Advancing Research in Enterprise Architecture
An Information Systems Paradigms Approach

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Abstract: Enterprise Architecture (EA) is an Information Systems (IS)-related domain aspiring to become a mature discipline underpinned by its own schools of thought. As with other emerging research areas, currently there is no widespread consensus on EA formal theoretical foundations and associated paradigms; thus, the EA researcher needs to find and tailor paradigms and research methods from related disciplines. As a possible solution contributing towards the maturing of the EA field, this paper advocates the application of social science-inspired qualitative research methods and paradigms typically engaged in the IS area to EA research. The paper starts by performing a critical review of the mainstream IS research assumptions, methods and paradigms in view of their suitability and expressiveness for the EA research endeavour according to ontological and epistemological assumptions specific to EA. Subsequently, the paper demonstrates the application of the reviewed IS research artefacts through a sample EA research strategy framework based on an IS-inspired reflective and iterative action research paradigm.

1 INTRODUCTION

Enterprise Architecture (EA) is a domain related to Information Systems (IS) that attempts to bridge the management, IS, Information Technology (IT) and engineering in order to guide organisations through the change processes involved in fulfilling their strategies. In effect, EA translates business vision and strategy into change by creating, communicating and improving the key principles and models that describe the enterprise's future state and enable its evolution (Gartner Group, 2008). Several EA research directions currently exist; however, the ontology of EA is not yet widely agreed upon. As the EA schools of thought (Lapalme, 2012) are presently not mature enough to agree on formal theoretical foundations and associated paradigms, the EA researcher needs to find 'best matches' in paradigms and research methods from related disciplines, notably IS. Finding and customising relevant research artefacts is in fact beneficial towards promoting creativity in the discovery of innovative approaches to answer research problems in the EA domain.

This paper aims to support the search for suitable artefacts by initially performing a critical review of the mainstream IS research assumptions, methods and paradigms in view of their suitability and expressiveness for the EA research endeavour. This is followed by an attempt to demonstrate the use of the IS research artefacts reviewed to EA, in the form of an example EA research strategy framework featuring a reflective and iterative action research paradigm background.

2 RESEARCH ASSUMPTIONS

The research work described in this paper has examined the paradigms used in classifying the IS schools of thought described by Iivari (1991) in order to select appropriate EA research assumptions and methodologies. From the start, it must be noted that there is a partially acknowledged connection between research methods and epistemological assumptions (Burrell and Morgan, 1979; Iivari, 1991); that is, adopting a particular epistemological stance may bias the researcher towards particular research methods. The view taken in this study is that such dependence and biases are acceptable, provided they are acknowledged by the researcher and taken into account when evaluating the research results.

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2.1 Ontological Assumptions

2.1.1 The EA View of IS: Technical System and Social System

The EA view of IS is important in order to underpin the stance towards using research artefacts originating in the IS body of knowledge. Thus, EA typically considers IS to be a subsystem of an enterprise used to collect, process, store, retrieve and distribute information within the enterprise and between the enterprise and its environment (Bernus and Schmidt, 1998), comprising "not only technologies but people, processes and organisational mechanisms" (Stohr and Konsynsky, 1992) "aimed at maintaining an integrated information flow throughout the enterprise" (Bernus and Schmidt, 1998) and providing the quality and quantity of information "whenever and wherever needed" (ibid.).

For EA, the business change processes are the main driver of IS development and the object of IT requirements (Earl, 1990). The above-mentioned IS definition implies a dualistic EA view of IS, where mechanistic (technical), but also utilitarian (users) and reflective (designers) aspects (Swanson, 1988) must be considered. Thus, in an EA perspective the IS as a fundamental component of the enterprise exists within a complex organisational, political and behavioural context (view shared by the Decision Support System IS school of thought (Keen and Scott Morton, 1978)). EA acknowledges that the IS plays an essential role in the design and operation of the organisation/s, both as a technical system and as an organisational and social one (Pava, 1983), depending on the view taken: 'tool' or 'institutional' (Iacono and Kling, 1988).

