reported by researchers more than 25 years ago are now repeated in the official report to the U.S. Congress after a billion dollars of overall wasted investments in EA, (5) nothing in the EA discipline has changed as a result, no lessons have been learnt by the EA community from the failure of FEA since the very same gurus continue to promote the very same flawed EA methodologies as "best practices", and (6) publicly available information on the failures of EA frameworks is generally ignored, while the number of framework-certified experts is constantly growing.

Therefore, the history of the entire three-generation family of EA methodologies is the history of flagrant scams and evident marketing manipulations, when the same flawed EA methodologies were continuously promoted under different titles as "best practices" over several decades regardless of plentiful empirical evidence against them. The history of EA frameworks provides an egregious example of irresponsible salesmanship harmful for everybody, except for the salesmen (probably the dissolution of Arthur Andersen after the Enron scandal is a fair redemption). If the FEA program alone has wasted more than a billion dollars, then what are the overall world-wide amounts of money wasted in attempts to implement "best practices" described in EA frameworks? The answer to this question is unknown, but can be impressive.

What Does It Mean for the EA Discipline?

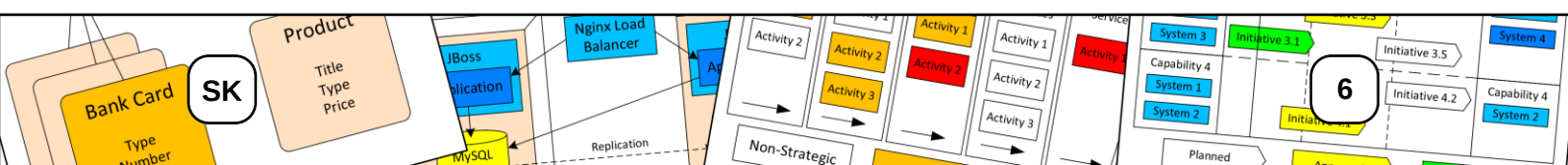
The evidence discussed in this article clearly demonstrates that the entire family of pre-EA and EA methodologies from BSP to TOGAF is fundamentally deficient. What does it mean for the EA discipline? Does it mean that EA does not work? Not at all, it only means that EA frameworks do not work and that successful EA practices are unrelated to EA frameworks as I reported previously[1, 2, 3].

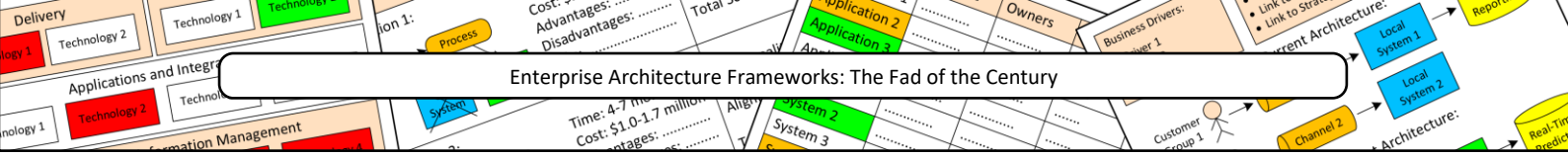
This conclusion is again not new. For instance, Periasamy[64] in 1993 and Periasamy and Feeny[65] in 1997 reported that the notion of architecture introduced by BSP was found useful, but with significant deviations from the original prescriptions of BSP. Ross et al.[66] reported in 2006 that business-oriented architectures are very useful, while detailed technical architectures recommended by pre-EA and EA methodologies are "useful as little more than doorstops". Holst and Steensen[40] reported in 2011 that successful EA practices are organic and do not resemble mechanistic ideas of EA frameworks.

