Organizational and Digital Transformation Projects: A Mathematical Model for a Dynamic Enterprise-Ecosystem Model (DEM)

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Abstract

Organizational and digital transformation projects are of strategic importance for enterprises, but such initiatives are very complex and have a very high failure. Taking these two critical factors, it is important de define a strategic concept base on a Polymathic-holistic approach, iterative implementation phases and a structure approach. These critical factors are the basis for an Applied Holistic Mathematical Model (AHMM) for a DEM (AHMM4DEM). The Enterprise's or organization's (ENT) Transformation (and Refinement) Processes (RP) are a sequence (or sets) of extraction and conversion steps that are executed on various levels. An ENT is a set of Organizational Units (OU)n where an OU has one or more OU Platform (OUP). An RP on the OU's level refines and transforms this OU and its OUP(s). A DEM for an ENT has to be capable of reorganizing its basic APplication Domain (APD) functions, OUs and all its functions. ENT's functions are RPed into Building Blocks (BB) which can be reused to reused to (re)engineer OUs and OUPs. OUs are then (re)assembled in ENTs.

Keywords: DEM, CBB/OBB, BB/MA, Refinement, MDTCAS, Business Transformation Projects, Enterprise Architecture, Components, Agility, Development and Operations, Decision Making Systems, and Knowledge Management Systems.

1. Introduction

The Organizational and Digital Transformation Projects (simply the Project) are very complex to finalize and they depend on the initial Project's RP phases like the Automated Refine Processes (ARP) based UP (ARP/UP) (Stitt, Stitt, Vahid, & Najjar, 2006). The RP of the legacy OUs and their OUPs, need an In-House-Implemented (IHI) Methodology, Doman, and Technology Common Artefacts Standard (MDTCAS) that can map to any existing methodology or technology. The IHI MDTCAS manages RP's basic elements: BBs, Composite BBs (CBB), Organizational BBs (OBB), and Micro-Artifacts (MA). RPs on the OUs (RPOU), which goal is to disassemble ENT's: Legacy OUs' archaic structure(s), Organizational/Working processes, Information system's administration, Resources/Artefacts, Applications/Modules, Check Resistance for Change (R4C), and Components; into dynamic reusable CBBs/OBBs/MAs which can be (re)used in standardized or IHI Process/collaboration Models (OPM). As shown in Figure 1, Projects' success depends on ENT's structure, which is general siloed and that makes them complex to finalize, because of many reasons, and they mainly depend on the RP phases and Viewpoints.

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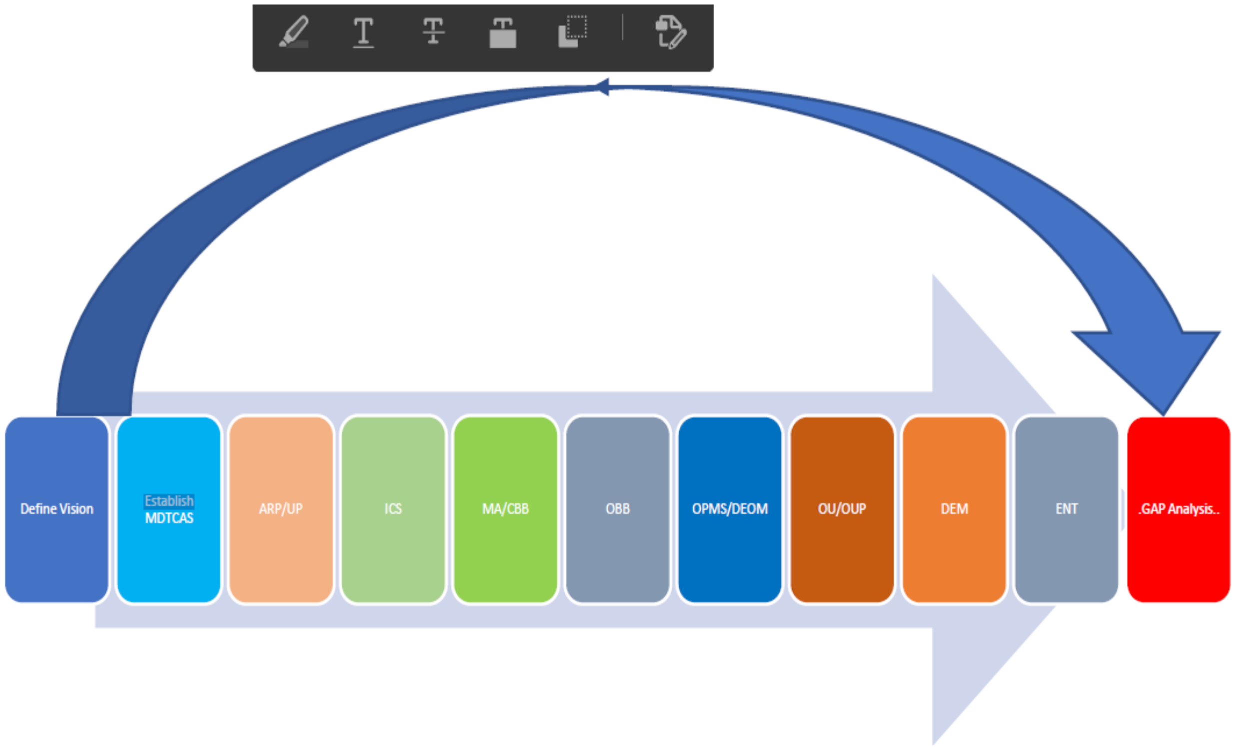

Figure 1: Project's phases.

RP Phases and Viewpoints

OPMs are used to implement DEMs. DEMs and OPMs share sets of CBBs/OBBs/MAs. A *Project* has various Viewpoints, like "O" for organizational, "S" for Security, "F" for Financial, … And RP operations depend on the selected Viewpoint(s) and in this article the it is "O". And as shown in Figure 1, the Viewpoint "O" has the following RP phases:

- A- Extract Vision's RP's constraints and scope.
- B- Set the AHMM based MDTCAS's and Transformation Development Methodology's (TDM) scope and dimension. Difficulties are due to *ENT's* heterogenous parts and the AHMM4DEM supports its feasibility and integrity.
- C- The refinement initial phases depend on the critical BBs that are refined/generated by the Unbundling Process (UP), which is the most complex *Project's* phase. success and the deliverance of pool(s) of extracted and refined MAs is the most important phase.
- D- The ARP/UP refines and then assembles MAs into BBs. An MA is a source-code (and resources) library.
- E- MAs and BBs construct a transformed Information and Communications System (ICS), which can become a secured ICS (secICS).
- F- RP uses refined combined Mas and BBs to offer reusable CBBs and are int turn used to construct OBBs.
- G- OBBs are further refined and assembled in OPM System (OPMS) and Dynamic Enterprise Organizational Models (DEOM).
- H- OPMSs and DEOMs are 'reused to (re)build and optimize OUs and their OUPs. This research, the optimization of OUs and OUPs takes into account mainly intangible and non-financial objectives. Managers/stakeholders exaggerated financial ambitions are *Projects'* main dangers.
- I- Then transform (using a *Project*) the *ENT*.

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- J- Check *ENT's* evolution with Gap Analysis and Progress (GAP). After the refinement processes GAP can face major difficulties because of the *ENT's* heterogenous human profiles/cultures, system parts, OU's Resistances (OUR) which can grow into *ENT's* Resistance to Change (E2C).

In this article the author uses an adapted version of the AHMM4DEM (Trad, & Kalpić, 2020a) to support *RPOU*'s and DEM's feasibilities that uses the initial phase's pool of secured BBs/Mas/CBBs/OBBs/OPMs/DEOMs/OUs/OUPs (simply *Artefacts*) that resulted from the RP (Trad, 2023a, 2023b, 2023c). OU is a set of OBBs and a DEOM is a set of OUs; and finally, an *ENT* is a set of OUs. Unfortunately, the *Project* is used to achieve immediate tangible financial profits, and such approaches makes them fail at the rate of more than seventy percent.

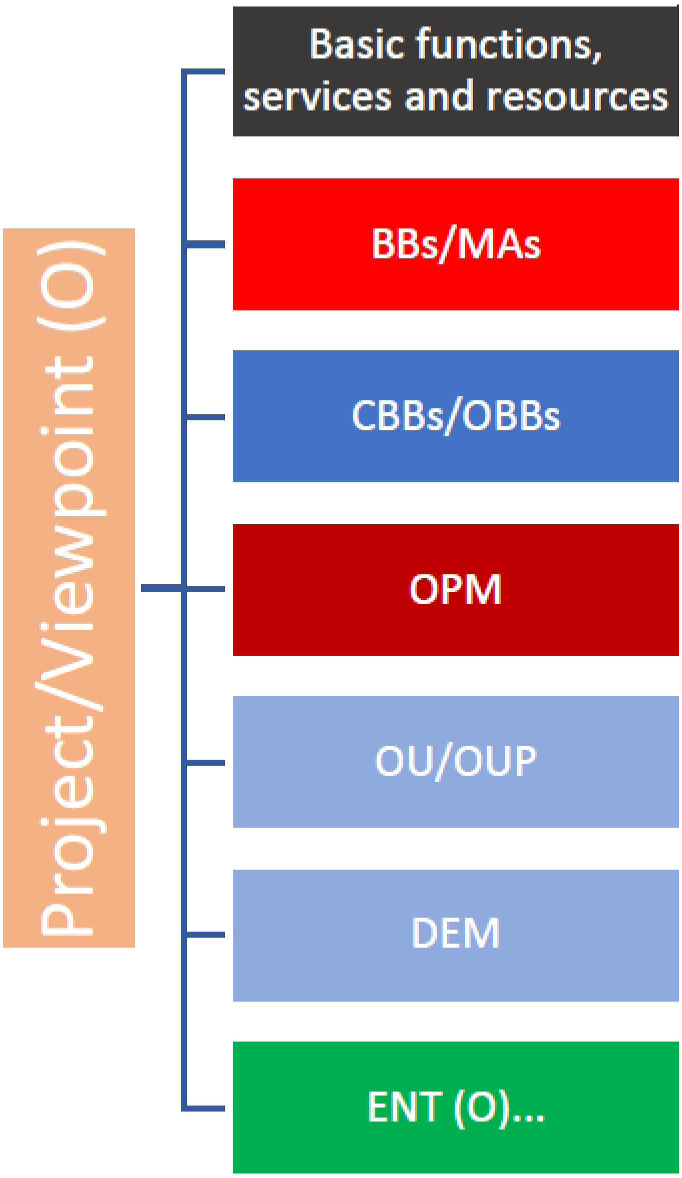


Figure 2: RP phases.

This article presents the possibility to implement an IHI DEM which avoids the financial-only locked-in strategies and ensures success. The main point is to define the levels of granularity and mapping concepts for the MDTCAS, which enables the reuse of existing or newly refined MAs, BBs, CBBs and hence OBBs. As shown in Figure 1, the DEM follows the ARP/UP a phase and if that step fails because of various types of resistances (like the OUR/E2C) and other difficulties, then a new DEM is to be implemented. Otherwise, the *Project* can move to the next step and can consider another major achievement was done. The DEM can choose which OU to transform the *ENT* and this article's scope; but that needs a Polymathic-holistic *Project's* Management Concept PMC).

The PMC

Various APDs have critical *Projects'* requests and the hyper evolution of domain/business needs, methodologies and technologies, create fatal problems because of the gaps between the evolution and *Projects'* progress and take a long time to terminate, on the other hand business and technology domains have a hyper-evolution. That is why there is a need to find a transcendent MDTCAS based PMC to ensure that *Project's* evolution is independent of all domain/business and technological evolutions. The MDTCAS based PMC is an important factor for the success of *Projects* because RPs unify *Artefacts* management to support the reorganization of DEMs and hence *ENTs*. *Artefacts* based *RPOU* is a risky *Project's* phase, because of limited and complex RP. In this article, the author proposes that a DEM supports *Project* Managers (or simply *Managers*) and his team, in extracting and reusing *Artefacts*. RP is not only disassembling (and reassembling) of *Artefacts*, but it is a structural and coherent reorganization of OUs into DEMs and then *ENTs*. An *Artefact* reuses models diagrams/documents, Architectural BBs (ABB), and Solution BBs (SBB). RP is mainly a *reengineering*, which delivers well-engineered *Artefacts*, which are used in next PMC based *Project's* phases, as shown in Figure 3.

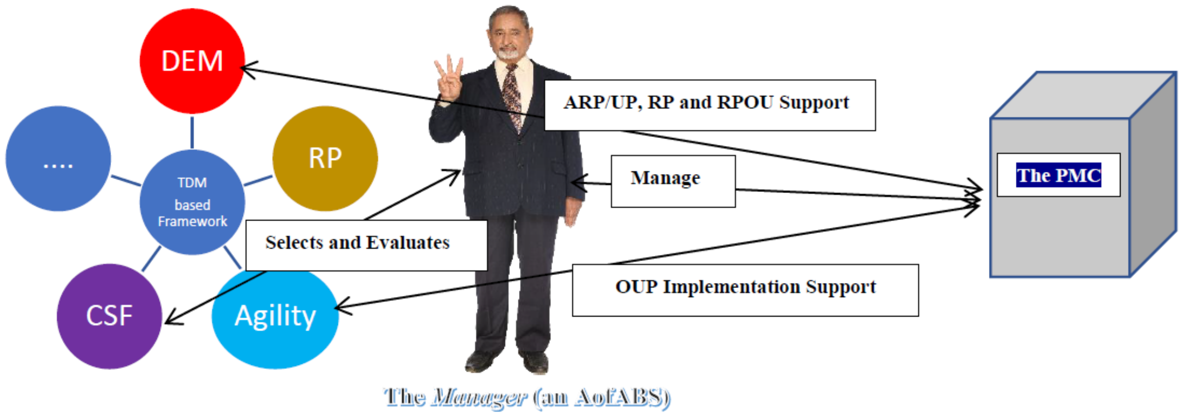


Figure 3: The *Project's* construct

In many *Projects, RPOUs*' operations are underestimated and ignored, and that causes *Project's* failure(s). Therefore, *RPOU*'s success is mandatory for *Project's* next phases. *RPOU*'s activities and its transformed/generated IHI *Artefacts*, are independent of a specific brand, PMC/methodology, tool, or other locked-in strategy. In this article the author uses an adapted version of the AHMM4DEM (Trad, & Kalpić, 2020a) to support the DEM which uses *RPOU* to extract *Artefacts*. This article keywords show RP's complexity and the need for the PMC; that is achieved by using an Enterprise Architecture (EA) based DEM that can be used in any APD. *RPOU's* objective is to reengineer common System and/or Domain Components (SDC), which assembles various *Artefacts*... The DEM done in consequent steps and use the Polymathic-AHMM4DEM based *RPOU*, to surpass the complexity of heterogenous approaches and ensures *Project's* continuity (Trad, 2022a, 2022b, 2022c, 2023a). The AHMM4DEM supports iterative *RPOU* of the legacy systems, by using MDTCAS and TDM to integrate standard PMC/methodologies, like The Open Group's (TOG) Architecture Framework's (TOGAF) Architecture Development Method (ADM) (The Open Group, 2011a). All ICS related *Projects* use cyclic/iterative PMC based implementation phases, which include *RPOU*s. *RPOUs* are performed mainly for SDCs that include: 1) OU/OUP refinement technics; 2) Development and Operations (DevOps) and DevSecOps; 3) Automated tests and qualifications; 4) Extracting *Artefacts* based