Vice versa, from an IS viewpoint, EA is a *holistic change management paradigm* that bridges management and engineering best-practice, providing the "[…] key requirements, principles and models that describe the enterprise's future state. […]. Thus, EA comprises people, processes, information and technology of the enterprise, and their relationships to one another and to the external environment" (Gartner Research, 2012). This EA definition reinforces the view of enterprises as collaborative social systems composed of commitments (Neumann et al., 2011) and socio-technical systems (Pava, 1983) with voluntaristic people (McGregor, 1960) in a complex organisational, political and behavioural context (Iivari, 1991; Markus, 1983).

2.1.2 EA View of Data: Constitutive Meanings, Partially Descriptive Facts

Similar to the Software Engineering school approach (Fairley, 1985; Sommerville, 1989), the modelling involved in EA sees information as an interpretation of reality, a way to communicate and to achieve a common understanding. However, as Lehtinen and Lyytinen (1986) assert, a *performative* function of data also exists, enabling users to *do* things; in EA, this function translates into simulations, forecasts and operation (e.g. using executable enterprise models). Adopting a dual view of the data allows creating models that promote common understanding (descriptive facts) while at the same time allowing for subjective meanings that construct possible realities (e.g. forecasts and designs). In addition, the interpretive view of data allows constructing customised models targeted to audiences having various competencies; notably however, these models must be views of a unique agreed-upon perception of 'reality', typically enabled by a consistent set of underlying meta-models and ontologies.

2.1.3 EA View of Human Beings: Voluntaristic with Deterministic Elements

A deterministic view of humans as adopted by the SE and Implementation schools of thought appears to be generally inappropriate to the EA research stream. In contrast, the voluntaristic position advocates user participation (Lundeberg et al., 1981) since end-user rejection of a technically successful project will ultimately render it useless (Swanson, 1988); motivational (encouraging / inhibiting) factors inherently present in organisations also promote a voluntaristic view of human beings. Therefore, a human view relevant to EA has to reflect aspects of Theory Y (McGregor, 1960) where people are voluntaristic in nature but display deterministic elements. This is because stakeholders are typically influenced by personal context, previous experiences (e.g. unpopular systems forced on the organisation) and organisational culture (e.g. clan, adhocracy, hierarchy, market (Cameron and Quinn, 2006)).

2.1.4 EA View of Technology: Human Choice with Deterministic Elements

EA studies typically produce a variety of technically acceptable solutions. Therefore, *human choice* is essential in the adoption of a particular (type of) solution to a given EA problem. The adoption of a specific solution by a group of people is a result of the

complex interaction of several factors such as technical needs and individual and group ambitions, agendas and beliefs. Thus, the acceptance and adoption of a proposed 'umbrella' solution by (potentially competing) human groups is very much a *political* process that involves taking ownership by identifying and confirming contributions to a common overarching framework. By taking into account the non-deterministic nature of humans it is possible to achieve a synergy towards an *inherently common, although differently perceived* final purpose. In EA, achieving unanimously agreed-upon meaningful enterprise models and modelling methodologies for the present (AS-IS) and chosen future (TO-BE) states is a core enabler of any successful change effort.

The *deterministic* elements of technology must also be considered, e.g. in order to model the effects of externally managed or imposed technological infrastructure (typically caused by outsourcing or by misalignment of IS vs. enterprise goals). Therefore, a deterministic view may suitable to some extent to model an existing AS-IS situation, while a human choice view is perhaps best adopted in designing possible desired TO-BE states.

2.1.5 EA View of Organisations: Interactionism, Structuralism to Some Extent

A static, structuralist view of the organisation allows constructing models that are relatively stable. However, the interactionist view of an organisation has a logical connection to the voluntaristic view of people and the human choice view of technology previously reviewed. Thus, the existence of organisational culture, power, politics and 'discretionary coalitions' (Pava, 1983) is undeniable; any undertaking towards integration and reconciliation of the existing and emergent EA framework and methodologies of the various schools of thought must take this fact into consideration.

In the global market conditions, successful organisations are typically *agile* - continuously evolving in response to, or even to pre-empt changes in the environment. As a result, enterprise models must be either *promptly* constructed as a 'snapshot' of the current state and regularly updated, or constructed in a way that reflects the modelled target over its *entire* life cycle. In the current research, the 'structuralism to some extent' approach adopted allows modelling the inherent degree of inertia present in organisations and the user resistance to change; these issues need to be properly addressed so as to obtain user satisfaction and cooperation and thus make organisational changes 'stick'.

