

Deconstructing abilities – in search for an ability viewpoint

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Abstract. (Cap-) ability based planning is an emerging discipline within the enterprise architecture domain. With strong influences from military frameworks and competence based management, a focus on abilities offers a complement to traditional enterprise modeling approaches and a possibility to represent organizational knowledge from a result based perspective. Unfortunately, contemporary frameworks and practices provide varying and overlapping definitions and applications of the concept of ability thus creating problems for practitioners with experiences from strategic planning, architecture and enterprise modeling disciplines.

This paper presents a research effort and research in progress aiming at designing and developing an artifact, that enables description of and reasoning about an organizations or systems abilities. The developed artifact, an ability framework, includes a conceptual model. In subsequent work we plan to add a viewpoint, and method components. The artifact is designed to complement and integrate with existing and established concepts and offers a unique analytical tool for theoretical (comparative) analysis of ability based approaches that span across multiple fields of application and knowledge.

Keywords: Ability, Capability, Competence, Capability Based Planning, Competence Based Management, Enterprise Architecture, Resource based theory, Services, Business-IT Alignment, Enterprise Systems and Architectures.

1 Introduction

Trying to make sense, understand the inner workings of an enterprise, agency and organization is part of most people's daily activities. Many kinds of techniques, principles are used, such as mapping out how work is performed (process modeling) and which ends to strive towards (ends, goal modeling). An (cap-)ability description represents a particular kind of organizational knowledge reflecting an organizations' power, skill, means, or opportunity to achieving a result.

Techniques and practices with an element of ability appears in multiple domains, such as: military capability based planning (UPDM [5]) and enterprise architecture frameworks (TOGAF [6]), competence based management [16], service oriented architecture frameworks (SOA [13]) and as part of natural language since 1400 [20].

The cross domain usage has lead to a great number of conceptions of ability - “The term ‘capabilities’ floats in the literature like an iceberg in a foggy Arctic sea, one iceberg among many, not easily recognized as different from several icebergs near by.” as formulated Dosi, Nelson, Winter in their book: “The Nature and Dynamics of Organizational Capabilities” [2]. These variations on a theme are supported by the authors experiences from participation in global, EU and national (standard setting) projects as expert and certified enterprise architect.

Within the military domain we find the following definition(s): “MODAF: A high level specification of the enterprise’s ability. DoDAF: The ability to achieve a desired effect under specified [performance] standards and conditions through combinations of ways and means [activities and resources] to perform a set of activities” - UPDM v2.0 [5].

An author, Ron Sanchez [16], researching Competence based management offers a Capability definition: “repeatable patterns of action that are created through a firms management processes for coordinating its resource in processes for value creation.”. Competence is another ability concept; “competence(s) – the ability to sustain coordinated deployments of resources and capabilities in ways that help a firm achieve its goals in its competitive context.”.

A detailed comparison of the definitions and the work by authors in the domains, reveal both similarities and differences. The differences become greater when including relevant adjacent concepts such as process and goal.

This paper introduces research in progress with an overall aim at designing and developing an artifact – ability based framework that can be used for ability based descriptions, enterprise modelling, analysis, and indirectly for planning and management practices. We present early findings from a literature study exploring the conceptual foundation of the phenomenon ability.

The main contributions of the research are identified desiderata and requirements needed to be satisfied by an ability framework that complements and integrates well with existing work perspectives, enterprise modeling approaches, practices, methods and frameworks. Secondly an ability framework including method elements and a conceptual model that offers an analytical tool for theoretical (comparative) analysis of ability based approaches that span across multiple fields of application and knowledge.

In section 2 we introduce the research area with key research problems, questions and research approach. In section 3 we present artifact considerations and requirements. Section 4 introduces the first hypothesis of an ability framework artifact and in section 5 we discuss usage aspects followed by a summary in section 6.

2 Research Problems, Questions and Design

The research process and problem identification started with the authors experiences from participation in large-scale international standardization projects as an international expert. For the purpose of this paper we present an outline of key identified problems.

- Approaches, frameworks, theories including ability, use definitions of central concepts that are similar but not equal. Different conceptions reduce common understanding across work perspectives with consequences that learning and comparisons between approaches becomes more difficult.
- The separation of concerns between ability and related concepts (e.g. process, goal, service) are not well defined and also used inconsistently.
- Ability based descriptions are used in different contexts, satisfying many, varying and sometimes conflicting contextual requirements.
- Military applications of and requirements on capability based planning differ from market driven enterprises operating on (selected) and dynamic markets, producing products based on supply and demand.
- Frameworks and theories that incorporate the concept of ability are constructed based on specific, sometimes implicit, target audiences. This creates problems when using or merging together multiple approaches in an actual organization since approaches may not be complementary.
- Abilities can be located throughout an organization or system, which introduce tensions between the boundary of an ability and organizational design considerations (e.g. responsibilities, procurement, allocation of resources).