SDCs; and 5) *Artefacts'* modelling activities. The DEM proposes an efficient use of *RPOUs*, which faces complexities due to: 1) The implementation of complex, chaotic, and heterogenous *Artefacts* based SDCs; 2) Technologies' and methodologies hyper-evolution; 3) The incapacity to establish a PMC and MDTCAS; 4) Resistance for Change (R4C) or OUR, which should be checked with the Readiness to Transform (R2C); and 5) Maintenance difficulties (Koenig, Rustan, & Leino, 2016). In this article the DEM uses a Proof of Concept (PoC) and a related Applied Case Study (ACS). The ACS descries a leading *European Bank's* (simply ***zBank***) *RPOU*. The mentioned *Project* was mainly used to support an *RPOU* for ***zBank***'s legacy framework and OU's structure, which was based on EA/TDM, ArchiMate, Mainframe and Java environments. The ADM based TDM, managed underlying design, refinement, DevSecOps, and governance activities. As shown in Figure 3, such a *Project* needs a qualified *Manager* (or Architect of Adaptive Business Information System-AofABIS) (Trad, & Kalpić, 2014; Trad, 2015a), RP specialists, and a capable team. And in this *Project,* the team was the main weakness and generated R4C and OUR, which proves that RP is a critical phase mainly because of the human incapacity factor. The TDM managed the implementation of the *ENT* refactored *Artefacts* and storing them in *ENT's Enterprise Continuum* (Trad, 2022a, 2022b). There were three common types of *Artefacts*: 1) IHI or imported MAs/CBBs/OBBs; 2) Mixed CBBs which include ABBs and SBBs, and create SDCs' libraries (The Open Group, 2011a); and 3) OPMs/DOEMs. As shown in Figure 3, DEM's interaction includes: 1) Decision Making System (DMS) for DEM (DMS4DEM); 2) Knowledge Management System (KMS) for DEM (KMS4DEM); 3) Critical Success Factors (CSF) (and areas Critical Success Areas-CSA) Management System (CSFMS); and 4) An IHI DEM. This article like all author's works are based on an iterative Research and Development Process (RDP).

An Iterative RDP

RDP's and DEM' author's related works are:

- Using Applied Mathematical Models for Business Transformation (Trad, & Kalpić, 2020a).
- Applied Holistic Mathematical Models for Dynamic Systems (AHMM4DS) (Trad, 2021a).
- Business Transformation Projects-The Role of a Transcendent Software Engineering Concept (RoTSEC) (Trad, 2022a).
- Business Transformation Projects-The Role of Requirements Engineering (RoRE) (Trad, 2022b).
- Business Transformation Projects based on a Holistic Enterprise Architecture Pattern (HEAP)-The Basic Construction (Trad, & Kalpić, 2022c).
- Integrating Holistic Enterprise Architecture Pattern-A Proof of Concept (Trad, & Kalpić, 2022d).
- A Transformation Framework Proposal for Managers in Business Innovation and Business Transformation Projects-Intelligent atomic building block architecture (Trad, 2015a).
- A Transformation Framework Proposal for Managers in Business Innovation and Business Transformation Projects-An Information System's Atomic Architecture Vision (Trad, 2015b);
- Organizational and Digital Transformation Projects-A Mathematical Model for Building Blocks based Organizational Unbundling Process (Trad, 2023a).
- Organizational and Digital Transformation Projects-A Mathematical Model for Enterprise Organizational Models (Trad, 2023b).
- Organizational Transformation Projects-The Role of Global Cyber Security and Crimes (RoGCSC) (Trad, 2023c).

- Organizational and Digital Transformation Projects-A Mathematical Model for Dynamic Enterprise Organizational Models (DEOM) (Trad, 2023d).

To prove RDP's iteratively and DEM' feasibility, the author uses his PoC and RDP for DEM (RDP4DEM) concepts.

2. The RDP4DEM

The Polymathic Model's Basic Elements

The DEM identifies and assesses strategic and critical *Project's* risks to guaranty *RPOU* operations' coherency, by using the AHMM4DEM and some of its basic elements:

• ***m***	mapping operator
• ***i***	instance of
• ***R***	∪ of Requirements
• ***C***	∪ of Constraints
• -	Difference or Gap analysis operator
• ***V***	Valuate function, ∪ of ***H***
• ***T***	∪ of Sts
• ***S***	∪ of Solutions
• ***F***	Function
• ***A***	∪ of Actions/***Fs***
• ***P***	∪ of Problem
• *GID*	*or GUID, is a **unique identifier***
• *ART*	*is an **artefact**, ...,*
• *CNT or **C's element***	*is a **constraint,** of an ENT, Enterprise, Project, ICS…*
• *RUL*	*is a **rule,** of an ENT, Enterprise, Project, ICS…*
• *PRB or **P's element***	*is a **problem,** of an Enterprise, Project, ICS…*
• *REQ or **R's element***	*is a **requirement,** of an Enterprise, Project, ICS…*
• *CLS*	*is a **structure**, class, method-part,…*
• *OBJ*	*is a **CLS instance**, object, exec code,…*
• *SRV*	*is a **service***
• *DIA*	*is a **Diagram**, UML, TOGAF, OOM, SA/SD,…*
• *APP*	*is an **application***
• *ARP*	*is an **Automated Refinement Process***
• *UPS*	*is an **Unbundling Process***
• *UPP*	*is an **Unbundling Phase***
• *CMP*	*is an ICS **structure,** like application, server…*
• *WGT*	*is a **Weighting***
• *HDT*	*is a **heuristics based …***
• *SOL or **S's element***	*is a **solution***
• *AIM*	*is a **AI models**, interaction,BPM,UML/Collaboration,*
• *GAP*	*is a **Project's gap analysis***
• *TSK*	*is a **Project task***

ICS basics:

ART	= ***m*** SRV	(I1)
ART	= ***m*** DTB	(I2)
ART	= mcArtefact	(I3)
SRV	= $\underline{\cup}$ mcArtefact	(I4)
CLS	= $\underline{\cup}$ FUN ***or*** SRV + $\underline{\cup}$ VAR + $\underline{\cup}$ REL	(I5)
OBJ	= ***i*** CLS	(I6)
DIA	= $\underline{\cup}$ CLS + $\underline{\cup}$ REL	(I7)
DIA	= $\underline{\cup}$ OBJ + $\underline{\cup}$ REL	(I8)
SCR	= ***i*** DIA	(I9)
BB	= $\underline{\cup}$ DIA	(I9)
ABB	= $\underline{\cup}$ DIA	(I9)
SBB	= ***i*** SCR	(I9)
APP	= $\underline{\cup}$ SCR	(I10)
CMP	= $\underline{\cup}$ APP ***or*** IEL ***or*** DST	(I11)
ICS	= $\underline{\cup}$ CMP	(I12)
CLD	= $\underline{\cup}$ ICS	(I13)
EST	= $\underline{\cup}$ CLD	(I14)

Requirements:

mcREQ	= ***m*** KPI	(R1)
mcMapping mcArtefact/mcREQ	= mcArtefact + ***m*** mcREQ	(R2)
FTR	= mcREQ	(R3)
PRB	= ***m*** PRB	(R4)
REQ	= ***m*** CSF = $\underline{\cup}$ mcREQ	(R5)
REQ	= $\underline{\cup}$ FTR + $\underline{\cup}$ RUL + $\underline{\cup}$ CNT + $\underline{\cup}$ DIA + $\underline{\cup}$ REL	(R6)

Figure 4: *The AHMM4DEM's* nomenclature.

AHMM4DEM's basic elements are used to present *RPOU's* elements:

• ***a***	for atomic, for the atomization of an element	
• *MVC*	= $\underline{\cup}$ DIA + $\underline{\cup}$ REL	(A1)
• *MVC*	= $\underline{\cup}$ MVC + $\underline{\cup}$ REL	(A2)
• *aBB*	= $\underline{\cup}$ SRV + $\underline{\cup}$ REL	(A3)
• *sBB*	= $\underline{\cup}$ ***i*** SRV + ***i*** $\underline{\cup}$ REL	(A4)

In this article the Viewpoint "M" (Enterprise Models) is the central section of the applied Polymathic approach.

A Polymathic Approach

Figure 5: Project's Polymathic approach.

RPOU for legacy OUs' components have created a paradigmatic shift in *Projects*, where these archaic components use sets of heterogenous structures, ICS/technologies, and PMC/methodologies. The transformation of such components in the form of *Artefacts* to supported DEMS. As shown in Figure 5 and Viewpoint "M", the DEM focuses on refactoring of OU's components. The main Viewpoint: "m" or DEM's Models main elements are:

- *RPOU* $= \sum ARP/UP + \sum RP$ (M1)
- MA $= \sum aBB + \sum sBB + \sum aMVC$ (M2)
- BB $= \sum ARP/UP + \sum MA + \sum OPM$ (M3)
- CBB $= \sum BB + \sum ABB + \sum SBB$ (M4)
- OBB $= \sum CBB$ (M5)
- DEOM $= \sum OBB$ (M6)
- SDC $= \sum DEOM$ (M7)
- OU $= \sum RPOU + \sum SDC + \sum OUP$ (M8)
- DEM $= \sum OU(M)$ (M9)
- ENT(M) $= \sum DEM$ (M10)

Transformed *Artefacts* are classified in *ENT's* repositories and are elements that interact using a unique and flexible GID. The RDP4DEM proposes the DEM to support *Managers* and *Project* teams in refining OUs in order to transform an *ENT*. *RPOU's* main activity is to extract DEM and relate them to *Artefacts*. The RDP4DEM presents the research methodology and the implementation and the ACS/PoC is based on the ***zBank***. Figure 6 shows the Polymathic-holistic approach used by the DEM based *ENT* for ***zBank***. For first RDP4DEM's step was to establish the Research Question (RQ) and achieve an in-depth Literature Review Process (LRP) for DEM (LRP4DEM).

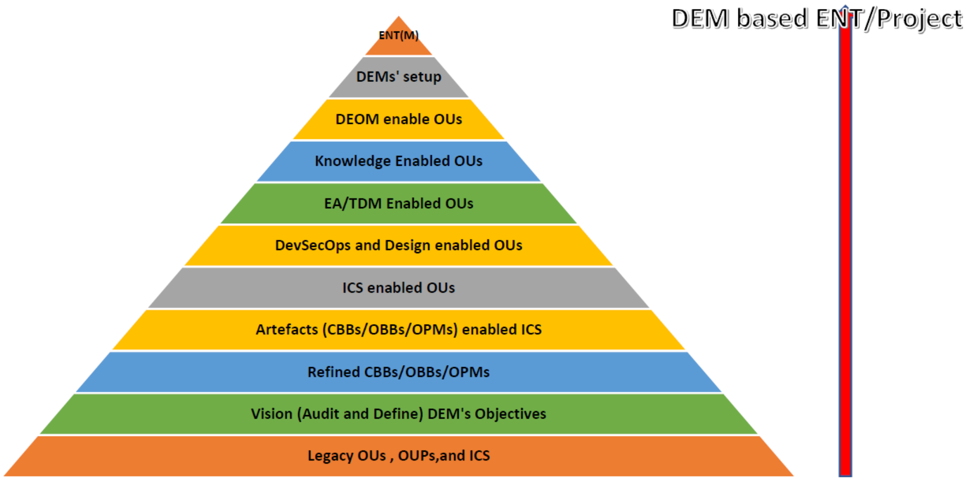


Figure 6: DEM based *ENT's and Project's* Holistic Approach

The RQ and LTR4DEM

The RDP4DEM's RQ is: "Can DEMs support *ENT's* (re)organization?". Where this article's auxiliary RQ is: "How can *Artefacts* and SDCs support DEMs?". Where the RDP4DEM uses EA/TDM, AHMM4DEM, CSFMS, and the DMS4DEMS. LRP4DEM's analysis showed that isn't any similar approach to Transformation Research Architecture Development framework (*TRADf*), TDM, ARP/UP/RP, *RPOU*, and AHMM/RDP4DEM/RQ. And there is a small number of relevant scholar resources that are related only to basic OPMs. Concerning TOGAF, which is a usable framework, but it is limited, simplistic cookbook, and tackles minor *Project* topics, like EA. Therefore, the AHMM4DEM based RDP4DEM related works, are pioneering, innovative and covers an important research gap, between *RPOU* and existing complex refinement/transformation solutions. *Project* related gaps and high failure rates were confirmed by the LRP4DEM (Bishop, 2009; Capgemini, 2011). There is a lack of a Polymathic-holistic approach to DEM and *RPOU* operations, which today are done manually or by the use of commercial products. The LRP4DEM used the following resources: 1) Articles and resources related to *RPOU*, OPM, DEM, ICS reengineering, and *Projects*; 2) The author's RDP/LRP works, TDM, and *TRADf*; 3) DEM's feasibility and capacities; 4) Initial sets of CSAs/CSFs; and 5) RDP4DEM's use of the Empirical Engineering Research Model (EERM). All the author's works are based on *TRADf*, AHMM, TDM, and RDP; which are today mature and can be applied in various domains like the DEM and related *Project's* risk management. The RDP4DEM proved the existence of an immense gap and the necessity to deliver DEM recommendations. The main RDP gap is due that there nothing similar to the DEM; but there are some basic refinement approaches that concern exclusively code-sources, and which are manual processes. As shown in Figure 7, the next step is to select and classify the sets of CSFs and CSAs in the CSFMS.

CSAs and CSFs Management System

A CSA is a category (or set) of CSFs where in turn a CSF is a set of Key Performance Indicators (KPI), where a KPI maps (or corresponds) to a single common or DEM requirement and/or *Project* feature, which is an MA attribute or variable.