2.2 Epistemological Assumptions

Enterprise models as a core component of the EA effort are being constructed for various reasons - such as enhancing the understanding of the enterprise structure, operation and lifecycle, enabling enterprise operation via executable models, or allowing to test various future state scenarios. Invariably though, the declared, tacit or emerging ultimate purpose of enterprise modelling within EA is *change*.

Consistent with the ontological assumptions previously adopted (e.g. voluntaristic human beings and technology as a human choice), perception, interpretation and understanding are crucial to the development of consistent enterprise models and agreed-upon EA methodologies. For example, technical-wise 'perfect' methods to construct specific models are pointless if the intended audience does not possess the required competencies to understand them and therefore will seldom or never put them to use. Thus, in the author's opinion, EA research must adopt an *anti-positivistic* epistemological stance focused on the *interpretations* of the stakeholders. This will allow to decide the required formalisation extent of the enterprise architecture framework (EAF) *artefacts* (e.g. modelling frameworks, methodologies, etc.) in order to match the intended audience competencies; this will promote shared user understanding leading to commitment to (and thus actual use of) the resulting EA endeavour deliverables.

Although implicit associations of the epistemology with the research methods exist (see Burrell and Morgan (1979), the author supports the view of relative independence of the two as advocated by Iivari (1991). This stance allows some flexibility in choosing the research methods that best suit the research, while keeping within the chosen epistemological stance.

2.3 Ethics of Research

The majority of IS schools of thought adhere to Iivari's (ibid.) view that practical relevance unavoidably implies a *means-end* approach. This is reflected in the EA perspective: research has to serve the interests of the host organisation (ibid.), while considering stakeholders' satisfaction; practical research outcomes would be useless if not fully understood and accepted by the intended users and decision makers. Thus, according to Lucas (1981) the

users must firstly be satisfied with and have favourable attitudes towards the EA artefacts produced; as a result, they will actually *use* them and by doing so, achieve payoffs for the organisation. Hence, an *interpretivist* approach appears to be appropriate in EA research so as to investigate the motivation, purpose and effects of the EA efforts, culminating in the previously stated view that the fundamental aims of the EA endeavour are *understanding* and *change*.

2.4 Other Research Assumptions

2.4.1 Research Paradigm

In view of the previous assumptions, an 'umbrella' research paradigm for this study is close to the *social-relativist* area according to Hirschheim and Klein (1989), or the *interpretivist* domain as defined by Burrell and Morgan (1979) (see Figure 1). Functionalist tendencies may be present, without necessarily denying the existence of conflict, or adopting a positivist approach (as argued by this framework's critics, e.g. Chua (1986) and Nurminen (1997)).

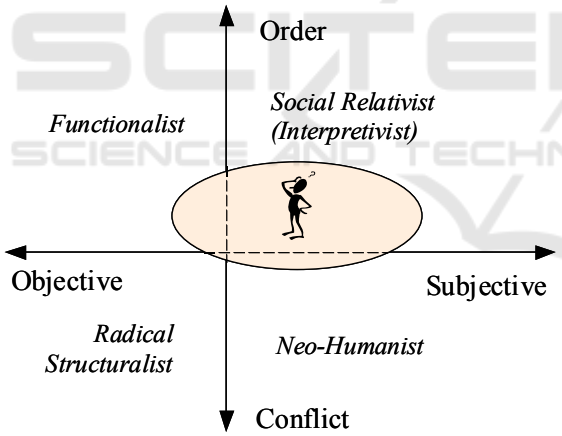

Figure 1: Proposed EA position within mainstream IS research paradigms.

2.4.2 Role of the EA Researcher

Within the framework defined by Hirschheim and Klein (1989), the EA researcher appears to be a *facilitator* in an anti-positivistic stance, believing that data can be interpreted in different ways by various stakeholders and taking a social-relativist approach when tackling the acceptance and effects of the EA artefacts on the organisation. However, due to the intrinsic mission of EA (change), the researcher must reconcile the facilitating role with that of a *systems expert*, acknowledging that *data* describes a unique reality (vs. *information* which is the interpretation of data by the stakeholders) and that research must have practical outcomes. Thus, the EA researcher acts to facilitate the audience's understanding of the present and possible future states of their organisations, but at the same time plays an expert role in producing a commonly agreed-upon EA methodology model and associated deliverables. These artefacts are essential in guiding the selection of suitable steps in the EA process and enable additional modelling aspects and formalisms as necessary for the target audiences.