The research is scoped to focus on ability based views of organizations that, either incorporate or can be extended to support, organizational work perspectives that span across business and IT-departments and their concerns, i.e. a business and it-alignment (BITA) focus. Based on the identified problems (and opportunities) we have formulated the main research question as:

"How should a framework, that address a systems abilities, be constructed in order to, be used as an instrument (means to some ends), be applicable within different domains and (work-) perspectives and complement and enrich existing enterprise modeling approaches?"

Research design

The presented research aims at creating a small set of “things” or “sociomateria” that address research questions and provide new solutions that address identified problems. The research strategy follows design science traditions. The particular variant of design science research strategy was developed by Peffers et.al in 2007 [15] and was chosen based on the general direction of the research of using practical (man-made) frameworks as instruments for improving organizations or systems to be qualitatively better. Design science (DS) research in information systems (IS) is a paradigm with origins in engineering disciplines that focus on changing scientific and practical knowledge by designing artifacts (model, constructs, etc.) that are relevant to an environment, generalizable, satisfies business needs while preserving scientific rigor and validity. The research process is an adaption on Peffers general design science research methodology (DSRM) [15].

We apply DSRM in an iterative manner, where, in each iteration, focus shifts from problems, through designing artifacts, evaluation, to communicating of results. DSRM consists of the following 6 steps.

1. Define the specific business needs, research problem and motivate the value of a solution/artifact (section 2). This was the focus of initial studies.
2. Define contexts for, objectives and requirements on a better solution/artifact (section 3). This is the focus of the next planned second iteration, contextual literatures review.
3. Design and development a new or improved solution/artifact (section 4). In each iteration we develop or elaborate on an artifact hypothesis with respect to existing bodies of knowledge and practices.
4. Demonstrate the use of the artifact to solve one or more problems satisfying business needs. In section 5 we demonstrate the artifact by informed reasoning.
5. Evaluation, observe and measure the degree to which the artifact supports the solutions to the problem, including ethical factors. In the fourth iteration we plan to perform a major evaluation that involves experts from different fields of application. The fifth iteration focus on exploring methodological aspects of using the artifact. Here we also intend to perform at least one case study, observing and evaluating applications of the artifact. In the sixth iteration we address how the artifact relate to and integrate with existing bodies of knowledge and practices.
6. Communicate the problems and its importance, the artifact, its utility and novelty, the rigor of its design, and its qualities to researchers and other relevant audiences.

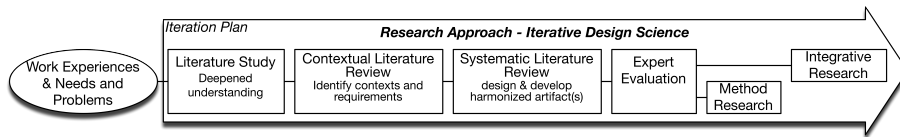


Fig. 1. Iteration plan for the research strategy

3 Artifact Objectives and Requirements

In this section we provide an outline of identified artifact and usage requirements. For the purpose of this paper and brevity we chose to describe selected sets of relevant requirements that has been extracted from studied literature and approaches [2], [4], [5], [6], [8], [9], [10], [11], [13], [14], [16], [18], [19], [20].

The conceptual model is subject to general design and quality criteria's as proposed by Gruber [7]: Clarity, Coherence, Extendibility, Minimal encoding and Minimal ontological commitment, and Moody and Shanks [12]: Completeness, Integrity, Flexibility, Understandability, Correctness, Simplicity, Integration, and Implementability.

The first set of requirements concerns the usage of an ability concept. These requirements provide usage contexts and has been identified and classified from references to or uses of ability in studied literature. For the purpose of informing the reader of the rather large and diverse set of forces on an ability framework, we provide a list of usage contexts.

Note: The abbreviation “uo” means that ability is unit-of or element in some context. Being a unit-of-planning (abbreviated as uo-planning) entails that ability is an entity/unit that is being planned, part of a plan, the subject of planning constraints.