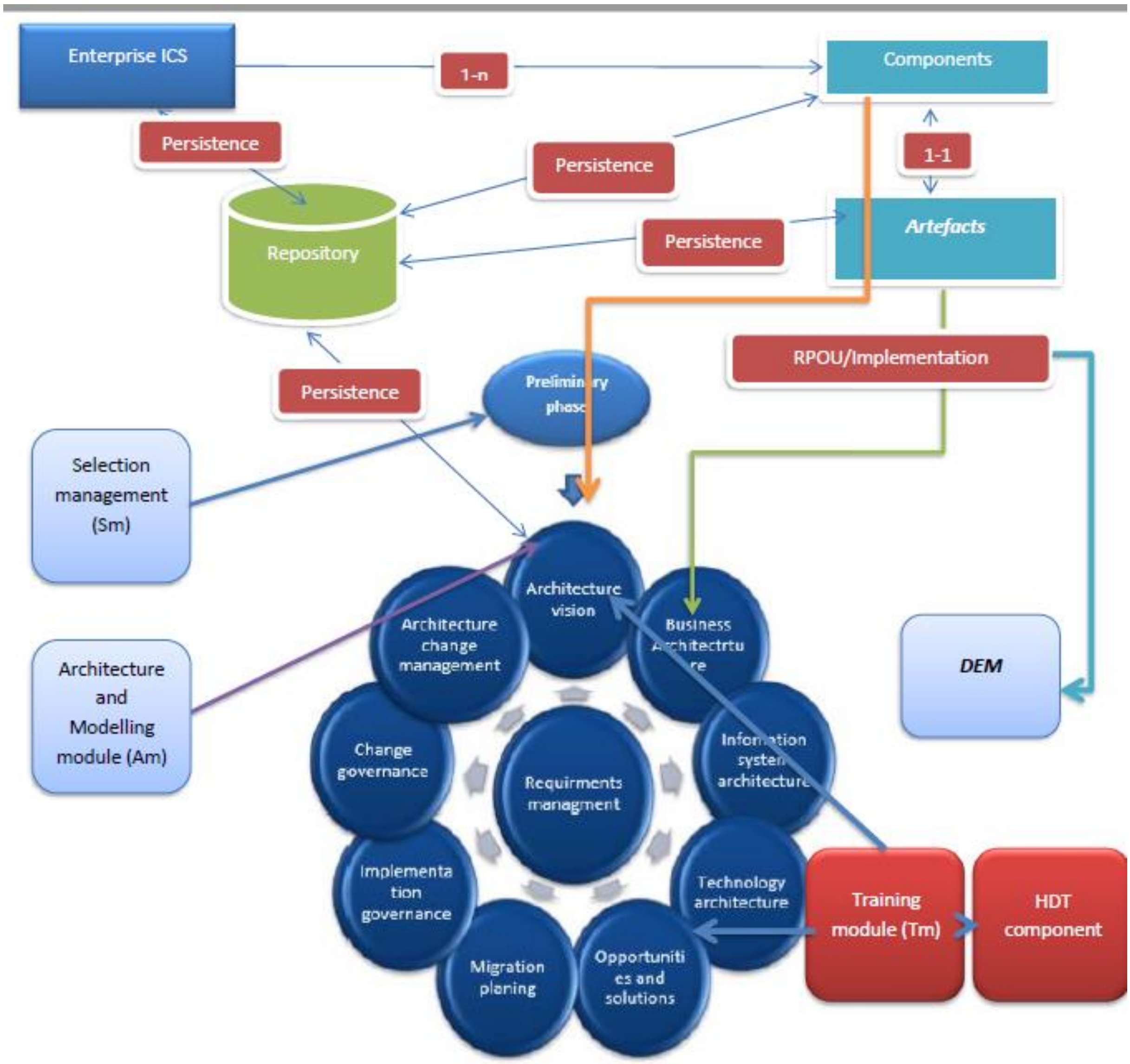


Figure 7: The RP and CSAs/CSFs integration with RDP4DEM.

For a *Project's* requirement or *RPOU* problem, the *Manager* identifies the initial sets of CSAs, CSFs and KPIs (simply *Factors*), to be used by the Heuristics Decision Tree (HDT) based DMS4DEM and maps these *Factors* to the sets of *Artefacts* and requirements. Hence *Factors* are important for the mapping between the requirements, knowledge constructs, *RPOU* generated *Artefacts*, OUs/OUPs, and DMS4DEM/KMS4DEM (Peterson, 2011). Therefore, *Factors* reflect areas that must meet the main strategic *Project* and DEM's goals and predefined constraints. Measurement's technics, which are provided by the author's *TRADf*, which can be used to evaluate performance in each CSA, where CSFs can one of the following: 1) DEM's status; 2) Mapping levels of resulting *Artefacts* and SDCs; 3) *Project's* GAP; and 2) DMS4DEM/KMS4DEM requests calls in real time, as shown in Figure 7. KPIs can be integrated in SDCs as programming languages variables. So HDT's based evaluation processes can automatically estimate the values of *Factors* (Dick, 2001; Quinlan, 2015). As shown in Figure 7, *Factors*' and *Project*'s risks estimations have the following characteristics (Ylimäki, 2006): 1) Understanding *RPOU* activities; 2) *Factors* based EA/ADM/TDM implementations' fallouts; 3) *Project's* team(s) assigned mitigation strategy for each risk mapped to a CSF; 4) CSFs are key elements that are linked to KPIs which are SDC variables; and 5) CSAs/CSFs/KPIs are tuned by the *Project team*. Sets of *Factors* are weighted by the DMS4DEM/KMS4DEM to offer sets of solutions for a DEM problem(s). The HDT-based DMS4DEM is used in all *TRADf's* modules. RDP4DEMS' phases are:

- Phase 1 (represented in decision-Tables), forms the empirical part of the RDP4DEM; which checks the following CSAs: 1) The RDP4DEM, which is synthesized in Table 1; 2) The Methodology/MDTCAS support for refined Artefacts, which is synthesized in Table 2; 3) The Artefacts based DEM's approach, which is synthesized in Table 3; 4) The Polymathic RPOU model, which is synthesized in Table 4; 5) The DEM based *Projects*, which is synthesized in Table 5; and 6) This article's RDP4DEM outcome, which is synthesised in Table 6. *TRADf* based DEM delivers a set of (managerial and technical) recommendations and solutions, and a strategy for a *Project and OUP*.
- Phase 2, solves a concrete DEM problem, by integrating DEM and RPOU with *TRADf*.

DEM's and RPOU's Integration with TRADf

As shown in Figure 8, *TRADf,* TDM, and its new module, the DEM supports the transformation of *ENT's* legacy OUs and their OUPs into a new *ENT*, which is supported by the MDTCAS, independently of the types of: 1) ICS/technologies; 2) APDs; 3) OU/OUP structures; and 4) Methodologies of formalisms. The MDTCAS ensures that *ENT's Projects* are not locked-in by global actors or the hyper-evolution of methodologies/technologies (Greefhorst, 2009).

Figure 8: *TRADf's* implementation interface.

The DEM is a complex *Model* and that is due to the unviable, heterogenous, and archaic OUP's and ICS' components formalisms which are mammothlike; that makes the ARP/UP and *RPOU* very hard to extract *Artefacts* and SDCs. DEM's Polymathic-holistic approach supports complex OU and OUP's integration activities (Daellenbach, & McNickle, 2005). In which the *RPOU* for various APDs, automates and refines/refactors OU parts. The DEM is a part of *TRADf's: Software engineering or the Implementation module* (Im), and *Architecture module* (Am); where it is recommended to build a similar IHI framework and MDTCAS/TDM, which can be based on the ADM. The TDM supports DevSecOps, to extract SDCs, *Artefacts*, which circulate through its phases. The elements contain their sets of CSFs and KPIs. The RDP4DEM reuses the author's works like *TRADf*, LRP4DEMs, MAs, and articles to solve this article's RQ. So, it is an iterative RDP and all related topics are only referenced, because otherwise it would be tedious to understand this work. The RDP4DEM is a non-conventional and pioneering concept, in the field of *Project's* topics. The DEM is Polymathic and is founded on a genuine RDP and EERM that in turn is based on *TRADf,* HDT, *RPOU*, DMS4DEM/KMS4DEM, TDM/EA and OUP/ICS concepts (The Open Group, 2011a).

EERM's Usage

The EERM based RDP4DEM is optimal for *Projects* and uses *TRADf* (where it applies a multi-level mixed research by using the HDT) that can be considered as different from conventional research models (Easterbrook, Singer, Storey, & Damian, 2008; Dick, 2001; Quinlan, 2015), and it includes: 1) Heuristics-Basic reasoning; 2) Quantitative Analysis for DEM (QNT4DEM); 3) Qualitative Analysis for DEM (QLT4DEM) research methodologies, to deliver empirical concepts as a possible approach for complex tuned mixed methods research; and 4) A learning process based on the HDT, which was inspired by Action Research learning process (Dick, 2001).

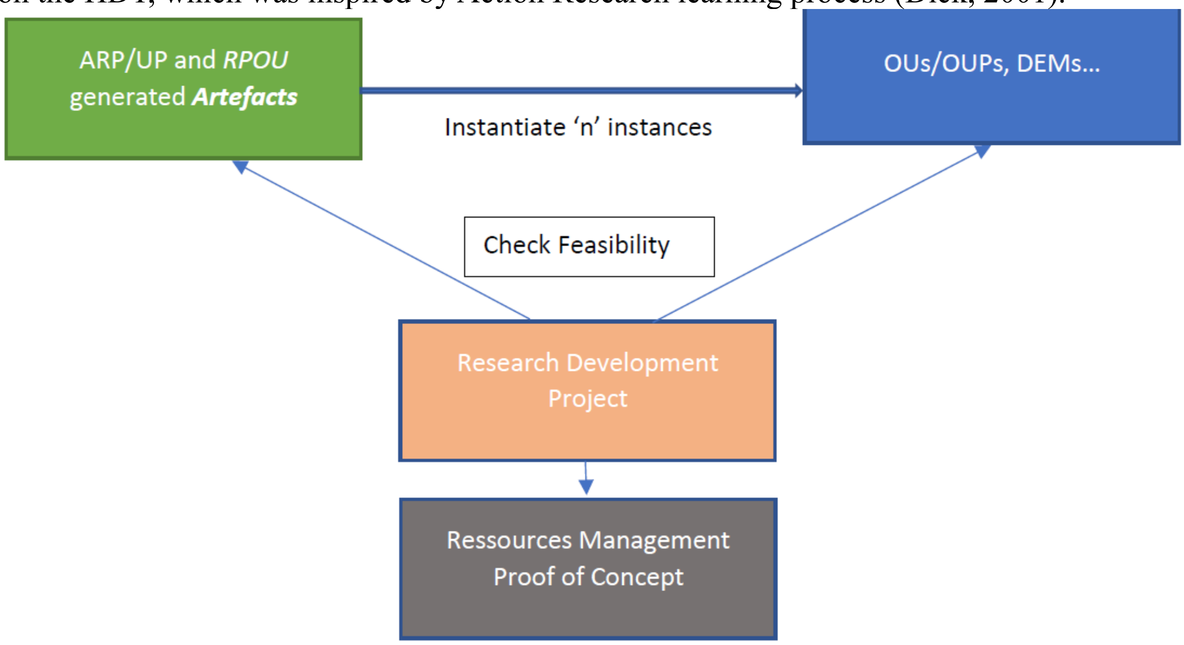


Figure 9: *TRADf's* RDP implementation environment.

TRADf can interface existing research methods, and the difference is just in the scope and depth of the RDP. Empirical research validity checks if the RDP, like the RDP4DEM, is acceptable as an important contribution to existing scientific (and engineering) knowledge and to convince the valuable reader(s) that the presented recommendations and PoC (or engineering experiment), are valid and reusable for various types of *RPOU* activities. In engineering, a PoC is a software prototype of a testable RQ (and hypothesis) where one or more CSFs and KPIs (or independent variables, in theoretical research) are processed to evaluate their influence on RDP4DEM's dependent variables. As shown in Figure 9, PoCs support the evaluation with precision of *Factors* and if they are related, whether the cause–effect relationship exists between these CSFs and CSAs. The TDM and DEM are transformation centric and use existing standards (The Open Group, 2011a). But *Projects* should not underestimate DEM's integration complexity, which is due to a long and complex process; which needs R2C based Transformation Readiness Checks (TRC).

DEM's Integration and TRCs

*RPOU*s are very complex and they are the major cause of *Projects'* failures; which are mainly due to ARP/Ups and *RPOUs*, which generate various types of problems, like (O'Riordan, 2021; Standish, 2011): 1) *RPOUs* cannot be successfully finalized; 2) *Projects* have > 70% failure rates; 2) *Managers* use accountability justifications to select people to be accused, and to justify the failure's *only* financial aspects; where the main reason is *RPOU's* and DEM's complexities; 3) OPMS and ICS fields evolve very fast and business schools graduate *Managers* are submerged by such complexities; 4) In an Oxford study, 90% of *Projects* were stopped because of budgets overruns, especially ICS budgets which have a 200% overruns rate; 5) Failure rates are also due to the excessive demands of stakeholders to make excessive gains; 6) *…these failure facts and numbers represent a downtick in the success rates from the previous study, as well as a significant increase in the number of failures…*; 7) *They are low point in the last five study periods. This year's results represent the highest failure rate in over a decade…*; 8) Business transformation initiatives for change is a critical subject for *ENTs*; where various research show that the failure rates of such initiatives are around 70-80%, while other business organizations are struggling for their projects' and business survival; 9) The Chaos Reports, produced by the Standish Group over the last fifteen years; they assert that: … *only about 29% of transformations come in on time and budget…*; 10) It is hard to define the profile and to find an the needed skills. Using the various LRP4DEM references (O'Riordan, 2021; Standish, 2011) shows that in fact that the failure rates are dramatically increasing…; and 10) *So why continuing such Projects?* RPs use refactoring processes are the main ones, and they need skills, IHI tools, synchronized extraction processes, and EA/TDM/ADM capabilities. *Projects* with successfully finalized *RPOUs*, had similar: Strategies, Legacy organizational and ICS (by size and complexities), Structure/discipline, Skills, Decision model, and Roadmap for localizing external skills. These successful cases are labeled the *Enterprise Capacity to Execute (EC2E)*, which is the ability of *ENTs* to perform all *RPOU* tasks and to make optimal *Project* decisions. The DEM supports various types of refinement action, to restructure legacy OU's structures, Application/Components portfolio, to align *Project's* management plan, and defined requirements' mappings. DEM needs the following types of skills (The Open Group, 2011a): 1) TDM/EA for DEMs and *Artefacts* to support *Business Transformation Readiness Assessment* capacities; 2) To support *RPOUs'* executions; 3) To establish *EC2E* capacities; 4) DMS4DEM based learning concept, to build *RPOU* experiences; 4) To build an MDTCAS; and 5) Design and implement OPMS, DEOMs, and DEMs.

RDP4DEM's CSFs

Based on the AHMM4DEM, LRP4DEM and DMS4DEM, this CSA's CSFs/KPI were weight and the results are shown in Table 1. This CSA's result of 9.25, which is high, is mainly due to the fact that the iteratively used RDP4DEM is mature and that the ARP/UP to deliver basic *Artefacts* was successful (Trad, 2023a). But that does mean that the *RPOU* is feasible. As the RDP4DEM's CSA presented positive results, the next CSA to be analyzed is MDTCAS' support for refined *Artefacts*.

Table 1: This CSA has the average of 9.25.