3 RESEARCH METHODS

This study has used the IS research taxonomy presented by Galliers (1992) as the main repository of potential research methods suitable for EA. Generally, humanities-inspired idiographic research methods which consider each subject as an 'agent' with a unique life history appear to better satisfy the particular needs of EA research: each enterprise presents unique features which are best investigated by getting close to it and exploring its background and life history. Therefore, anti-positivist-specific methods such as action research (AR) and case study feature prominently among the chosen methods. The researcher has adopted Jick 's (1979) view in respect to the importance of triangulation and of the 'triangulating investigator' (establishing convergence of results) in research.

3.1 Action Research (AR)

AR is suitable for EA because often the researcher directly participates in the Universe of Discourse being researched and because typically, the problems in this area contain both theoretical (research) and practical (real-world) aspects that need to be addressed; this method is also be consistent with the interpretivist (Burrell and Morgan, 1979) and social relativist (Hirschheim and Klein, 1989) stances (Jönsson, 1991). In addition, Davison (2001) argues that problems for which previous research has yielded a validated theory are well suited for AR: the action researcher intervenes in the problem situation, applying the theory provided, evaluating its usefulness and potentially enriching it as a result of the evaluation. This matches the EA situation where often usable and proven, albeit not always complete or fully established theoretical artefacts (e.g. EAF elements) are provided. Notably, AR is perceived by

some IS schools of thought as an iterative process in which reflection is the crucial phase (Davison, 2001).

There is an on-going debate about rigor vs. relevance in the IS field. These two apparently opposing aspects can be reconciled in the author's opinion: AR can produce results usable in practice (relevance) (Benbasat and Zmud, 1999), while a cyclic type of AR may be used to build the necessary scientific rigor (Davidson et al., 2004; Davison, 2001). This resolution is also applicable to EA: AR can produce an applicable repository of EA artefacts (relevant to practice) and at the same time build the necessary theoretical rigor and refine these deliverables with each research iteration. Thus, the author considers reflection and iteration applied to AR as essential and equally important aspects when applied to the EA domain.

3.1.1 EA-specific AR Features and Issues

AR as a qualitative method usable in IS (Baskerville and Wood-Harper, 1996) displays a great diversity of methods (Chandler and Tvorbert, 2003; Lau, 1997); thus, it needs to be further scoped for the EA domain, using frameworks such as described by Chiasson and Dexter (2001). This framework contains four AR characteristics that may be used to distinguish between various AR approaches: the AR process model (iterative, reflective, or linear), the structure of each AR step (rigorous or fluid), the researcher involvement (collaborative, facilitative, or expert) and the AR primary goals (organisational development, system design, scientific knowledge or training). In terms of the viewpoints of this framework, the most beneficial AR process model for EA would include the repetitive use of a sequence of activities (*iterative* AR) and reflection upon the results obtained (*reflective* AR), leading to uncovering and resolving potential differences between the theory in use and the espoused theory (Avison et al., 2001). Furthermore, as the typical turn-around period for an EA field test / case study is often measured in years, it can be argued that the AR steps should be *rigorous*, since appropriate succession and timing of the AR phases are essential to a meaningful research outcome. In regards to involvement, the EA researcher is typically both a facilitator and an expert. As for the last framework viewpoint, the primary goals of AR in EA are typically system design (since EA perceives enterprises as *systems of systems* (Carlock and Fenton, 2001)), scientific knowledge (advancement of EA as a discipline) and organisational development (as organisational change processes are typically a major aspect in EA).

Avison et al. (2001) state several essential issues that need to be addressed for a successful AR approach - namely initiation, determination of authority and degree of formalism. In respect to EA, initiation appears to be typically both research and practice-driven. For example, in the process of the development of the sample research strategy framework presented in Section 5, a brief analysis of the current EA environment has revealed research fragmentation and incompatibility of the enterprise modelling methods available, leading to the practical problem of *what and how to use, for which problem* (problem-driven). Authority determination in EA-specific AR for the enterprise architect and EA team is typically decided according to the policies of the hosting organisation and the standing of the project champion (e.g. CEO vs. office manager). Finally, the degree of AR formalism in EA will have to be high, so as to enforce rigorousness and ensure the stakeholders' trust and support of the architecting effort.