Descriptive forces:

- Unit of Description, uo-Differentiae, uo-Position, uo-Communication, uo-Assessment, uo-Analysis, uo-Measurement, uo-Statement, uo-Attestation

Prescriptive forces:

- Unit of Planning, uo-Specification, uo-Realisation, uo-Work perspective, uo-Statement of Change, uo-Transformation, uo-Organisation, uo-Work product, uo-Command and Control, uo-Resource Allocation
- Unit of Lifecycle (conceptualization, design, manufacturing, deployment, execution, retirement, etc.).
- Subject of Instrumentation (information, guidance, recommendation, directive)

An initial ontological classification analysis, of reviewed articles and frameworks, revealed a number of important concepts and distinctions that serves are requirements on the conceptual model itself.

“having something (e.g. skills, knowledge, power) to do something or bring about something” is the key conception and relationships of being able.

"doing" – the concept of what enables being able, the mechanisms, processing, that may be formulated as abstract value creation, activities, routines, servicing, work process, use of effort, etc.

"result" – represents all phenomenon that can happen in a conjunction with a mechanism.

"result attributed to entity" - A result may benefit an organisational unit that performs a process or be (partially or fully) beneficial for another unit (system). The concept of service, servicing and co-creation of value are closely related to providing benefits to others.

"quality of ability" - An ability may exist to a greater or lesser degree, be better or worse, be abstract or concrete and exhibit qualities (e.g. capacity, sustainable)

"system/organizational alignment" – abilities, doing and result may be aligned with specific systems but may also transcend boundaries.

"indirect ability" – non-doing oriented entities such a piece of land constitute an indirect ability to produce oil since a production mechanism is not present.

"vantage point" - an ability may be viewed from within (internal), internal in relation to the environment (market,...) (inside-out), or from the environment looking in (outside in).

"relationship structures and mechanisms" – internal structures and mechanisms (within ability) have an impact on results (e.g. culture, learning, communication, coordination, integration of resources management and organization of work).

"2nd order ability" – abilities may operate on other abilities in order to acquire, build new or leverage existing. Staying competitive in changing markets condition may require such dynamic capabilities.

"specification – realisation"- an ability description may serve as specification to more concrete solutions. Strategic planning may strive towards establishing fit between an intended ability specifications and emerging realisations.

“characteristics of participating entities” – the relevance, nature and qualities of ability depends on the characteristics of involved entities. A sustainable ability in a stable market (environment) is different from ability in an uncontrollable market.

We plan to present the complete sets of identified requirements at the end of the current iteration.

4 Design and Development of an Ability Framework

In this section we outline the proposed Ability Framework artifact. This first design and development attempt represents a first initial hypothesis of content and structure. For the purpose of this article and brevity we focus on describing two key parts of the framework, conceptual model and ability viewpoint leaving other parts for continued research and papers. (e.g. method components, guidelines, principles, rules, recommendations, templates and theoretical alignment specifications (how the artifact relate to other concepts, theories and approaches)).

A conceptual model provides a body of formally represented knowledge, concepts, terms and a language that allows for discussions, reasoning, achieving common understandings relating to the central idea of the ability of systems or organizations.

We have chosen to investigate a conceptual deconstruction of ability phenomenon in order search for a minimal subset that captures the essence of ability and can be used to re-construct other ability concepts. The conceptual model is organized into smaller, internally consistent mini languages - Micro Ontologies and Theories (MOT) and bridged together with a Context Ontology and Theory (COT)[17].

The Ability Viewpoint, provides a knowledge organization structure that is commonly used in Enterprise Architecture (EA) frameworks, ISO 42010 [8]. The author was part of the Swedish ISO team developing this standard.

Systems thinking and theories approaches offers a set of central ideas and concepts, such as system, environment and mechanism, that can be used to represent markets, firms, strategic business units, departments and other parts organizations as system-of-system within environments. By adopting a systems thinking approach in the conceptual model we are able to reduce the number of additionally developed concepts, e.g. increase clarity quality.

The System MOT consists of concepts drawn from M. Bunges - CESM [1] (Composition, Environment, Structure and Mechanism) systems approach. The System MOT is defined as: System Model(s) = <Entites (s), Environment(s), Structures (s), Mechanism(s)>, Entities: the set of parts/entities of system, Environment: the collection of environmental items that act on system or are acted upon by system, Structure: the structure, or set of bonds or ties that hold the entities of system together, Mechanism: mechanisms, or characteristic processes of system. A mechanism may be abstract, concrete known or unknown, causal in nature, non-causal, intended, emerging, etc.

The Ability MOT forms the centerpiece of the conceptual model where we provide definitions of ability and related fundamental concepts.