John Zachman had famously noted that EA is the issue of the century[67]. Taking into account the total figures of money wasted in attempts to implement EA frameworks, it is fair to say that while EA might still be the issue of the century, EA frameworks (including the Zachman Framework) might only be the fad of the century - probably the most harmful fad in the history of management fads, the "cocaine for executives"[41, page 1]. Therefore, the EA community should acknowledge that the entire family of EA frameworks has no relationship to successful EA practices and is only a detrimental management fad. SK

■ References

[1] Kotusev, S. (2016) "Enterprise Architecture Is Not TOGAF", British Computer Society (BCS), URL: https://www.bcs.org/articles-opinion-and-research/enterprise-architecture-is-not-togaf/.





[2] Kotusev, S. (2016) "One Minute Enterprise Architecture", British Computer Society (BCS), URL: https://www.bcs.org/articles-opinion-and-research/one-minute-enterprise-architecture/.

[3] Kotusev, S. (2016) "The Critical Scrutiny of TOGAF", British Computer Society (BCS), URL: https://www.bcs.org/articles-opinion-and-research/the-critical-scrutiny-of-togaf/.

[4] Zachman, J. A. (1987) "A Framework for Information Systems Architecture", *IBM Systems Journal*, Vol. 26, No. 3, pp. 276-292.

[5] TOGAF (2011) "TOGAF Version 9.1" (#G116), Reading, UK: The Open Group.

[6] FEAF (1999) "Federal Enterprise Architecture Framework, Version 1.1", Springfield, VA: Chief Information Officer Council.

[7] Miller, D. and Hartwick, J. (2002) "Spotting Management Fads", *Harvard Business Review*, Vol. 80, No. 10, pp. 26-27.

[8] Miller, D., Hartwick, J. and Le Breton-Miller, I. (2004) "How to Detect a Management Fad - And Distinguish It From a Classic", *Business Horizons*, Vol. 47, No. 4, pp. 7-16.

[9] Kotusev, S. (2016) "The History of Enterprise Architecture: An Evidence-Based Review", *Journal of Enterprise Architecture*, Vol. 12, No. 1, pp. 29-37.

[10] BSP (1975) "Business Systems Planning: Information Systems Planning Guide" (#GE20-0527-1), White Plains, NY: IBM Corporation.

[11] Lederer, A. L. and Putnam, A. G. (1987) "Bridging the Gap: Connecting Systems Objectives to Business Strategy with BSP", *Journal of Information Systems Management*, Vol. 4, No. 3, pp. 40-46.

[12] BSP (1984) "Business Systems Planning: Information Systems Planning Guide (4th Edition)" (#GE20-0527-4), Atlanta, GA: IBM Corporation.

[13] Arthur Andersen (1979) "Method/1: Systems Development Practices", Chicago, IL: Arthur Andersen.

[14] Lederer, A. L. and Gardiner, V. (1992) "Strategic Information Systems Planning: The Method/1 Approach", *Information Systems Management*, Vol. 9, No. 3, pp. 13-20.

[15] Nolan, R. L. and Mulryan, D. W. (1987) "Undertaking an Architecture Program", *Stage by Stage*, Vol. 7, No. 2, pp. 1-10.

[16] Martin, J. (1982) *Strategic Data-Planning Methodologies*, Englewood Cliffs, NJ: Prentice Hall.

[17] Finkelstein, C. (1989) *An Introduction to Information Engineering: From Strategic Planning to Information Systems*, Sydney, Australia: Addison-Wesley.

[18] PRISM (1986) "PRISM: Dispersion and Interconnection: Approaches to Distributed Systems Architecture", Cambridge, MA: CSC Index.

[19] Rivera, R. (2013) "The PRISM Architecture Framework - Was It the Very First Enterprise Architecture Framework?", *Journal of Enterprise Architecture*, Vol. 9, No. 4, pp. 14-18.

[20] Rigdon, W. B. (1989) "Architectures and Standards", In: Fong, E. N. and Goldfine, A. H. (eds.) *Information Management Directions: The Integration Challenge (NIST Special Publication 500-167)*, Gaithersburg, MD: National Institute of Standards and Technology (NIST), pp. 135-150.