From the above it can be concluded that EA research should consider an *iterative* and *reflective* AR type, with iterations occurring in a dual cycle representing the theoretical and practical significance of the research undertaken (Checkland, 1991; McKay and Marshall, 2001). This is represented in Figure 2, where the meaning of the symbols can be interpreted from an EA viewpoint as follows:

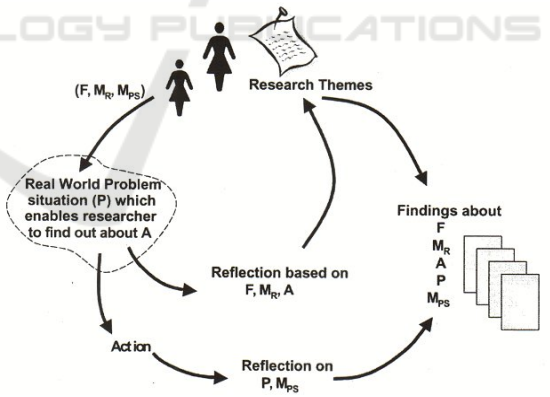

Figure 2: The dual cycle of Action Research (Checkland, 1991; McKay and Marshall, 2001).

- **F**: the theoretical EA framework adopted (e.g. an EAF or combination thereof)**;**
- $\mathbf{M_R}$: the EA research method (or a combination thereof);
- $\mathbf{M_{PS}}$: the EA problem solving methodology (or *meta*-methodology (Noran, 2008));
- **A:** the theoretical EA problem to be solved;

- **P**: the real world EA problem; e.g. how to combine and apply existing EAF elements and domain knowledge for a given EA task.

3.2 Conceptual Development

This constructive type of research method (Iivari et al., 1998) allows for the necessary creation of EA artefacts. Therefore, in an iterative AR approach each research cycle should include a conceptual development phase to build or refine the EA research deliverables.

3.3 Descriptive / Interpretive Research

This method can be involved for example in a *critical* literature review phase. It allows the researcher to develop a cumulative knowledge of the EA domain issues and thus ensure that the current research is relevant and builds on previous achievements (Galliers, 1992). For example, in the research approach framework proposed further on in Section 5, the critical review prepares the researcher for the entry in the iterative AR cycles by contributing to the creation of a structured repository of EAF elements.

3.4 Simulation

Galliers (1992) and Eden and Chisholm (1993) argue that simulation is well-suited to methodology and theory development, testing and extension. The large turn-around time involved in EA field tests makes simulation an effective choice for artefact development and testing, bearing in mind that the results obtained can only be checked for internal validity (Trochim, 2000). In the proposed research approach framework, simulation is used for prototype testing and development in the early stages of the research so as to achieve the quality and detail necessary for the typically time-consuming EA field testing.

3.5 Field Experiment and Case Study

This method can be used in EA to externally validate (i.e. in a real-world situation) the artefact under development. Thus, in an iterative AR approach, field experiments would represent the 'action' part of AR (see e.g. Figure 3) employed in each cycle.

Describing the present states and relevant past events of the organisations involved in the simulation and field experiments is essential to the development, refinement and validation of the artefacts being developed in an EA research endeavour. In addition, the potential effects of the research product(s) on the target organisations should also be investigated. For these reasons, case study (in conjunction with field experimentation) also constitutes a useful method for EA research.

An interesting proposition is the dual use of case studies (see (Lin, 1998)) in EA: in an *interpretive* fashion so as to explore / generate theory and to ask questions, but also in a *positivistic* way, to find predictable aspects (infer EA theory) and test the effects of proposed artefacts (e.g. EAF elements, associated methodologies and so on).

3.6 Ethnography

This anthropology-based interpretive research method aims to explore 'contextual webs of meaning' (Myers, 1997), i.e. examine human actions in a socially constructed context. In particular, post-modernist (Harvey, 1997) and critical (Myers, 1997) ethnographies appear to be well-suited for the exploration of the complex and changing social context of EA. Ethnography is recommended as a suitable method for EA research since it may be effectively used to study the organisational effects of implementing the change processes driven by enterprise models created during EA projects.