Critical Success Factors	KPIs	Weightings
CSF_RDP4DEM_Polymathic_Approach	Proven	From 1 to 10. **10 Selected**
CSF_RDP4DEM_CSA_CSF_KPI_Integration	Proven	From 1 to 10. **10 Selected**
CSF_RDP4DEM_RPOU_Integration	Complex	From 1 to 10. **08 Selected**
CSF_RDP4DEM_EERM	Feasible	From 1 to 10. **09 Selected**
CSF_RDP4DEM_Transformatio_Readiness	Feasible	From 1 to 10. **09 Selected**
CSF_RDP4DEM_Needed_Skills_Profiles	Feasible	From 1 to 10. **09 Selected**
CSF_RDP4DEM_IHI_TRADf	Possible	From 1 to 10. **09 Selected**
CSF_RDP4DEM_LTR4DEM	Proven	From 1 to 10. **10 Selected**

valuation

3. MDTCAS' Support for Refined Artefacts

The Role of DEM in Digital Transformation

As shown in Figure 10, DEM is crucial for *ENT's* transformation, and DEM's goal is to create a common platform of *Models* for a sustainable *ENT's*. *Artefacts* and *Models* are instantiated in SBBs for the support of Digital Transformations (DT), which improves Time-to-Market (TtM) pressures and adapts to changing APD requirements.

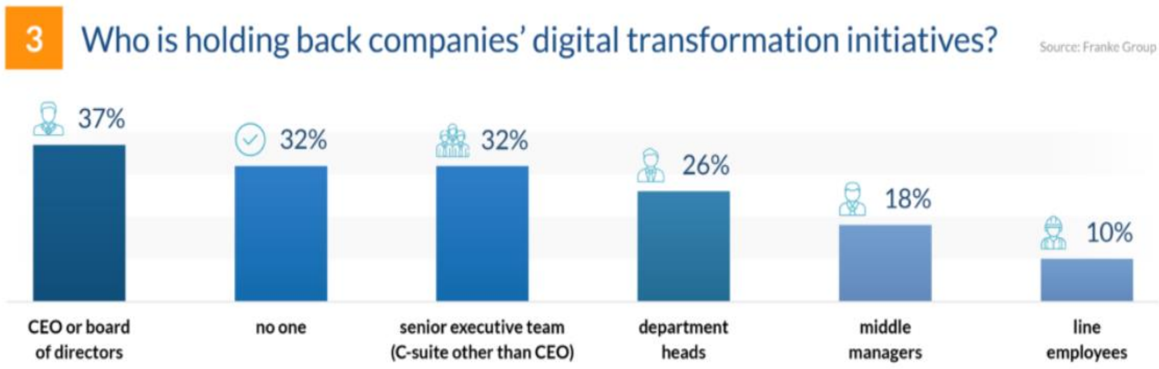


Figure 10: An APD viewpoint on the rejection of DTs (Eira, 2022).

ENTs, OPMs and DEOMs based DTs are strategic objectives and that implies the need for the high-adoption rate of ICS/digital technologies; but *Project* based digitization are complex and more than 70% fail, even if in general *Managers* are the accused, the main reason is the wrong DEM. As shown in Figure 10, *Managers* consider that DEM, business strategy, team members' concerns/R4C, and customer experience, are the cause for failures, which from APD's perspective are not the real reasons (Eira, 2022). The DT supports DEM to break down *ENT's* silos to enable *Projects*. DTs use TDM//MDTCAS/EA experts to model digitized APD models and to define DT's scope (Bizzdesign, 2022). DTs, OPMS, DOEMs, and DEMs managed by the TDM has benefits and many challenges, where the goal is to digitally transform OPMs, SRVs, and resources. The TDM synchronizes *ENT's* DEM*,* OUP, and ICS, where DT profoundly changes the way the *ENT* acts and behaves (Möhring, Keller, Schmidt, Sandkuhl, & Zimmermann, 2023). DTs are difficult to scope because they depend on the APD, OPMS/DEOMs, and MDTCAS' incorporation capacities. A successful DT supports a *Project* and future APD's functions and (re)organization, which enhances functional performances. An *Artefacts* based APD models' development needs a DT to adopt a Polymathic-holistic approach to transform (Chaione, 2022): 1) Legacy OU/OUP and OPMS/DEOMs; 2) To coordinated *Artefacts* based choreography; 3) OPMS/DEOM based DT based interfaces capable of finding new markets; 4) OUs structure, by redefining skills, OPMS/methodologies, and capabilities; 4) *EC2E* for *RPOUs* and for all APD's sub-domains; 5) Use DT based DEM and MDTCAS; 6) Legacy OUs' reengineering skills to enable DEMs; and 7) *ENTs* with DEMs.

Legacy OPMS, Structured Concepts and MDTCAS

A *Project* must define an MDTCAS, which is a mix of existing methodologies and practices, which are used by the DEM. MDTCAS includes Object Oriented (OO) Methodology (OOM) and legacy methodologies, like the Structure Analysis and Structured Design (SA/SD). In the case of 2nd generation legacy components and code, *RPOUs* can use the following phases: 1) RPs transforms legacy-components into SA/SD modelled components; 2) Implements MDTCAS based on OOM; 3) Adapts MDTCAS to be compatible with Unified Modelling Language (UML) models; 4) Interfaces MDTCAS with TDM/TOGAF-ADM-ArchiMate; 5) Offers an OPMS; and 6) Interfaces MDTCAS with the Decision Making Notation (DMN). The DEM recommends avoiding the costly and risky conversion from the 2nd generation legacy-code to integrate methodologies like TDM/TOGAF-ADM-ArchiMate, which was a major failure for the ***zBank***. Instead it should use an IHI MDTCAS and OPMS based non-locked-in approach that uses the following steps: 1) To convert Mainframe legacy-code/system to well-designed/mapped SA/SD models, where for the ***zBank****,* a *structure* corresponded to an OOM/UML entity-class; 2) To transform existing

OOM/UML models/diagrams based components into well-designed/mapped UML/Choreography models, using classes, sequences, communication models, Entity Relationship Diagrams (ERM), and OPMs/Business Processess (BP) and their Models (BPM) diagrams; 3) Implement a light-version of Spiraled/UML, TOGAF and TDM/ADM/DevOps development cycles; 4) Recycle processes in *Artefacts*; and 5) Adopt basic DMN like artefacts, such as requirements diagrams and Tables' evaluations done by the DMS4DEM. For all mentioned methodologies/disciplines OOM is central for the MDTCAS, and *Artefact*s.

OOM based MDTCAS and Artefacts

MTCAS interfaces standard methodologies which are based on the OOM which have OO features, inherited from three OOMs, namely Rumbaugh, Booch, and Jacobson methodologies. The methodologies are the fundaments of the most known modelling/ICS standard, the UML (Liu, 2022). All methodologies like the ADM, are developed using an UML profile/metamodel. The first major paradigms that influenced MTCAS are: 1) Rumbaugh's Object Modeling Technique (OMT), which develops manageable OO based SDCs and supports OO Integrated Development Environments (IDE). OMT's allows class attributes, methods, inheritance, and association to be coherently open to implementers; 2) Booch's methodology, focuses on OO Analysis (OOA) and OO Design (OOD) phases, and has five activities: Conceptualization, Analysis, Design, Evolution, and Maintenance of requirements and their related SDCs. It is cyclical (or spiral) model, which uses incremental implementation processes, which are the origin of the ADM and DevSecOps. OOA/OOD phases, use six types of models/diagrams: Class, State transition, Object, Process, Module, and Interaction; which all are MDTCAS basic artefacts. Class and module are static diagrams, while state transition are dynamic ones (Liu, 2022); 3) Jacobson's methodology (OOSE) can be used to plan, design, and implement OO ICS components; and has five types of models: Requirements, used to specify Use Case (UC) diagrams, Analysis, Design, Implementation (used by DEMs), and Testing; they are also MDTCAS's basic elements; 4) *Artefacts* and OPMs; and 5) UCs help the DEMs to link to *Artefacts*, to create OPMs and DEOMs. Where a UC can include: OOM diagrams, non-formal code, Events flow, Pseudo-code, and Actors. OOM, UC are the basis of the actual EA modelling languages to support *Artefacts* to be used by the DEM.

EA Modelling Capabilities and the MDTCAS

Like ArchiMate, which has many artefacts, diagram types, views, and that is why in this article only its UC View (UCV), Business Process Interaction View (BIV), and Business Process View (BPV) will be presented, to show how MDTCAS can include common OPMS, EA/ArchiMate elements and diagrams. Combining the DEMs with TDM/EA in complex *Projects* can be supported by *Artefacts*. The DEM uses *Artefacts* to support *ENT's* restructuring operations, in the *Business Architecture* phase aspect of TDM/ADM (Rosing, Hove, Subbarao, & Preston, 2012). EA languages, like ArchiMate's UCV, BIV, and BPV are incorporated in *Artefacts* to be used for analyzing APD scenarios from the functional perspective. *Artefacts* map to *Application Services* in the form of SDCs, and an *Artefact* can have the following type of resources: Business, and System or non-functional. When *Artefacts* are refactored/identified as MDTCAS elements like composite application services, which can be used to build DEMs as shown in Figure 11. These diagrams are elements of functionalities of the target SDC or DEM; and where refactored *Artefacts* represent the behavior (the functionalities) of an SDC (Hosiaisluoma, 2022). *Artefacts* are heavily used in BPs, BPMs, OPMs, and DEMs. The TDM synchronizes the implementation of: 1) The OPMS which provides the supports BPMs; 2) EA models; 3) DEMs. That all needs a Polymathic-approach to enable structured BPM based OPMs and DEMs.

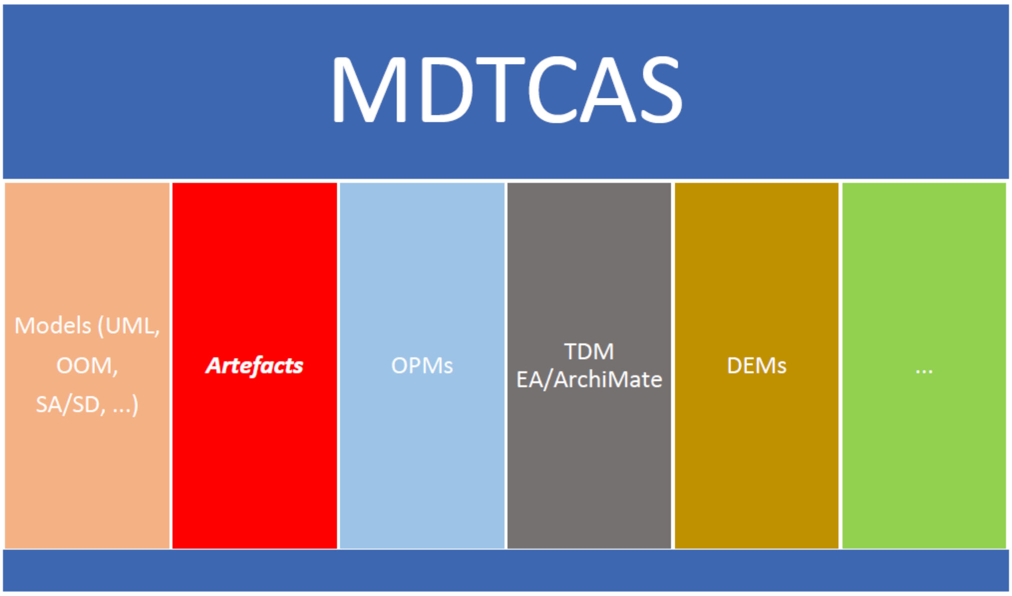


Figure 10: MDTCAS' Implementation.

Automated and non-automated DEMs have a key role in developing APD competencies, and where *Business Architecture* and ICS architecture are vital.

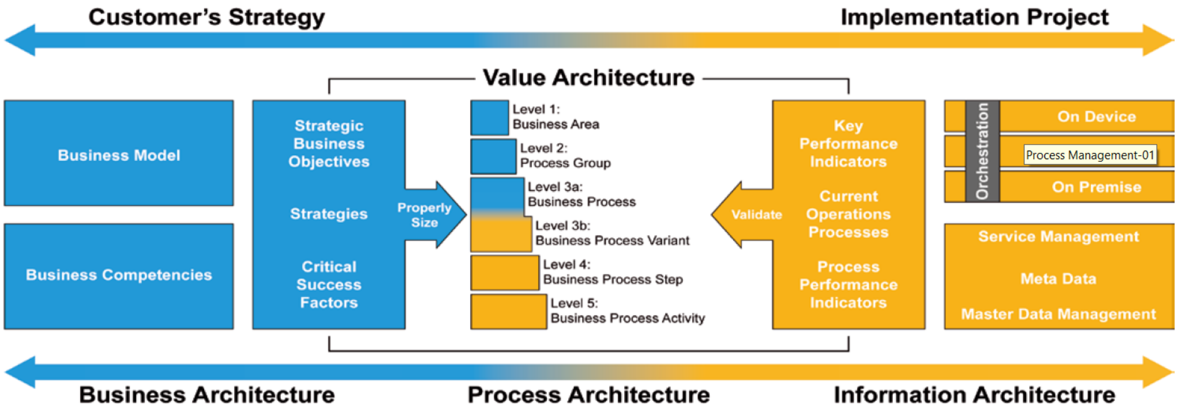


Figure 11: BPs fit into TDM/ADM/EA for DEMs (Rosing, Hove, Subbarao, & Preston, 2012).

As shown in Figure 11, the key to linking ICS and business architectural domains are BPs, OPMs, BPMs, and DEMs which are subsets of process/BP architecture(s). Implement a complex process architecture in APDs like finance, HR or supply chain, are the major part of the *Project* and has interdependencies with other OUs and external DEMs based *ENTs*. Analyzing APDs requirements in a siloed manner can have negative impacts on the *Project* and there a need to have a holistic approach to capture interdependencies, and for that goal the *Artefacts* based DEM. A Polymathic-holistic overview/visibility across all APD's CSAs, helps *Project Managers* and teams, to predict the *butterfly effects* (how actions can have huge effects on the course of a major event) (Rosing, Hove, Subbarao, & Preston, 2012). Where *Artefacts* BPs, OPMs, and BPMs are incorporated in DEMs.

BP, BPM, OPMS, and DEM's Incorporation

To align BPs, OPMs, BPMs, and DEMs (simply *Model*) with: TDM, *Artefacts*, and OUs, there is a need to use TDM/ADM's life-cycle, where *Artefacts* include: MAs, ABBs, SBBs, and Governance. The DEM establishes: Common *Artefacts* for the MDTCAS, Business Process Architecture (BPA), *Models'* tools and management, DevOps, Test scenarios, Best practices, OUs' based *ENT's* control, and a Security concept (Luyckx, 2015).