- A system is *Able* when there exist, or can be added, at least one Mechanism that *can* bring about some Result.
- A system possesses *Ability* if it is in a state of being Able.
- A *Result* is a phenomenon that can happen as part of a happening of a Mechanism.
- A Mechanism is said to *Bring About* some Result during happening.
- A set of Result is organized in a set - *Results*.
- Ability and Result are bound by spatiotemporal regions

In the following diagram we illustrate the concept of Ability in relationship to a system and environment. In a) we illustrate ability using a specific symbol that express ability. In b) we present an alternative expression of ability where results are partially located outside the symbol. In c) we include system and result concepts.

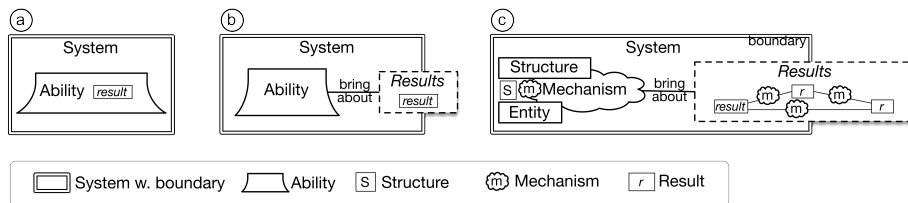


Fig. 2. Illustration of ability and related concepts

The Result MOT provides a language for representing *Result(s)* phenomenon. The result forms a key part of any ability and results are represented differently by authors, comes in many variations and with different qualities. Results can be partially ordered (e.g. qualitative comparable (better, worse, equal), low-order vs higher order, supported by vs supported). A particularly interesting result ordering scheme is a Ladder. A Ladder is a partially ordered set of result, ordering relations and mechanisms.

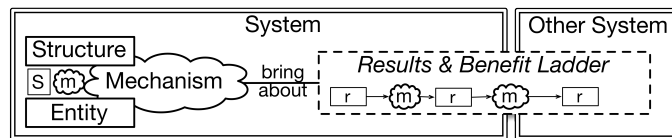


Fig. 3. Illustration of laddering of results

The Process MOT is an extension of the System MOT that introduces mechanism related concepts and provides an integration point to concrete enterprise terminologies and process modeling approaches. A *Process* is specific kind of mechanism where the inner workings of the mechanism are performed by *Performer's* (entities that can

bring about changes in state) (e.g. humans, IT-Systems, machines, organizations', energy). A performer is an *operant* that operates on *operand's* (entities).

The Resource MOT is an extension of the System MOT that introduces entity related concepts and provides an integration point to resource-based approaches.

The Perspective MOT provides concepts that link systems, entities, qualities to people, their work oriented perspectives, situations and viewpoints.

The Ability Viewpoint provides an overall frame for the conceptual model by bridging all MOT's together with a COT and enables specializations of existing concepts, additions from relevant bodies of knowledge. The ability viewpoint is designed to be tailored by a specific organization to fit their usage requirements.

In this section we have outlined the fundamental elements of the artifact under design. The focus is on the conceptual model.

5 Using the Ability Framework to Address Problems

In this section we outline how the artifact assists in addressing identified problems.

Ability modeling as an Enterprise discipline

The conceptual model and a focus on abilities offer an important complement to traditional enterprise modeling approaches. An ability is neither solely process (how) nor agent (who) or ends (why), but a combination. An ability viewpoint offers an abstraction away from the specifics of how and why, with focus on results and benefits (e.g. outcome based management and management by objectives by Drucker [3]). As such it offers tools to identify and discuss aspects that does not follow current value creating flows (e.g. asymmetries, [11]) and organizational boundaries (e.g. pricing process [4]), and can function as specification that can be realized by others.

Integration with existing bodies of knowledge and practices

The chosen design of the artifact allows for fairly straightforward integrations with existing bodies of knowledge and practices. Process modeling may be integrated by extending the Process MOT, Services modeling by adding a mechanism "Servicing" and goal modeling by adding a result type "Goal fulfillment" together with a "support" partial result ordering relationship. The separation of concerns promise to simplify practitioner's problems of not understanding the differences between ability and more familiar and mature bodies of knowledge.

Theoretical and comparative use

The conceptual model provides a small toolbox that can be used for theoretical and comparative analysis purposes. An example is comparisons between ability concepts; Capability may be defined by adding a capacity quality to ability and a core competence definition may be based on abilities defined in relation to the market (environment) and by adding a sustainable quality. An example of multiple ability concepts is found in Mansour Javidan's work where he has elaborated on

competences, capabilities and strategic hierarchies [9]. Another example is ability hierarchies that can be represented as system-in-system structures.