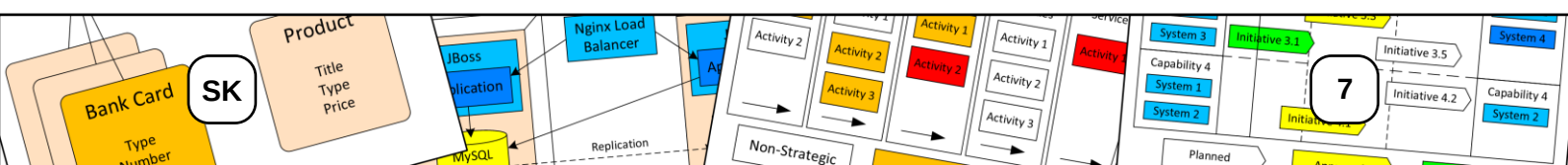
[21] Richardson, G. L., Jackson, B. M. and Dickson, G. W. (1990) "A Principles-Based Enterprise Architecture: Lessons from Texaco and Star Enterprise", *MIS Quarterly*, Vol. 14, No. 4, pp. 385-403.

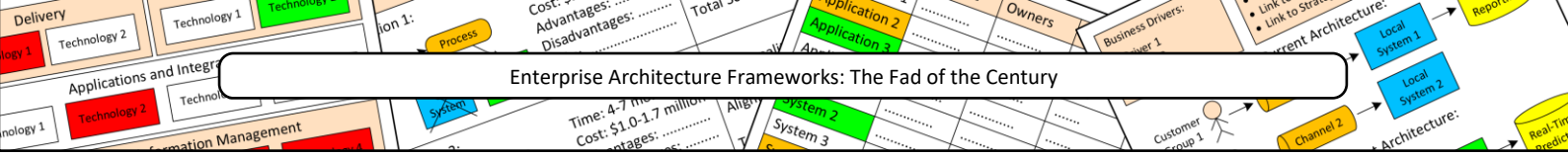
[22] Spewak, S. H. and Hill, S. C. (1992) *Enterprise Architecture Planning: Developing a Blueprint for Data, Applications and Technology*, New York, NY: Wiley.

[23] TAFIM (1996) "Technical Architecture Framework for Information Management, Volume 4: DoD Standards-Based Architecture Planning Guide (Version 3.0)", Arlington County, VA: Defense Information Systems Agency (DISA).

[24] Lederer, A. L. and Sethi, V. (1988) "The Implementation of Strategic Information Systems Planning Methodologies", *MIS Quarterly*, Vol. 12, No. 3, pp. 445-461.

[25] Goodhue, D. L., Kirsch, L. J., Quillard, J. A. and Wybo, M. D. (1992) "Strategic Data Planning: Lessons from the Field", *MIS Quarterly*, Vol. 16, No. 1, pp. 11-34.





[26] Goodhue, D. L., Quillard, J. A. and Rockart, J. F. (1988) "Managing the Data Resource: A Contingency Perspective", *MIS Quarterly*, Vol. 12, No. 3, pp. 373-392.

[27] Shanks, G. (1997) "The Challenges of Strategic Data Planning in Practice: An Interpretive Case Study", *Journal of Strategic Information Systems*, Vol. 6, No. 1, pp. 69-90.

[28] Beynon-Davies, P. (1994) "Information Management in the British National Health Service: The Pragmatics of Strategic Data Planning", *International Journal of Information Management*, Vol. 14, No. 2, pp. 84-94.

[29] Kim, Y.-G. and Everest, G. C. (1994) "Building an IS Architecture: Collective Wisdom from the Field", *Information and Management*, Vol. 26, No. 1, pp. 1-11.

[30] Perks, C. and Beveridge, T. (2003) *Guide to Enterprise IT Architecture*, New York, NY: Springer.