A Security Concept

For the DEM the role of an *ENT* Polymathic Security Concept (EPSC) is crucial; and *EPSC* uses measurable Cybersecurity and governance security Risk (secRisk) CSFs, which are mitigated and tuned, to ensure *Project*'s successful evolution and predict/block Cyber (or classical) crimes/misdeeds. Actual Cyberspace's resilience, control, and security concepts are siloed, insufficient, chaotic, and concentrate only on platforms' infrastructural aspects. *ENT*s are wrecked by Cybercrimes that are based on Cybersecurity violations that are hard to detect. Secured *Projects* are very complex to finalize, because of various (re)organizational problems, and they depend on the organization's dynamic structure. The organization's structure depends on secured *Artefacts*, OPMs and DEMs which are used to (re)organize secured OUs, OUPs and hence *ENTs*. The EPSC uses secMDTCAS and secTDM to integrate standard methodologies, like TOGAF and the Sherwood Applied Business Security Architecture (SABSA) (SABSA, 2020). The secured ICS' (secICS) related *Projects* use iterative/cyclic transformation phases, which includes secRPs (Trad, 2023a, 2023c). Figure 12 shows the BPMs security roadmap, which can be applied for DEMs and its main goal is the definition of methods that are combined to a methodology for supporting *Models* oriented *ENTs*. Focusing on *Models'* security is (Neubauer, Klemen, & Biffl, 2006): 1) The reduction of complexities and a clear MDTCAS; 2) Parallel development of *Models* using DevSecOps; 3) Valuation and allocation of security controls to ICS elements, OU/OUP aspects, …; 4) Consideration of interdependencies between *Models* and security controls; 5) *ENT* wide monitoring, optimization and improvement of *Models.*

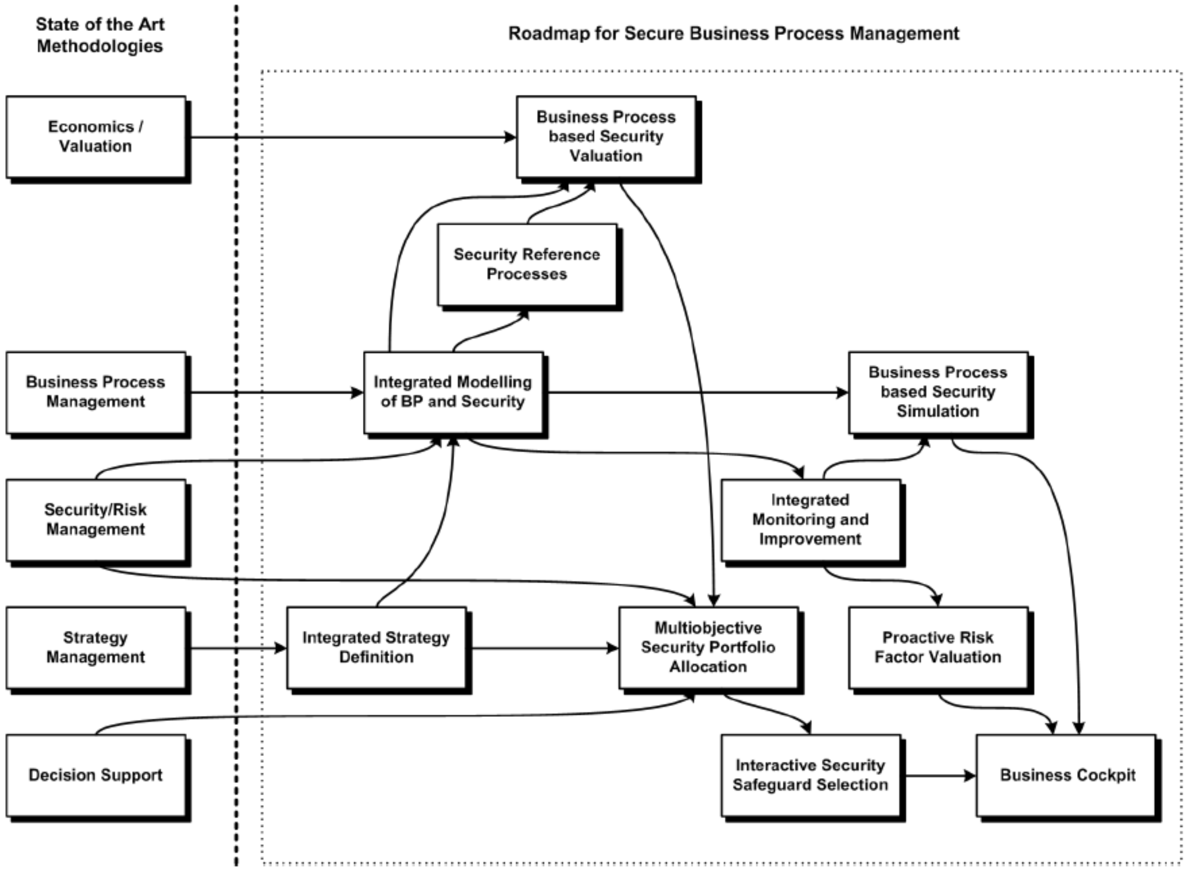


Figure 12: Roadmap for secured BPMs … and for DEMs (Neubauer, Klemen, & Biffl, 2006).

Methodologies' and Artefacts CSFs

Based on the AHMM4DEM, LRP4DEM and DMS4DEM, for this CSA's CSFs/KPI were weight and the results are shown in Table 2. This CSA's result of 8.0, which is low, and that is due to the fact that the RP and MDTCAS are difficult to integrate. And that does mean that it is impossible. To organize various types of generated *Artefacts* based DEM's approach.

Table 2: CSFs that have the rounded average of 8.0.

Critical Success Factors	AHMM4CBB enhances: KPIs	Weightings
CSF_MDTCAS_DEM_DT_Implementation	Complex	From 1 to 10. **08 Selected**
CSF_MDTCAS_OPMS_OOM_UML_Usage	Complex	From 1 to 10. **08 Selected**
CSF_MDTCAS_TDM/ADM/EA	Complex	From 1 to 10. **08 Selected**
CSF_MDTCAS_Legacy_Conversion	Complex	From 1 to 10. **08 Selected**
CSF_MDTCAS_Models_Incorporation	Complex	From 1 to 10. **08 Selected**
CSF_MDTCAS_*RPOUP*_Security	Complex	From 1 to 10. **08 Selected**
CSF_MDTCAS_Artefacts_Link	Complex	From 1 to 10. **08 Selected**
CSF_MDTCAS_OUs_Control	Complex	From 1 to 10. **08 Selected**

valuation

4. Artefacts Based DEM's Approach

Artefacts based Vision

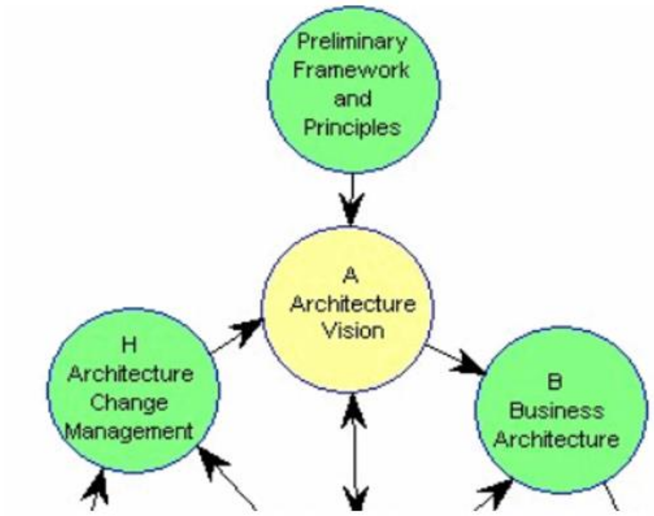


Figure 13: ADM based TDM's vision phase.

The TDM needs a directed vision on how to integrate generated *Artefacts*; and the *Project* must establish an *Artefacts* based DEM's Architecture Vision (DAV), as shown in Figure 13. DEMs, *Artefacts* interaction needs clear DAV principles. An adaptive OUP/ICS is based on various *RPOU* generated atomic resources like aBBs, sBBs, Services (SRV), Model View Control (MVC) which are managed in various TDM phases to support: 1) *Artefacts* integration; 2) To apply DAV patterns; 3) Control and monitoring activities; 4) Interaction of MVCs (Palermo, 2012); 5) Relate DAVs to CSFs, 5) Viewpoints, like: OU, BPM/OPMS, Stakeholders reporting, *Artefacts*' usage in TDM models, and ICS' standards application; and 6) DMS4DEM to quantify vision's applicability by using the following CSFs:

- Coalition to Support the Vision (CSF_VIS_CSV).
- DAV's Adoption (CSF_VIS_DAV).
- RPOU's Capacities (CSF_VIS_RPC).
- Time for Execution (CSF_VIS_T4X).
- Tooling ADoption (CSF_VIS_TAD).
- Artefact's concept adoption (CSF_VIS_ART).
- MVC's concept adoption (CSF_VIS_MVC).
- Process Control and Monitoring adoption (CSF_VIS_PCM).
- Transaction Capability Adoption (CSF_VIS_TCA).
- Strategy for avoiding REsistances (CSF_VIS_SRE).
- PoC's capabilities (CSF_VIS_PCC).

The DAV supports the interaction of the ICS, SRVs, CAVs, *Artefacts* and DEMs; where the TDM manages DAVs and uses the following TDM/ADM's phases: 1) Preliminary that aligns *Project's* vision with DAV; 2) Phase "A", establishes the DAVs and relates them to *Artefacts* and OUP/ICS; 3) Requirement ensures that requirements are managed accordingly to DAV, where a requirement is linked to an instance of an *Artefact* and its SBB; 4) Phase "B" develops APD DIAs based on *Artefacts, Models*, and SBBs; 5) Phase "C", develops implementation DIAs based on MVC, *Artefacts* and SBBs; 6) Phase "D" develops technical DIAs based on MVC, *Artefacts, Models,* and SBBs; 7) Phase "E" uses the HDT based DMS4DEM to estimate the iteration's GAP value and offer possible solutions/opportunities; 8) Phase "F" delivers migration plans; 9) Phase "G" analysis the *Project*'s plans and defines governance mechanisms; and 10) Phase "H" manages requested changes. A TDM iteration generates sets of refined *Artefacts for Models*.

Refined Artefacts for Models

An *Artefact* has a DAV that is based on a mapping-patterns that are managed by the TDM/EA (Greefhorst, 2009). *Projects* apply *Artefacts* driven implementation which needs specific implementation skills and a *Artefacts and Models* based model-first or a Pseudo-Bottomup-Approach (PBA), where IHI and standard *Artefacts* support *Models'* integration, modelling strategy, methodology, and productivity environment.

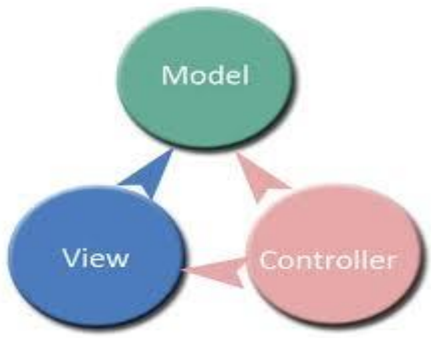


Figure 14: The Model-View-Control pattern (Palermo, Bogard, Hexter, Hinze, M., & Skinner, 2012).

Artefacts support upstream *Models* that are refined by the *RPOU* and coordinated by the MVC pattern, as shown in Figure 14. TDM/EA manages *RPOUs* in which *Artefacts* are templates for instantiating SBBs. The TDM manages DAVs which provide conceptual and logical views of SRVs across various APDs (Gartner, 2005). EA like TOGAF has generic *Artefacts* which has the following characteristics (The Open Group, 1999):

- Packages requirements, functionalities, and resources to meet APD's needs.
- Standardizes interfaces to access all its resources and functionalities.
- Interoperable with other *Artefacts*.
- Defines functionalities that will be implemented and captures requirements.
- It is technology aware and is standardized and is used as a template to build SBBs.
- Aggregates with other *Artefacts*.
- Has a GID, respects the "1:1" mapping concept and enables interoperability.

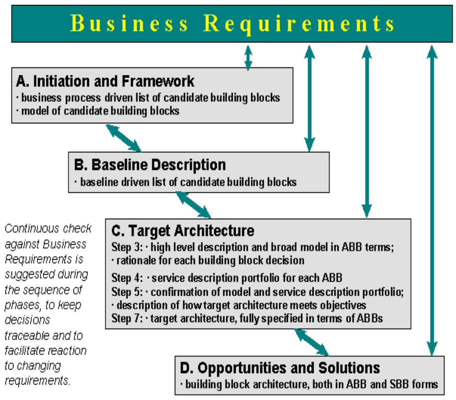


Figure 15: ADM's key phases at which CBBs are managed (The Open Group, 1999).

Artefact sets are used by a OPM which can correspond to an APD Transaction (ATR) or Cybertransaction. The way in which *Artefacts* functionalities and resources are combined into an ATR vary between APDs. The TDM/ADM manages the implementation *Artefacts* as shown in Figure 15, to serve SBBs (The Open Group, 1999). An SBB has the following characteristics:

- Defines which SRVs and *Artefacts* will implement APD's functionality.
- Uses implementations of *Artefacts*.
- Fulfills ATR's or Cybertransaction's requirements.
- Is traceable and interoperable.
- Enables dynamic implementations and supporting *Artefacts* Reference Models (ARM).

The TDM/ADM/EA depends on requirements, *Artefacts*, and ATRs architecture which supports the related SRVs, interfaces, and standards that satisfy APD needs (The Open Group, 2011c). DEM follows technology trends which are driving the *Project's* vision. The DEM tries to reengineer OUs, this approach ensures that the *Project* succeeds. Because it aligns: Requirements, (re)Structure/governance OUs, and OUP/ICS. That is why the MDTCAS must support a set of transcendent patterns-based *Artefacts based Models*.