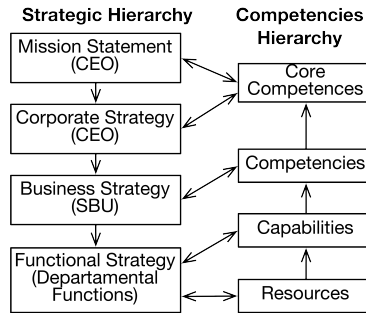


Fig. 4. Competences, capabilities and strategic hierarchies

A third example relates to the concept of dynamic abilities that are by many considered as a necessary addition to resource based theories of a firm. The conceptual model contains several entities and structures that enable dynamic analysis. 2nd order abilities/processes and may be viewed as operants operating on other abilities/processes, the operands. Such dynamic abilities/processes build, leverage, maintain other abilities/processes and are important to consider in environments that are characterized as volatile and uncertain. Secondly dynamic abilities may be further elaborated on and represented by sub-mechanisms and structures. Here Pavlou and Sawy [14] have identified sensing learning, integrating coordinating as important dynamic capabilities.

An important analytical tool is the laddering concept. Laddering or benefit ladders are commonly use in marketing and for value analysis [19] and relative orderings amongst result can be used for qualitative analysis and theory comparisons. The first three ladders illustrated in the following diagram are frequently used in the marketing domain. The fourth relates to software qualities. The fifth organize doing some work in relation to being efficient, effective and satisfy a stakeholder. The last provides an interpretation of a benefit perspective on Kaplan-Norton's Strategy map [10] .

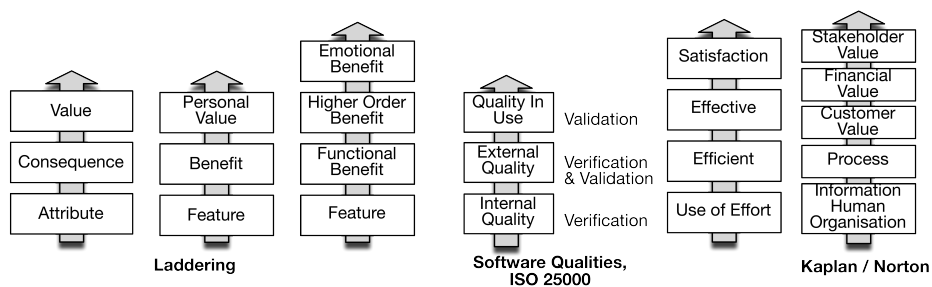


Fig. 5. Laddering examples

Deconstructing services into servicing

Service constitutes a longstanding phenomenon in many domains of application. The ability framework provides integration points with services approaches and theories, and may be used to analyze them. By using a minor reformulation the service definition used by Vargo, Lusch in their Service Dominant Logic theory and approach [18], together with laddering and a separating of the system that the servicing mechanism relates to from the system where the benefits/values occur we have functioning and service(s) analysis model. (adapted definition “servicing is the use of effort for the benefit of other or self”). What could be observed is that the separation of systems indicates that there is need for some transfer mechanism in order to relay benefits from servicing. This observation supports the existence of interface, interaction, integration and information oriented service framework (I-Services).

6 Summary

The purpose of this paper is to present an ongoing (design science) research effort aimed at investigating the nature of abilities of system and the role of ability based modeling within enterprise and modeling approaches and disciplines. The presented material represent early work and findings that provide a base for the next steps of the research strategy where this initial hypothesis is transformed into a formalized artifacts, demonstrated, evaluated and communicated. The results, findings and conclusions are furthermore planned to be supported by triangulation through use of multiple research techniques, such as investigation of cross-domain ability approaches, comparisons with adjacent, related theories and framework and finally comparison with adjacent methods.

We believe that the early results from the literature study, requirements analysis and design activities show great potential, where the conceptual model can be used for theoretical (comparative) analysis, and that ability based analysis complements traditional kinds of enterprise modeling. The viewpoint and system approach provide integration points with organizational work perspective concerns and promise to increase understanding and uptake of ability based points-of-view.

During the later stages of the conceptualization work an unexpected relationship was encountered between the concepts of mechanism, laddering and servicing. We intend to explore this interesting and promising link closer in upcoming research efforts and papers. Early findings indicate that by considering results relating to transactions and goods as lower order benefits and emotional values as higher order benefits we can use the ability framework to analyze differences and similarities between goods and service dominant logic approaches [18].

The next step is to conclude the literature study and to start the next iteration, a more extensive contextual literatures review.

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