[31] Segars, A. H. and Grover, V. (1996) "Designing Company-Wide Information Systems: Risk Factors and Coping Strategies", *Long Range Planning*, Vol. 29, No. 3, pp. 381-392.

[32] Lohe, J. and Legner, C. (2014) "Overcoming Implementation Challenges in Enterprise Architecture Management: A Design Theory for Architecture-Driven IT Management (ADRIMA)", *Information Systems and e-Business Management*, Vol. 12, No. 1, pp. 101-137.

[33] Kotusev, S., Singh, M. and Storey, I. (2015) "Investigating the Usage of Enterprise Architecture Artifacts", In: Becker, J., vom Brocke, J. and de Marco, M. (eds.) *Proceedings of the 23rd European Conference on Information Systems*, Munster, Germany: Association for Information Systems, pp. 1-12.

[34] Seppanen, V., Heikkila, J. and Liimatainen, K. (2009) "Key Issues in EA-Implementation: Case Study of Two Finnish Government Agencies", In: Hofreiter, B. and Werthner, H. (eds.) *Proceedings of the 11th IEEE Conference on Commerce and Enterprise Computing*, Vienna: IEEE, pp. 114-120.

[35] Gaver, S. B. (2010) "Why Doesn't the Federal Enterprise Architecture Work?", McLean, VA: Technology Matters.

[36] Ambler, S. W. (2010) "Enterprise Architecture: Reality Over Rhetoric", Dr. Dobb's Journal, URL: https://web.archive.org/web/20201020205941/http://www.drdobbs.com/architecture-and-design/enterprise-architecture-reality-over-rhe/224600174.

[37] Hauder, M., Roth, S., Matthes, F. and Schulz, C. (2013) "An Examination of Organizational Factors Influencing Enterprise Architecture Management Challenges", In: van Hillegersberg, J., van Heck, E. and Connolly, R. (eds.) *Proceedings of the 21st European Conference on Information Systems*, Utrecht, The Netherlands: Association for Information Systems, pp. 1-12.

[38] Lederer, A. L. and Sethi, V. (1992) "Meeting the Challenges of Information Systems Planning", *Long Range Planning*, Vol. 25, No. 2, pp. 69-80.

[39] Kemp, P. and McManus, J. (2009) "Whither Enterprise Architecture?", *ITNOW Computing Journal*, Vol. 51, No. 2, pp. 20-21.

[40] Holst, M. S. and Steensen, T. W. (2011) "The Successful Enterprise Architecture Effort", *Journal of Enterprise Architecture*, Vol. 7, No. 4, pp. 16-22.

[41] Bloomberg, J. (2014) "Is Enterprise Architecture Completely Broken?", Forbes, URL: http://www.forbes.com/sites/jasonbloomberg/2014/07/11/is-enterprise-architecture-completely-broken/.

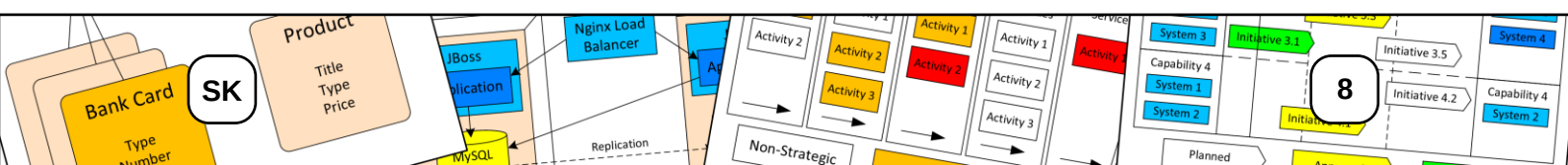
[42] Hamilton, D. (1999) "Linking Strategic Information Systems Concepts to Practice: Systems Integration at the Portfolio Level", *Journal of Information Technology*, Vol. 14, No. 1, pp. 69-82.