Artefacts based Models

The MDTCAS includes common and coherent sets of IHI *Artefacts* to compose *Models*. *RPOUs* generate feasible *Artefacts*, which can also emerge from *the best architecture & modeling practices*. *RPOUs* has to apply *architecture & modeling extraction techniques*, which can fail because it causes: 1) Bad design, and is unmaintainable; 2) Lacks evolution and scalability; and to 3) *Artefacts, Models,* and SDCs are un-usable. *Models* uses sets of *Artefacts* for (re)modeling, and (re)designing *ENT's* structure and activities, and the PoC checks their feasibility. SBBs instances can be used to create generic types of *Models*. *Artefacts* are stored in SBBs, which are used for implementing *Models* (The Open Group, 2011a), which need the reduction of silos complexities and the adoption of a PBA. The PBA is based on a *1:1/1:n* mapping concept. The MDTCAS needs *Artefacts*-based *Models* to build an OPMS which (The Open Group, 2021; Trad, 2023a; Trad, & Kalpić, 2022c, 2022d): 1) Quick support by offering sets of *Artefacts and Models* to be used by the TDM/ADM, Enterprise continuum, ARM, Catalogs, ….; 2) Domain *Model* patterns; 3) Data-source architectural patterns; 4) Enterprise Service Bus (ESB) patterns; 5) Enterprise Application Integration (EAI) patterns; and others… There are many redundant categories of standard and internal *Artefacts*, which makes *Models* difficult to implement. *RPOUs* also redesigns by extracting various types of complex data structures/patterns like *Business Data or Interaction Modeling Patterns*, that extract business data and offer interaction *Models*, which are indepenednt of the databases types, which support *Business Knowledge Management Pattern* (Pavel, 2011); a combination of IHI *Artefacts* are used to assemble *Models*. Assembling *Models* include, the *Models* Integration Pattern (MIP) that is used by *RPOUs* to extract types of common *Models* to be used and mapped to OUs, OUPs and *ENT's* structure. The extracted *Models* are orchestrated by the AHMM4DEM actions and the *RPOU* maps them to the *Artefacts*, which are located in *ENT's* repository (The Open Group, 2011a)

Predefined Models

ARP/UPs and *RPOU* generate *Artefacts*, which assemble predefined *Models,* to be referenced by the MDTCAS. MDTCAS is used to interface standards methodologies like the Object Management Group's (OMG) DMN which can be used for modeling operational decisions. DMN's *Models* can be shared between different OUPs/ICSs and the MDTCAS interfaces DMN's implementation environments to: 1) Refine and map DMN patterns which can interface any other type of *Models* (RedHat, 2022); 2) Use diagrams and *Artefacts* like the: Decision Requirement Diagrams, Components, BPs, Business Knowledge Model, and Decision Tables, similar to *TRADf's* Tables that are used in this RDP4DEM; 3) *RPOUs* processing results in a set of MDTCAS *Artefacts based Models*; 4) *Models* include the following steps: Defining MDTCAS main *Artefacts* and basic *Models'* structures, Transforming. legacy-code-base to deliver *Artefacts* by using BPM, UML, TDM/TOGAF/ADM, and to integrate DMN; and 5) DEM has to avoid that *RPOUs* deliver a *Artefacts*' hairball, and it uses the PBA to offer a set of *Artefacts* to be included in MDTCAS (The Open Group, 2021).

The Artefacts based DEM's approach CSFs

Table 3: CSA's average is 8.20.

Critical Success Factors	AHMM4CBB: KPIs	Weightings
CSF_Artefacts_DEM_Viision	Feasible	From 1 to 10. **09 Selected**
CSF_Artefacts_DEM_RPOU_Extraction	Complex	From 1 to 10. **08 Selected**
CSF_Artefacts_DEM_Generate	Complex	From 1 to 10. **08 Selected**
CSF_Artefacts_DEM_Assembling	Complex	From 1 to 10. **08 Selected**
CSF_Artefacts_DEM_Predefined	Complex	From 1 to 10. **08 Selected**

valuation

Based on the AHMM4DEM, LRP4DEM and DMS4DEM, for this CSA's CSFs/KPI were weight and the results are shown in Table 3. This CSA's result of 8.20, which is low, and that is due to the fact that the *Artefacts*-based *Models* concept is difficult to integrate. And that does mean that it is impossible. To implement DEM the author will propose a Polymathic *RPOU* approach.

5. A Polymathic RPOU Approach

Evolution and Risk of RPOU based Project

Artefacts-based *Models* refinement and evolution take a very long time, and OUPs/ICSs evolutions are extremely fast, therefore there is a need to find a Polymathic *RPOU* approach to deliver transcendent DEMs. The AHMM4DEM based DEM uses various mathematical domains to deliver a unique AHMM (Trad, & Kalpić, 2020a). As shown in Figure 16, a *Project* must select the optimal risk mitigation concept, which is based on the following types of risks: 1) Risk avoidance and prediction; 2) Risk reduction; 3) Offers AHMM4DEM actions to reduce risks; 4) Actions to transfer risks to third parties; and 5) Risk acceptance, like in the case of R2C. Risks' estimations include (Pratap, & Predovich, 2020): AHMM based analysis, Remediation, Compliance, Coherent/Synchronization, User experiences, Reporting, Basic-advanced integration, Digital asset discovery, and Real-time control based assessments. Risk mitigation artefacts are linked to the Polymathic AHMM4DEM basic elements. AHMM4DEM's nomenclature is presented in a basic form to be understandable by the readers. The AHMM4DEM based DEM and its main artefacts and characteristics are:

- *RPOU* actions = supports ARP/UP operations, DevSecOps activities, for finalizing DEMs.
- *Project* parts = ∑ *RPOU*(S) (for the OUP/ICS, SDCs, and its infrastructure/networks).
- DEM = transformation of *Project's* parts + the defined goals of *Project* operations.
- APD's AHMM (AHMM) = ∑ DEM.
- ENT(M) = includes *Project's* parts + ∑ DEM.

Figure 16: Quadrant for risk management (Pratap, & Predovich, 2020).

ENT's DEM based Model

As shown in Figure 17, the symbol ∑ indicates summation of all the relevant named set DEM related members, while the indices and the set cardinality have been omitted. The summation should be understood in a generic sense, more like a set. The AHMM4DEM uses services model to support the DEM and is represented in a simplified form. The DEM interfaces are based on the TDM and uses services to enable the Polymathic transformation model. The AHMM4DEM based TDM is the combination of TDM and AHMM4DEM looks as follows:

The Generic AHMM's Formulation

TDM	*is a **Transformation Development Method**, which can be ADM based…*	
AHMM	$= \bigcup$ TDMs + $\bigcup$ DMMs	(G1)

AHMM's Application and Instantiation for a Domain

Domain	$= \bigcup$ APD	(G2)
AHMM4(*Domain*)	$= \bigcup$ TDMs + DMMs(*Domain*)	(G3)

Figure 17: The AHMM4DEM main formulas.

The Polymathic Transformation Model

The AHMM4DEM based TDM model:

AHMM4DEMbTDM = AHMM4DEM(TDM) (G4).

The DEM transformation model is the combination of an AHMM4DEMbTDM and *IterationGap* that can be modelled using the following formula:

Project = AHMM4DEMbTDM(*IterationGap*) (G5).

The *Project's* model is based on the extraction of choreographies or *Models*.

Extraction of Artefacts based Choreographies/*Models*

DEMs depend on the results of *RPOUs'* operations, which refine/extract *Models* (or BPM/choreography). The extracted *Models* are based on the HDT that uses *Artefacts* to support DEMs. The AHMM4DEM is composed of large number of interconnected nodes, to solve DEM types of problems. DEM's used *Artefacts* are connected to each other, like nodes of the HDT and there is a WGT (a real number) and CSFs; which are used by the GAP.

Using GAP for DEMs

The GAP for DEMs used the following AHMM4DEM's rules:

- *ENI* *is a* ***Enterprise intelligence***
- OU or Sector = APD[n] (G1)
- OU_Element = OU[n or element], € {1 … k} (G2)
- CSA(OU or Sector) = ∑ CSF (G3)
- CSF(OU_Element) = ∑KPI (G4)
- KPI = ∑VAR (G5)
- FUN(ARG) = WGT x QNT(ARG) v/& WGT x QLT(ARG) (G6)
- GAP(ITR) = TDM(ITR) - TDM(ITR-1) (G7)
- GAP = ∑ GAP(ITR) (G8)
- PRJ = ∑ TDM (ADM based) (G9)
- PRJ = ∫ FUN() x GAP(ITR) (G10).
- *ENT* = ⋃ OUs (G11)
- *ENT* = ∑ PRJ + ∑ OUP/ICS + ∑ ENI (G12)

The Polymathic Approach's CSFs

Based on the AHMM4DEM, LRP4DEM and DMS4DEM, for this CSA's CSFs/KPI were weight and the results are shown in Table 4. This CSA's result of 9.60, which is high, and that is due to the fact that the Polymathic *RPOU* approach is based on the AHMM which is a mature model; and that it can be used.

Table 4: CSA's average is 9.60.

Critical Success Factors	**HMM enhances: KPIs**	**Weightings**
CSF_AHMM4DEM_RPOU_Elements	Proven	From 1 to 10. **10 Selected**
CSF_AHMM4DEM_RPOU_Risk	Possible	From 1 to 10. **09 Selected**
CSF_AHMM4DEM_RPOU_Models	Proven	From 1 to 10. **10 Selected**
CSF_AHMM4DEM_RPOU_TDM	Possible	From 1 to 10. **09 Selected**
CSF_AHMM4DEM_RPOU_Choreography	Proven	From 1 to 10. **10 Selected**

valuation

The AHMM4DEM and MDTCAS' artefacts are used to support the DEM based *Projects*.

6. DEM Based Projects For ENTs

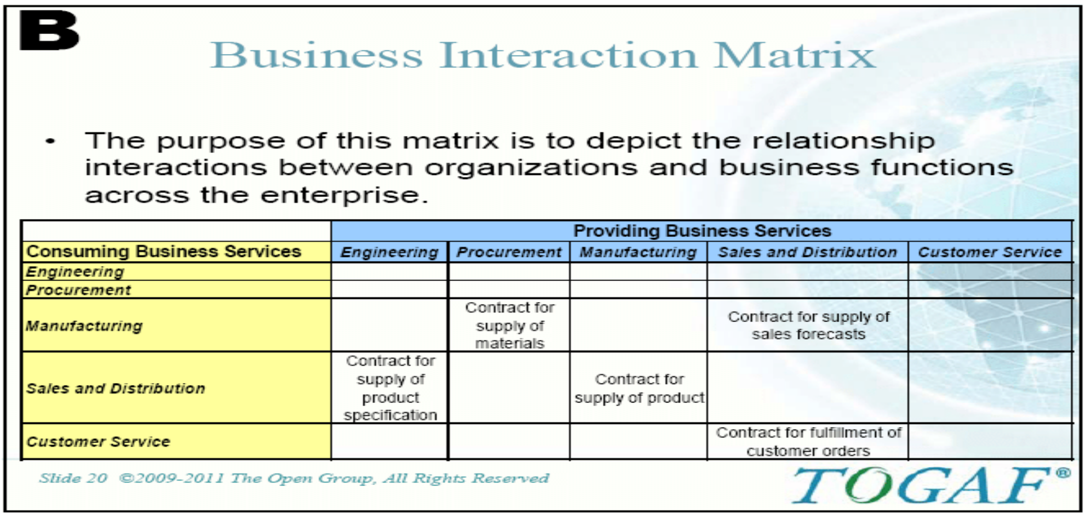
The Strategy for ENI

Models (including) DEM is supported by a predictive the KMS4DEM based DMS4DEM (simply ENI) depends mainly on the HDT and the selected CSFs, like the types of *RPOUs* activities, types of risks, R2C, financial situation, types of *Models*, needed skills, … A *Project* should adapt an ENI that is coordinated with *Models* that can offer complex designs and eventual problems, which can be the source of risks and failures... *Models* problems can be measured and weighted, where the *Project's* risks are not easy to measure. This explains the difficulty of estimating *Project's* risks related to consequential sets of *RPOUs* operations. The ENI and selected weightings are used to deliver a set of possible *Models* actions. Weightings' ENI concept supports the *Models* to deliver solutions in the form of *Models* recommendations. The ENI uses the HDT to solve *Model* types of problem(s). A *Model* adopts a holistic-systemic approach, which makes the *ENT* robust and *Artefacts* management subsystem the basis of a successful *Project*. *A*rtefacts based *Models* are managed .by the MDTCAS based TDM. The MDTCAS provides support for refined *Models* synchronizes *Project's* plans with the TDM. The TDM supports interactions between strategies, global processes, services, and OUP/ICS' platform. The ENI controls *Models'* risks to implement *Artefacts* pools to support the implementation of *Models*. *Models'* contains the following concepts: 1) Agile DevSecOps for *Artefacts*, and SDCs extractions; 2) MDTCAS sets of *Artefacts*; 3) TDM's interfacing capabilities; 4) Mapping MDTCAS' *Artefacts*; 5) *Artefacts* granularities; and 6) Requirements mapping to *Artefacts*. *Models'* capabilities to integrate emerging avant-garde domains, like *Models*, AI, EA, Refine techniques, and scalable OUPs/ICS platforms (Sargent, 2021).

The Role of Avant-garde Domains

MDTCAS supports *Models* and their capacities to refine legacy *Artefacts and Models*. Refined *Artefacts and Models* can be used with existing standards by implementing the MDTCAS and its TDM. *Artefacts based Models* deliver organizational ABBs that instantiate SBBs. Existing *Artefacts and Models* refinement initiatives have the tendency to *reinvent the wheel* when creating them. The *RPOU* delivers refined *Artefacts and Models* for architecture/modeling, designs, and implementation constructs for the reengineering of OUs based *ENTs*. Mixing *Artefacts and Models* that can be mapped by the TDM and the *Project,* must implement a generic *ENT* patterns (The Open Group, 2011a). Using MDTCAS enables the reduction of complexities and the adaption of a PBA cycle based on a "1:1" mapping approach. *Artefacts and Models* applies standardized: 1) Methodologies; 2) Domain, business or APD architecture; 3) *Models*' choreography; and 5) Mapping *Artefacts and Models*. Applying the mentioned standards and the classification of behavior and interoperation of *Artefacts based Models*, has positive impacts on *Projects*. *Artefacts based Models* rely on the mentioned standards to deliver an adequate MDTCAS which is based on: 1) The evolution and stability of *Models* and enables TDM based agile management activities; 2) BP Integration (BPI) enables the integration of refined *Models* by the use of EAI's infrastructure; 3) APD's documents standards, like XML; 4) Governance standards are important for control operations; 4) Avant-garde methodologies, applications and technology standards: 5) *Artefacts and Models* stack standard that includes various levels of APD and OUP/ICS resources and SDCs; and 6) The IHI TDM supports *Artefacts based Models* implmentations. Technology evolves faster than *Project's* evolution, and it is difficult to finalize the *Project* with the initial goals and defined OUP/ICS structure. That is why it is important to define MDTCAS artefacts that are transcendent to time and to all *Project's* iterations. As already mentioned, the MDTCAS for avant-garde domains includes: 1) *Models,* UML/OOM basics and other; 2) DIAs, like *Artefacts and Models*, UC or DMN diagrams; 3) Delimiters, actors and interfaces; 5) Circular implementation methods, like DevOps or TDM; and 6) SRVs' technologies, abstracted by *Artefacts*. TDM's integration with *Artefacts based Models*, enables the automation and auto-generation of MDTCAS' activities, which go-through TDM's phases which uses cyclic iterations. *Artefacts based Models* has a generic interface with the TDM supports legacy-components refinement, mapping, and integration. That all enables APD's integration and inter-operability.

APD's Integration and Inter-operability



	Providing Business Services				
Consuming Business Services	Engineering	Procurement	Manufacturing	Sales and Distribution	Customer Service
Engineering					
Procurement					
Manufacturing		Contract for supply of materials		Contract for supply of sales forecasts	
Sales and Distribution	Contract for supply of product specification		Contract for supply of product		
Customer Service				Contract for fulfillment of customer orders	

Figure 18: TOGAF's Business Interaction Matrix (The Open Group, 2011b).