3.7 Survey

Surveys are a possible alternative to the critical EA literature review. However, employing surveys of the major EA schools of thought may prove less useful due to typical problems such as sensitivity to data gathering methods (typically questionnaire and structured interviews), self-selection and interviewee observation and counteraction of the interviewer strategy, which are likely to be magnified in the context of the currently pronounced fragmentation of current EA research and polarisation of the EA schools of thought.

3.8 Longitudinal Research

This approach typically allows for the measurement of behaviour (involving several other research methods) at a number of points in time during a finite time span (Galliers, 1992). Longitudinal research applied in EA could be useful in the same manner as ethnography; however, due to the extensive period of time involved (compounded by the typically long turn-around of EA field tests), it may involve high cost, obsolesce, bias and could require significant resources.

4 DATA GATHERING METHODS

The use of primary data in EA is subject to typical collection method pitfalls. For example, questionnaires are subject to bias and self-selection on the respondents' part (Galliers, 1992), delays and low rate of response, while interviews can be affected by hidden agendas and by the interviewee lack of self-disclosure. A better alternative is participant observation, which can be employed in the field testing phase to gather primary data, subject to the research team being representative of the project environment viewpoints (Trauth, 1997). For example, participant observation and semi-structured interviews have been used in the field experiments employed to test and validate the proposed research approach framework in Section 5, with the researcher participating in working groups in charge of EA artefacts' life cycle management. The collected data has been used in the reflection and triangulation phases of the research framework testing and validation.

The use of secondary data for research purposes has critics (Bowering, 1984; Kiecolt and Nathan, 1985) and defenders that argue for its value in complementing or even replacing primary data (Jarvenpaa, 1991). Similar to the case of IS, one may conclude that secondary data may be used in EA if the *purpose* and the *methods used* in the original data collection can be rigorously ascertained.

Note that in EA, data reflecting business processes, strategies, networks etc. may provide a decisive edge to a business in a competitive situation. Hence, in the EA domain most such data is confidential thus requiring *trust building* between the researcher and the practitioners within the organisation; this can be achieved e.g. by the adoption of an ethnographical approach, whereby the researcher is immersed in the participant organisation(s) for a significant period of time.

5 CASE STUDY: AN AR-BASED EA RESEARCH STRATEGY FRAMEWORK

5.1 Overview

This section presents a sample application of some of the research methods previously reviewed within a proposed *EA research strategy framework*. Note that in this context, AR is perceived as an overarching research *approach* (Galliers, 1992) providing a context for other research methods – here, conceptual development, simulation, field testing and case study. Figure 3 shows the customised dual cycle of the research strategy employed, based on the work of McKay and Marshall (2001) and Checkland (1991) previously explained in Section 3.1.1 and illustrated in Figure 2.

The inner cycle comprises conceptual development and simulation followed by reflection. Besides checking internal validity, this cycle aims to promptly refine and bring the research deliverables to a level suitable for field testing (which in EA may span over significant periods of time, thus requiring a mature prototype for a meaningful result). The outer cycle performs a field experiment combined with case study; the results are reflected upon and then triangulated with the simulation result.

Several iterations may occur within the inner and outer cycles; the exit from these cycles is triggered by mitigation between the required level of artefact maturity and quality and available research resources. The results are then refined one last time and critically assessed in regards to their contribution towards theory (EA body of knowledge) and practice (e.g. EA design and operation artefacts).

5.2 Brief Explanation of the Most Relevant Framework Components

5.2.1 Critical Literature Review

Typically, EA problems require the use of components belonging to *more* than one EAF. The effective application of such EA components requires their review and categorisation in respect to their life cycle and universe of discourse coverage, using a common reference that has to be expressive and generic enough to accommodate the scope of all assessed frameworks. Typically this requirement is fulfilled by a suitable theoretical model; in several of the case studies used to develop, test and validate the sample research strategy framework presented here (e.g. (Noran, 2009, 2012, 2014; Noran and Panetto, 2013)) this generic, albeit expressive reference has been provided by ISO15704 Annex A (ISO/IEC, 2005), a document outlining *requirements* for EAFs. From the aforementioned case studies it has also emerged that a mixed descriptive / interpretive research approach (Galliers, 1992) would be beneficial for the EA literature review - i.e., rather than merely appraising the state-of-the-art, also attempt to assess and *interpret* the reviewed knowledge using a consistent EA terminology (provided by the adopted theoretical model).