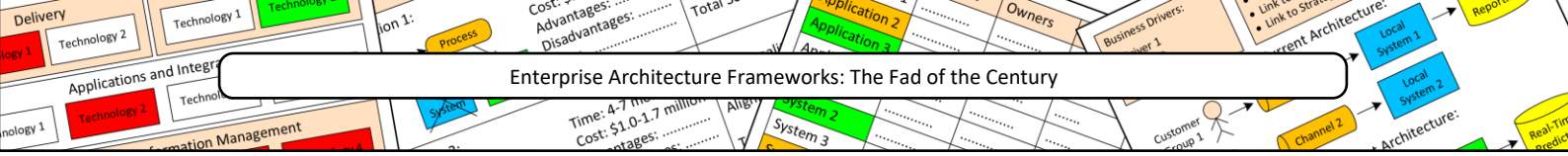
[43] OMB (1997) "Memoranda 97-16 (Information Technology Architectures)", Office of Management and Budget, URL: https://www.whitehouse.gov/omb/memoranda_m97-16/.

[44] GAO (2003) "Information Technology: FBI Needs an Enterprise Architecture to Guide Its Modernization Activities" (#GAO-03-959), Washington, DC: Government Accountability Office.

[45] GAO (2005) "DOD Business Systems Modernization: Long-Standing Weaknesses in Enterprise Architecture Development Need to Be Addressed" (#GAO-05-702), Washington, DC: Government Accountability Office.

[46] GAO (2003) "Information Technology: Architecture Needed to Guide NASA's Financial Management Modernization" (#GAO-04-43), Washington, DC: Government Accountability Office.





[47] Buss, T. F. and Shillabeer, A. (2012) "IT and Enterprise Architecture in US Public Sector Reform: Issues and Recommendations", In: Saha, P. (ed.) *Enterprise Architecture for Connected E-Government: Practices and Innovations*, Hershey, PA: Information Science Reference, pp. 412-440.

[48] GAO (2002) "Information Technology: Enterprise Architecture Use Across the Federal Government Can Be Improved" (#GAO-02-6), Washington, DC: Government Accountability Office.

[49] GAO (2003) "Information Technology: Leadership Remains Key to Agencies Making Progress on Enterprise Architecture Efforts" (#GAO-04-40), Washington, DC: Government Accountability Office.

[50] GAO (2004) "Information Technology: The Federal Enterprise Architecture and Agencies' Enterprise Architectures Are Still Maturing" (#GAO-04-798T), Washington, DC: Government Accountability Office.

[51] GAO (2006) "Enterprise Architecture: Leadership Remains Key to Establishing and Leveraging Architectures for Organizational Transformation" (#GAO-06-831), Washington, DC: Government Accountability Office.

[52] GAO (2002) "Information Technology: OMB Leadership Critical to Making Needed Enterprise Architecture and E-Government Progress" (#GAO-02-389T), Washington, DC: Government Accountability Office.

[53] GAO (2003) "A Framework for Assessing and Improving Enterprise Architecture Management (Version 1.1)" (#GAO-03-584G), Washington, DC: Government Accountability Office.

[54] Reynolds, T. (2010) "Curing the Federal EA Hangover", *Architecture and Governance Magazine*, Vol. 6, No. 5, pp. 1-4.

[55] GAO (2011) "Opportunities to Reduce Potential Duplication in Government Programs, Save Tax Dollars, and Enhance Revenue" (#GAO-11-318SP), Washington, DC: Government Accountability Office.

[56] Perera, D. (2005) "Hula Hoop, Rubik's Cube... Enterprise Architecture?", FCW, URL: https://fcw.com/Articles/2005/09/19/Hula-Hoop-Rubiks-Cube--enterprise-architecture.aspx.

[57] Tucci, L. (2011) "Two IT Gurus Face Off on Value of Enterprise Architecture Frameworks", TotalCIO, URL: https://web.archive.org/web/20171206151129/http://itknowledgeexchange.techtarget.com/total-cio/two-it-gurus-face-off-on-value-of-enterprise-architecture-frameworks/.