Artefacts based Models integration and inter-operability capacities have the following characteristics: 1) Supports the integration of refined *Models* and installs long-term compatibility, by using the following artefacts: *Models'* inter-operability, TDM's interfacing, An anti-locked-in strategy, MDTCAS' artefacts exchange, A generic inter-operable APD communication layer; 2) APD's inter-resources operability that is supported by the XML based on XMI or any *Model* format which can be IHI; 3) *Project* management and *Models* serialization in standardized or IHI format files, like the *business interaction matrix* shown in Figure 18, which shows the mapping between APD's services and functional domains. APD's integration/inter-operability depends on CSFs, like APD's OUPs. Managing OUPs by the *Project* team, implies that they transform it into an agile cloud platform. The *Artefacts based Models* are deployed on OUPs/ICSs. This is needed for the management of *Artefacts* repository that are to be used by the *Project* to use *Models* based OU's reorganization.

Models based OUs' Reorganization

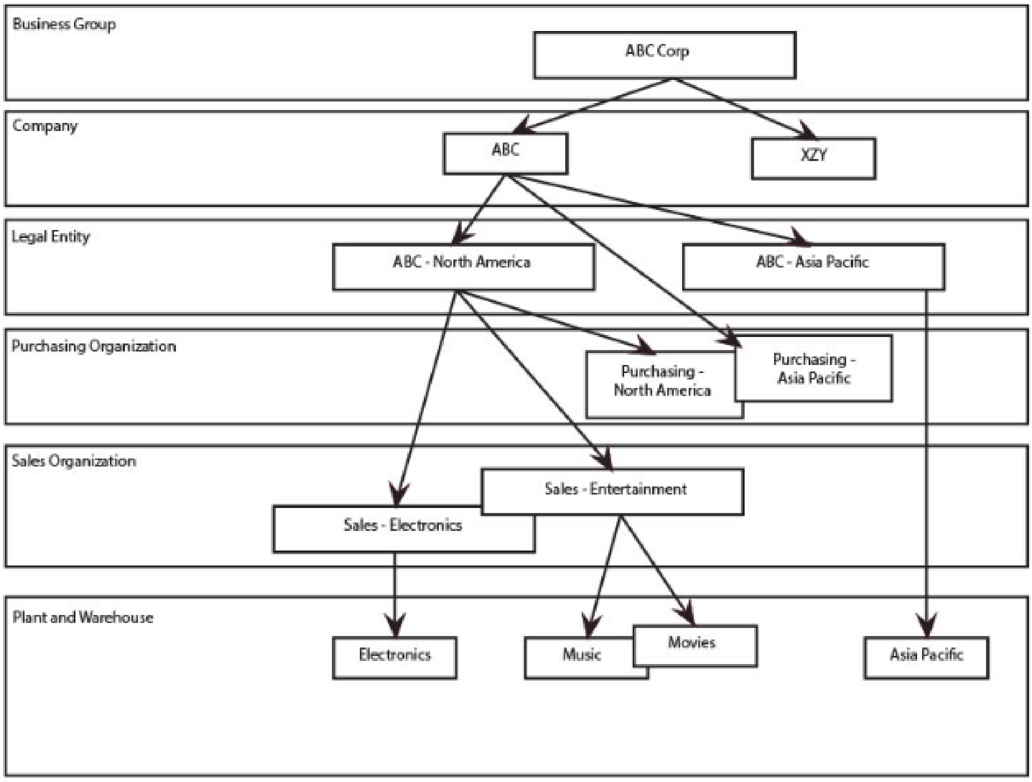


Figure 19: Typical organization model (IBM, 2021)**.**

Artefacts based Models block various types of inconsistencies and use the AHMM4DEM based ENI to make decisions to deliver optimal actions on how to reorganize OUs into a transformed *ENT*. Using the right sequence of *Models'* actions can determine the *Projects* success. Such actions are based on *organizational routines* or *known actions*, knowing that there are various types of reorganizational *Models* (Kuwashima, 2014): 1) The Rational Actor *Model* (RAM), in which decisions (or sets of actions) of a large *ENT,* are under central control. RAM presupposes the rationality of *Managers*; and it is used to make *rational choices* or *rational decisions,* where RAM can be a *Model* actor; 2) The *Model* examines *ENT's* actions which are considered as an output of an OUP that is based on OU routines, which are packaged in *Artefacts based Models*, where a *Model* depends on the critical Management's Political *Model* (MPM); and 3) The MPM focuses on important *Managers*/decision-makers and it considers actions as bargaining activities that include strategic objectives. The ARM, OPM, and MPM support *ENT's* organizational modelling, where (re)organization represent: OUs/departments, cost-center, division, sales-unit or other. As shown in Figure 19, typical *ENTs* have the following OUs: Business, Legal, Sales, Purchasing, Plant and Warehouse (IBM, 2021). *Artefacts based Models* supports *ENT's* building or (re)assembling.

ENT's Building or (Re)Assembling

Refined *Artefacts based Models* support *ENTs* to work efficiently and there are various ways to implement *Models*, and they depend on the *Project's* strategic goals. *Models* have the following characteristics (Nicholas, 2023):

- It visualizes *ENT's operating* and *support* activities; and also clarifies relationships between OUs' *support* functions and implemented *Models*.
- It shows how employees report to *Managers* and how *Models* based OUs are (re)structured.
- *ENT's* goal is to bring together employees with a common objective and *Models* defines: 1) The scope of groups of employees and tries to predict R2C; 2) The formal relationships

between employees and reporting lines; 3) The functional role for each employee; and 4) The interfaces between OUs' functions.

- Has the following elements: 1) Types like value chain, units, matrix, functionally-oriented, market-oriented; 2) Roles which define skills and responsibilities; 3) Interfaces (interactions) between OUs/OUPs; 4) Organizational (or *Model*) charts; and 5) Influencers are employees who manage information, direct, and generating advice/recommendations.
- Support work includes: 1) Policy which sets rules and governs OUs; 2) Controls and actions' for *Models'* optimization; 3) Shared *Model* services support customer/supplier relationships; and 4) Core-resources provide support for OUs.
- There are different ways to structure the OU's operations that include the following *Model* types: 1) Value chain; 2) Matrix; 3) Functionally-oriented; and 4) Market-oriented.
- *Model* based OUs are a form of *ENT's* robotization which may provoke R2C. *Projects* in general and *RPOU* more specifically can face OUR and/or R2C, that is why the *Manager* must implement a R4C in the *Project's* vision. R4C can be evaluated in all TDM's phases. R4C must be integrated in secured *Model* Architecture (secMA).

Integrating secMA

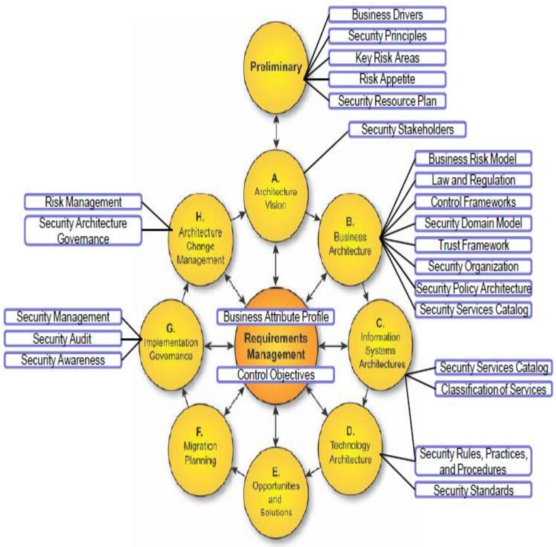


Figure 20: Integration of SABSA with TOGAF (Kasarkod, 2011).

The TDM needs a secured *Artefacts based Models* based vision to establish a secMA. An adaptive and secured OUP/ICS is based on various *RPOU* generated *Artefacts based Models* which are coordinated by TDM's phases. And EPSC supports (Trad, 2023c):

- Protection by: 1) Localizing gaps in the infrastructures; 2) Review of security solutions; 3) Blocking cumulative-attacks; 4) Defining a security strategy; 5) Building a robust/ defensive ICS; 6) Integrating security in Cybertransactions; 6) Blocking State Organized Financial Predators) SOFPs; and 8) Applying qualification procedures. secTDM's usage avoids: 1) Siloes and poor performances; 2) Lack of scalability; 3) To fail and to become un-maintainable; 4) Unsynchronized; 5) Interfacing market risk frameworks like the Committee of Sponsoring Organizations of the Treadway Commission (COSO), which is shown in Figure 20.
- Conversion: Of legacy siloed architectures to *Artefacts based Models* and a OUP/ICS, which enables the automation of *Artefacts*, throughout TDM's phases.
- Hosting: Of ICS modules by using TDM's *On Premises Hosting Model*, where the *ENT* is responsible for IHI ICS (Charles, 2021). *The IaaS Hosting Model* represents hosting in

both *On Premise* and in the *Cloud*, where *ENT* manages its EA-based OUP; and *RPOUs* refine *Models*' based applications' cartography.

- Unifying: ICS security aspects by aligning with standards like the National Institute of Standards and Technology (NIST), which has a list of best practices that can influence the secMA. The NIST has created the necessary steps for an *ENT* to self-assess its ICS security preparedness and to apply adequate security measures.

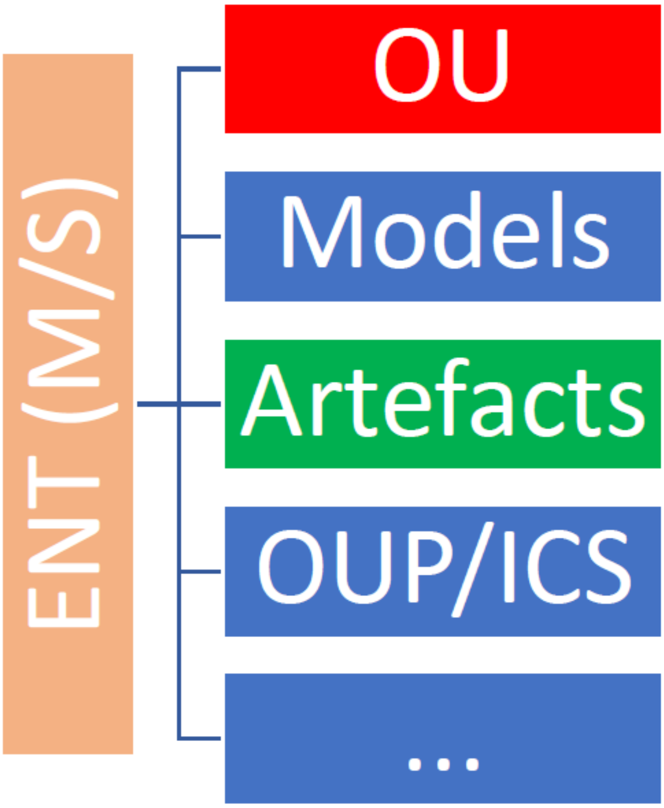


Figure 21: secMA's' approach.

These principles are built on the NIST's five pillars of Cybersecurity framework: Identify, Protect, Detect, Respond, and Recover. Another framework is the Cloud Security Posture Management (CSPM) which is designed to address common TDM's integration. The role of EA based TDM is like in all civil engineering fields, is central and it is directly inspired from civil engineering. Urbanistic architecture for large cities, like Hausman's restructuring of Paris main aim was holistic security… So secMA is of crucial importance! As shown in Figure 21, *ENT(M/S)* needs a Polymathic-holistic approach for secMA because it combines many security fields, and Cybersecurity is the central issue. So, it needs the secTDM, which interfaces frameworks like ADM, SAFe, COBIT, CISA… Unfortunately, today, we are just tackling isolated fields like Software security, Network Security… *ENT* must establish a Digital Forensics and Incident Response (DFIR) Concept (DFIRC). A DFIRC is important for secMA and is supported by ICS standards which can be integrated in ICS (Watts, 2020). The reason for this global contradiction is that they have overwhelming legal, political, and financial advisory support, which blocks any attempt to divulge such Cybercrimes and support cross-*ENTs Models* management (Trad, 2023c).

Polymathic cross-*ENTs Models* Management

ENTs aim is to improve the quality of provided products and services by optimizing their *Artefacts based Models*. *ENTs* OUs are enablers for connecting users to users by using the OUP/ICS. *Models* rely on standards' specifications that refine domain workflows to optimize resources. In general *ENTs* use unorganized and ad-hoc processes, which make OUPs volatile. A Polymathic cross-*ENTs*

Models manages cycles, by accurately modelling all its *Artefacts based Models* which aim is to: 1) Optimize *Models* by automating and rationalizing routine activities; 2) Implement an OPMS; 4) Optimize and remodel OUs for an *ENT*; and 5) Implement cross-*ENTs Models* (Ilahi, Ghannouchi, & Martinho, 2016). Today there is the need for cross-*ENTs Models* mining and their executions. Where these *Artefacts based Models* are deployed in different *ENTs*. Avant-garde paradigms like *Software*-as-a-Service (SaaS) and Cloud based OUP/ICS to enable *ENTs* to share a *Models'* platform(s). The shared *Models'* platform(s) has to support many types of *Artefacts and Models* and their possible variants. Such a huge collection of similar *Artefacts and Models* for a set of *ENTs* is more than challenging. But the shared *Artefacts and Models* platforms enables cross-*ENTS Artefacts based Models* mining. To unify cross-*ENTS Artefacts based Models* management, it is possible to cross-correlate *Models* and *ENTs'* different behaviors (Buijs, van Dongen, & van der Aalst, 2011). All the presented CSAs can be verified in the PoC's implementation.

DEM Project's CSFs

Based on the AHMM4DEM, LRP4DEM and DMS4DEM, for this CSA's CSFs/KPI were weight and the results are shown in Table 5. This CSA's result of 7.40, which is very low, and that is due to the fact that the DEM is very complex to implement and would probably fail.

Table 5: CSA's average is 4.0.

Critical Success Factors	KPIs	Weightings
CSF_RPOU_Project_ENI_Strategy	Complex	From 1 to 10. **08 Selected**
CSF_RPOU_Project_MDTCAS_Avant_Domains	VeryComplex	From 1 to 10. **07 Selected**
CSF_RPOU_Project_APD_Inter-Operability	Complex	From 1 to 10. **08 Selected**
CSF_RPOU_Project_OU_Reorganization	VeryComplex	From 1 to 10. **07 Selected**
CSF_RPOU_Project_DEM_Assembling	Complex	From 1 to 10. **08 Selected**
CSF_RPOU_Project_Integrating_secMA	VeryComplex	From 1 to 10. **07 Selected**
CSF_RPOU_Project_cross-ENTs_Models	VeryComplex	From 1 to 10. **07 Selected**

valuation

7. The PoC's Implementation

Models'/DEM's Basic Preparations

As shown in Figure 22, the first step is to prepare the PoC's environment by setting-up the Vision, MDTCAS/TDM, and extracted *Artefacts* from the *RPOU* (Trad, 2023a, 2023b).

Figure 22: PoC's basic preparation.