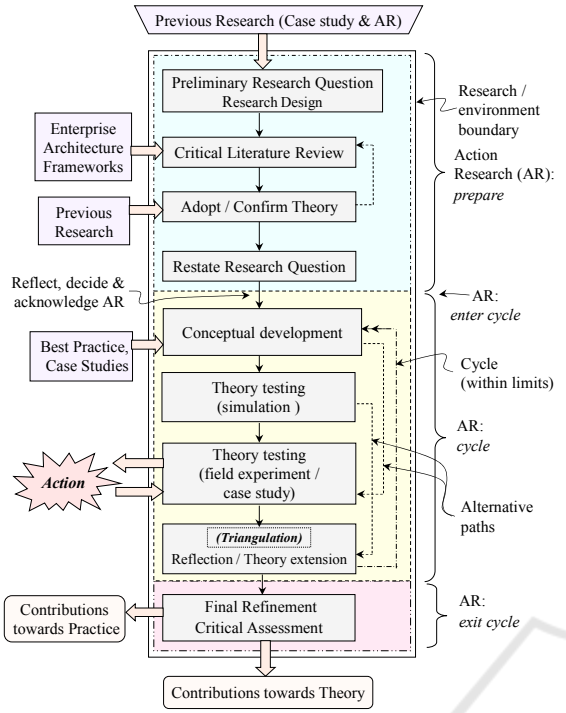

Figure 3: A sample IS AR-based EA research strategy framework using Galliers (1992) and Wood-Harper (1985).

5.2.2 Theory Testing (Field Experimentation/ Case Study)

The field experimentation method is associated here with case study in order to record the effects of EA artefacts' application on the target enterprise. As can be observed from Figure 3, field testing is a two-way process: external validation is achieved (input from the environment) while at the same time practical outcomes are created (output to the environment). Member checking (Trauth, 1997) should be regularly involved by validating the models produced with the stakeholders of the involved organisations. The feedback thus gathered can be used to reflect on the research and suitably adjust the artefacts in subsequent conceptual development phases within the AR research cycle iterations.

5.2.3 Reflection / Theory Extension

Reflection is necessary after each iteration in order to elaborate on the field experiment / case study conclusions and to assert possible causal relationships (Trochim, 2000). Reflection results in theory extension and refinement proposals, which are fed into the conceptual development phase of the next research iteration. In testing the framework, the AR iterations have deliberately involved largely diverse environments, so as to enable an effective triangulation (Jick, 1979) ascertaining the convergence of the results obtained in the simulation and field experiments.

5.2.4 Final Refinement / Critical Assessment

The final refinement phase aims to address concluding change requests from the reflection contained in the last AR iteration and to provide an overarching critical assessment in order to test the thoroughness of the research in adhering to the stated AR strategy and researcher's stance, biases and assumptions. The final results (theoretical and practical EA research deliverables) are then disseminated.

5.3 Testing and Application in Practice

The above-described research strategy framework has been tested during its development in several practical EA research projects spanning collaborative networks, disaster management, standards management, healthcare and environmental management domains. The lessons learned from each application (not described here due to space limitations, however published separately) have contributed to the development and progressive refinement of the framework.

6 CONCLUSIONS AND FURTHER WORK

EA as a maturing IS-related field of research is in need of suitable and proven research patterns. This paper has performed an EA-focused critical review of the main IS ontological and epistemological assumptions, research paradigms and methods in view of their suitability given the specific context and requirements presented by EA. As a general conclusion, IS provides a rich and useful repository of research artefacts which, suitably customised, can significantly assist the EA research endeavour.

The IS research artefacts appraisal was followed by putting together an illustrative research strategy framework for EA using a selection of research methods from the reviewed set, on the background of an iterative and reflective AR approach.

The sustained quest to find, combine and adapt suitable research paradigms to tackle various EA research questions and practical tasks is expected to continue to contribute towards the advancement of

EA research by making valuable contributions to the EA body of knowledge.

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