[58] GAO (2004) "DOD Business Systems Modernization: Limited Progress in Development of Business Enterprise Architecture and Oversight of Information Technology Investments" (#GAO-04-731R), Washington, DC: Government Accountability Office.

[59] GAO (2013) "DOD Business Systems Modernization: Further Actions Needed to Address Challenges and Improve Accountability" (#GAO-13-557), Washington, DC: Government Accountability Office.

[60] GAO (2015) "DOD Business Systems Modernization: Additional Action Needed to Achieve Intended Outcomes" (#GAO-15-627), Washington, DC: Government Accountability Office.

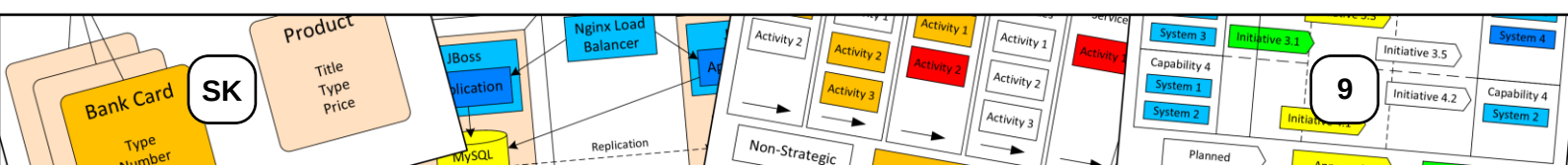
[61] Zachman International (2012) "Zachman International Closes Acquisition of the FEAC Institute", Zachman International, URL: https://www.zachman.com/press/97-zachman-international-closes-acquisition-of-the-feac-institute.

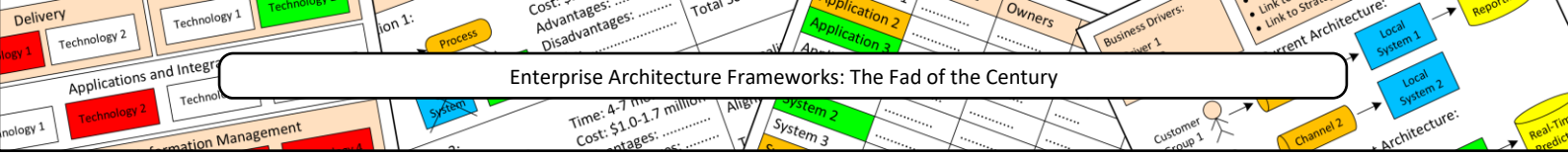
[62] FEAC Institute (2016) "FEAF Certification and Training", Federal Enterprise Architecture Certification (FEAC) Institute, URL: https://web.archive.org/web/20160109080148/http://www.feacinstitute.org:80/feac-training/feaf.

[63] Rao, P. C., Reedy, A. and Bellman, B. (2011) *FEAC Certified Enterprise Architect CEA Study Guide*, New York, NY: McGraw-Hill Education.

[64] Periasamy, K. P. (1993) "The State and Status of Information Architecture: An Empirical Investigation", In: DeGross, J. I., Bostrom, R. P. and Robey, D. (eds.) *Proceedings of the 14th International Conference on Information Systems*, Orlando, FL: Association for Information Systems, pp. 255-270.

[65] Periasamy, K. P. and Feeny, D. F. (1997) "Information Architecture Practice: Research-Based Recommendations for the Practitioner", *Journal of Information Technology*, Vol. 12, No. 3, pp. 197-205.





[66] Ross, J. W., Weill, P. and Robertson, D. C. (2006) *Enterprise Architecture as Strategy: Creating a Foundation for Business Execution*, Boston, MA: Harvard Business School Press.

[67] Zachman, J. A. (1997) "Enterprise Architecture: The Issue of the Century", *Database Programming and Design*, Vol. 10, No. 3, pp. 44-53.