DEM's Feasibility Check

This PoC uses the PoC from the author's previous work that is related to ARP/UP, which presents the extraction of BBs/CBBs/OBBs (Trad, 2023a). BBs are assembled to build CBBs and OBBs. And another PoC's part was used from a previous PoC, in which a BB and ATR based Transaction was experimented as shown in Figure 23, it also proved that the granularity level/approach can be used to refine the "1:1" mapping (Trad, & Kalpić, 2014; Yalezo, Thinyane, 2013).

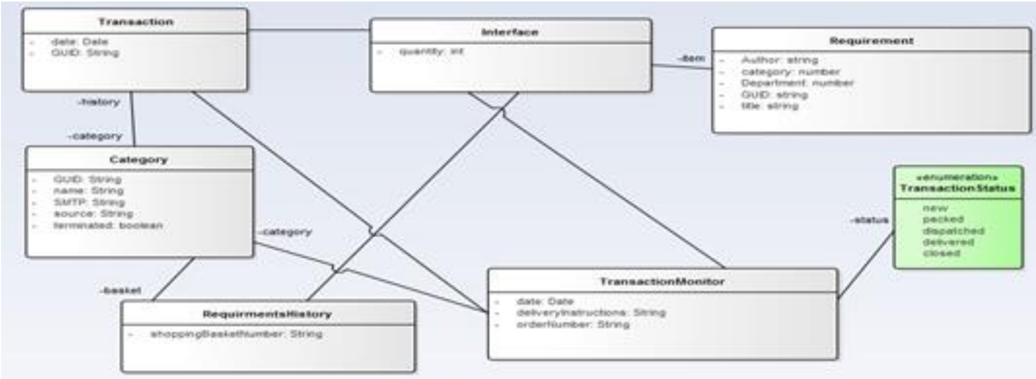


Figure 23: PoC's OBBs' based ATR design.

A logical view of a series of OBB based ATRs is presented in Figure 24, and their consumption of SRVs, in the form of an activity diagram in which all the events are exchanged between various nodes, require encryption which is defined in the TDM.

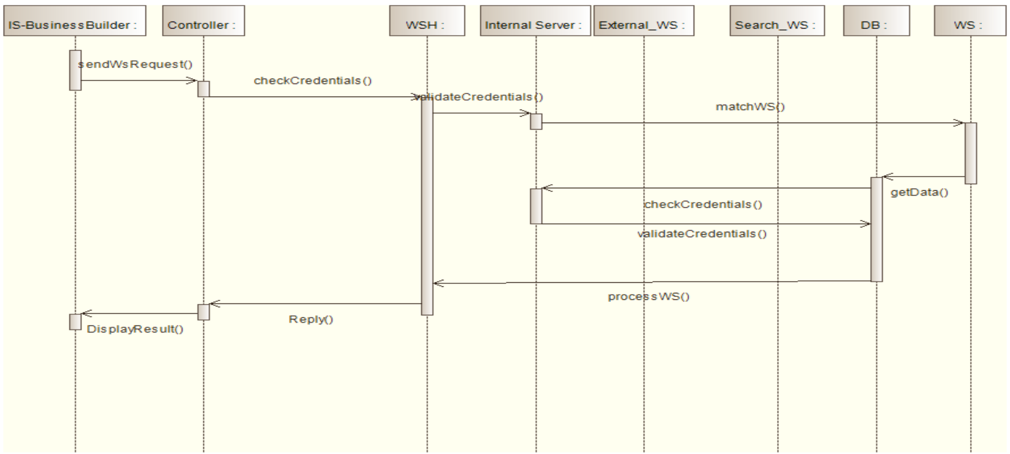


Figure 24: The ATR's activity diagram.

The ATR uses a set of *Artefacts* which are assembled in a Model/DEM as presented in Figure 25. The TDM uses ADM's phases B and D to implement the needed *Model* based ATRs.

OUP-APD Environment	Provide APD Models
Controller	Passes a SRV request
Find Models/SRVs	Execute
Data Source	Return information

Figure 25: *Model* based ATR's elements.

DEM' Design and Implementation

An essential constraint for the PoC is to use of existing standards in a reduced form, what corresponds to the MDTCAS. In this case MDTCAS transcendent *Artefacts based Models*, and diagrams are used. These standards include *Artefacts and resources* to be used to integrate *Models* in SDCs in the existing *Project*. To identify the initial sets of CSAs' CSFs and test whether the RQ's of CSFs affect DEM's integration. The PoC uses the HDT based mixed qualitative and quantitative method. The CSF's analytical process is illustrated in Figure 26. The PoC in the beginning uses Phase 1 that is mainly based on the HDT tables, which use WGTs. Phase 1 is used to weight the relative importance of CSAs and CSFs for the usage of *Model*/DEM and that is done using a decision table (Quang Phu, & Thi Yen Thao, 2017).

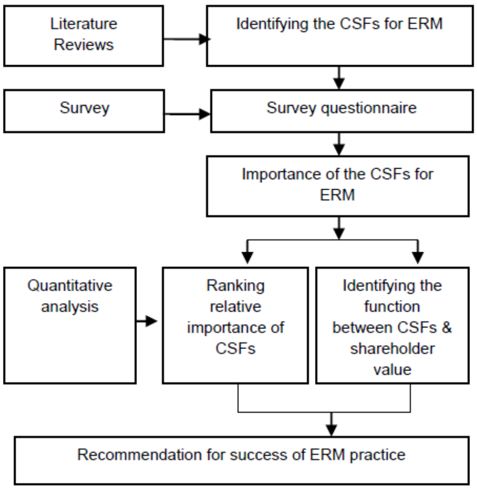


Figure 26: RDP4DEM's similar flow (Quang Phu, & Thi Yen Thao, 2017).

PoC's Phase 1

Table 6: The DEM PoC's phase 1 outcome is (rounded) 8.50.

CSA Category of CSFs/KPIs	Transformation Capability	Average Result	Table
The RDP4DEM's Integration	Usable-Mature	From 1 to 10. 9.25	1
The Methodology/MDTCAS support for refined Artefacts	Transformable-Possible-Complex	From 1 to 10. 8.00	2
The Artefacts based DEM's approach	Transformable-Possible-Complex	From 1 to 10. 8.20	3
The Polymathic RPOU Approach	Transformable-Possible-Mature	From 1 to 10. 9.60	4
The RPOU based Project	Heterogenous-VeryComplex	From 1 to 10. 7.40	5
Evaluate First Phase			

LRP4DEM's outcome proves the existence of a major knowledge gap and it's (or Phase 1's) outcome supports the RQ's credibility, by the use of the LRP4DEM and *TRADf*'s archive or knowledge-base, of an important set of references, previous author's works, documents, and links. After selecting DEM's
CSA/CSFs, they are linked to various HDT scenarios. The PoC is based on the CSFs' binding to specific RDP4DEM resources, where the DEM was prototyped using *TRADf*. The HDT represents the relationships between this RDP4DEM's RQ/requirements, *Artefacts*, and selected CSAs/CSFs. PoC's interfaces were achieved using Microsoft Visual Studio .NET environment and *TRADf*. The DEM uses calls to resulting *Artefacts, Models*, to execute HDT actions related to RP requests. CSFs were selected and evaluated (using WGTs, HDT, and DMS4DEM) and the results are illustrated in Table 6, which shows that the DEM is a central phase and not an independent one. In fact, it is essential for the *Project's* risk concept. HDT's main constraint is that CSAs having an average result below 7.5, will be ignored. This fact, leaves the DEM' CSAs (marked in green) effective for RDP4DEM's conclusion(s); and drops the CSAs marked in red. Phase 1, shows that the RP part of the *Project* will probably fail and is a very complex one because of the DEM' extraction operations. The PoC can proceed to Phase 2.

PoC's Phase 2

MDTCAS/TDM's Setup and CSFs' Selection

The Phase's 2 setup includes: 1) Sub-phase A or the Architecture Vision phase's goals, establishes a *RPOU* approach and goals; 2) Sub-phase B or the Business Architecture phase establishes DEM's target TDM/EA and related *RPOUs'* activities; 3) Sub-phase C shows and uses the Application Communication Diagram to describe *RPOUs* activities; 4) Sub-phase D or the Target Technology Architecture shows the needed DEM's optimal infrastructure landscape; and 5) Sub-phases E and F, or the Implementation and Migration Planning, presents the transition DAV based architecture, which proposes intermediate situation(s) and evaluates DEM's statuses. The HDT based DMS4DEM has mappings to *ENT's* resources and the DEM defines relationships between *Artefacts, Models*, MDTCAS' elements, and Requirements/PRBs.

PRBs Processing Control in a Concrete HDT Node

The DMS4DEM solves DEM' PRBs, where CSFs link to specific RP PRB type and has a set of actions that are processed in a concrete HDT node. For this goal, the action *CSF*_DEM_*Extraction_Procedure* was called and delivered SOL(s). Solving PRBs involves the selection of actions and possible SOLs for multiple *Project* activities. The HDT is on mixed quantitative/qualitative and has a dual-objective that uses the following steps:

- In Phase 1, *TRADf's* interface implements HDT scripts to process the selected CSAs. And then relates PoC's resources to *CSF*_DEM_*Extraction_Procedure*.
- The DMS4DEM is configured to weight and tuned to support the HDT.
- Link the selected node to HDT to deliver the root node.
- The HDT starts with the *CSF*_DEM_*Extraction_Procedure* and proposes SOL(s) in the form of RP actions/improvements.

SOL Nodes

HDT scripts support AHMM4DEM's instance that are processed in the background to deliver DEM risk value(s). The hAHMM4DEM based DMS4DEM uses BBs to deliver *recommendations*; which are a set of RPs actions.

8. Solutions and Recommendations

The set of DEM's architecture, refinement, technical and managerial recommendations:

- This article presents the possibility to implement an IHI DEM which avoids the financial-only locked-in strategies and ensures success.
- RPOU like the ARP/UP, is another *Project's* very critical phase.
- A *Project* must build a holistic TDM and MDTCAS to support the *RPOU's* activities.
- The *RPOU* unbundles the legacy-OPMS into *Models* to support OU's OUPs and the *ENT*. This process can face problems in the alignment of various refined *Models* and SDCs.
- Each *ENT* constructs its own IHI DEMs.
- DEMs replace legacy-OPMS using conversion concepts in order to ensure *Project's* success.
- DEM interface *ENT's* TDM and delivers the pool of *Artefacts* based *Models* and DIAs.
- The ADM based TDM, manages design, *RPOU*, DevSecOps, and governance activities.
- TDM's and DevSecOps' integration with the DEM, enables the automation of all *Project's RPOU* activities.
- *ENT's Artefacts* stability and coherence are crucial for its evolution.
- *Artefacts* can be (re)used in an IHI *Models*; where a OU is a set of *Models* and different OUs can share *Artefacts*, and hence *Models*.

- OU's transformation needs an IHI Methodology, Domain, and MDTCAS that manages BBs, *Artefacts* and *Models*.
- Avoid consulting firms and to build internal *RPOU* mechanisms.
- DEM is very complex and will very probably face failure.
- Each *ENT(M)* constructs its own IHI DEM and EPSC.
- The *RPOU* unbundles legacy-OPMS to support OU's/OUPs and *ENT(S)*.
- Viewpoints "M", "O", and "S" present a structured evolution's roadmap, as shown in Figure 27.

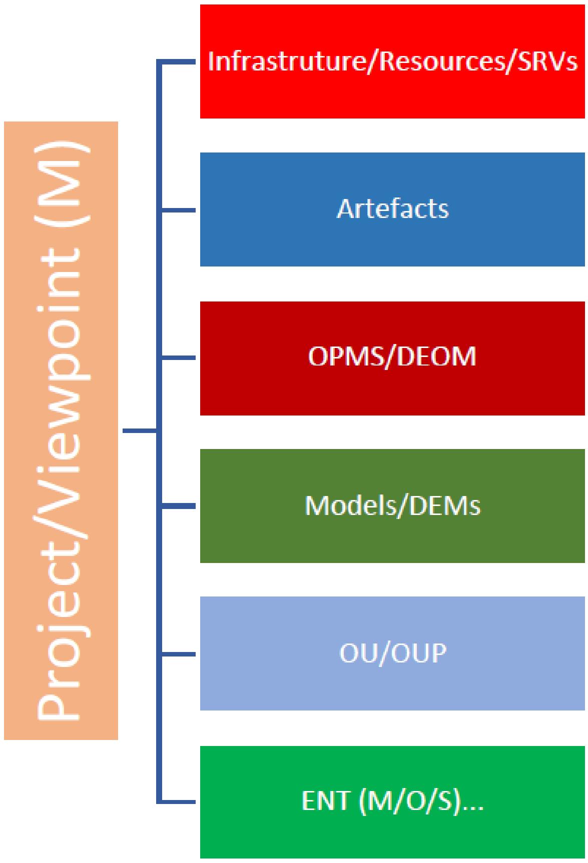


Figure 27: Viewpoints "M", "O", and "S" evolutions roadmap.

9. Conclusion

Monolithic systems' unbundling is the major cause of *Projects'* failures and success rates can be improved by using *Artefacts based Models* and DAVs based strategies (IBM, 2014). DAVs uses a just-enough approach and the PoC proved its application's complexities (Greefhorst, 2009). The DEM support OUs based *ENT*s concept. The proposed PBA is an optimal approach for the DEM which supports *Project's* unbundling activities; and the LRP4DEM presented a knowledge gap, that is mainly due to the fact that are no similar research approaches and that there is a lack of a holistic approach. There are limited-manual refinement technics for legacy-OPMS, but the DEM presents the possibility to implement an IHI concept (Koenig, Rustan, & Leino, 2016). The RDP4DEM is a part of a series of publications on *Projects*, RP, TDM/EA, Polymathic models… The DEM uses the HDT and CSFs/CSAs to support *RPOU* activities. PoC's Table 6 result of (rounded) 8.50 that used CSFs' binding to a RDP4DEM resources, the ENI, RQ, and *based Models*, shows that the DEM is very complex due to the risky ARP/UP and *RPOU* operations. The DEM should be an IHI process, methodology and framework. In this article, the author proposes the following set of managerial recommendations:

- The *RPOU* supports the *based Models* to ensure the unbundling of legacy-OPMS.
- The MDTCAS based DEMs fits in the *ENT's* TDM/EA framework.
- TDM's integration in the DEM enables the automation of all its *RPOU* activities.
- *RPOU* constraints are controlled and monitored by the OUP and ICS.
- *ENTs'* sustainability is orthogonal to its *RPOU* capacities.
- To avoid any form of locked-in scenario the *ENT* must build its own DEMs.
- The DEM can face OUR or R4C, which should be predicted by using R2C.
- APDs high demand for *Projects'* and the hyper evolution of technologies, create fatal problems because of the differences in their evolution's rate.
- All author's works are based on *TRADf*, AHMM, TDM, and RDP; which are today mature and can be applied in various APDs.
- The *RPOU* unbundles legacy-components to generate *based Models*/DEMs to reorganize an *ENT*.

Based on the conclusions *TRADf's* future research will focus on the *ENT's* collaborative decision-making processes.

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