

*e*³ *competences* : Understanding core competences of organizations

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Abstract. In this paper we present the *e*³ *competences* ontology, which enables us to conceptually model *core competences* of an organization such that we can (1) *identify* the core competences and (2) analyze whether value activities positively or negatively *contribute* to the core competences of the organization at hand. The *e*³ *competences* ontology, which has an internal view on organization and is partially based on the *e*³ *value* ontology, is positioned next to the *e*³ *forces* ontology, which has an external view on organizations.

1 Introduction

As early as the 1980's the importance of information technology (IT) on an organization's business strategy has been stressed (eg. [1]). Since then, IT has evolved from simple databases to worldwide service oriented architectures, making the impact of IT on an organization's business strategy in the present even more important [5].

In (traditional) business literature two distinctive, although complementary, views on business strategy can be distinguished. One view considers the *environment* of an organization to be the most important strategic motivator. This strategy school is grounded in the work of M. Porter [9]. Their understanding is that *forces* in the *environment* of an organization determine the strategy the organization should chose. An organization should position itself such that competitive advantage is achieved over the competition and threats from the environment are limited. In contradiction, the second school considers the *internal* competences as the prime motivator for an organizations business strategy. This school is rooted in the belief that an organization should focus on *unique resources* or *core competences* of an organization [2, 6]. Core competences are those activities with which an organization is capable of making solid profits [6]. For the continuity of the organization it is best to choose a strategy which focuses on the organization's core competences.

In previous work [7, 8] we focused on the "environmental" school of business strategy. In this paper however, we focus on the "competences" school of business strategy. The goal of this paper is to present an ontology, named *e*³ *competences*, which we will use to conceptually model and analyze the core competences of an organization. By looking at *internal* business strategy motivators *e*³ *competences* complements the *external* business strategy motivators

considered by *e³forces* [7, 8]. Together *e³competences* and *e³forces* draw up the conceptually modeling framework *e³strategy*, which is intended to understand and analyze strategic business motivations of actors in a networked value constellation. As with the *e³forces* ontology, we closely tie the *e³competences* ontology to the *e³value* ontology developed by Gordijn and Akkermans [3, 4], such that a well integrated set of business ontologies for networked value constellations emerges. Because the *e³value* ontology, like the *e³forces* ontology, focuses on the environment of organizations, it is necessary to complement the *e³value* ontology with additional *internal* constructs. These additional constructs will make the *e³competences* ontology suitable for analyzing the *core competences* of an organization. To present the *e³competences* ontology and demonstrate its practical use we utilize a small desk-based case study to analyze two different situations: (1) The organization does *not* have clear understanding of what its core competences are and we use *e³competences* to determine the core competences. (2) The organization has identified its core competences, but wants to determine to what extent the organization’s value activities/transfers contribute to these core competences.

This paper is constructed as follows: first we introduce a desk based case study. Subsequently we present the constructs used in the *e³competences* ontology. Next, we demonstrate how *e³competences* is used to reason about the core competences of an organization. Finally, we reflect on extending the *e³value* ontology for strategic analysis, present conclusions and make suggestions for further research.

2 Case Study

To present and demonstrate the *e³competences* ontology we consider a constellation consisting of three organizations: (1) *Airport Inc.*, hereafter referred to as “AP”, who owns and exploits a physical airport. (2) *Air Traffic Control*, hereafter referred to as “ATC”, responsible for the air traffic management (ATM) (eg. landing and take off) at the airport. (3) *Dispatcher*, hereafter referred to as “DP”, who is responsible for services such as loading and unloading of the planes. The constellation has two basic groups of customers: (1) *Airliners*, who acquire infrastructural services (eg. (un)loading) from “DP”, air traffic management from “ATC” and infrastructural services (eg. a runway) from “AP”. (2) *Passengers*, who acquire value objects from “AP” in the form of infrastructural services (eg. shops and other facilities).

Fig. 1 provides a basic *e³value* model for the constellation (for more information on *e³value*, see [3,4]). As can be seen, “AP”, “ATC” and “DP” exchange value objects to provide other value objects to “airliners” and “passengers”. What however cannot be seen is which value activities are, or contribute to, the core competences of the various organizations in the constellation. As motivated earlier, this is an important component for understanding the strategy of an enterprise.

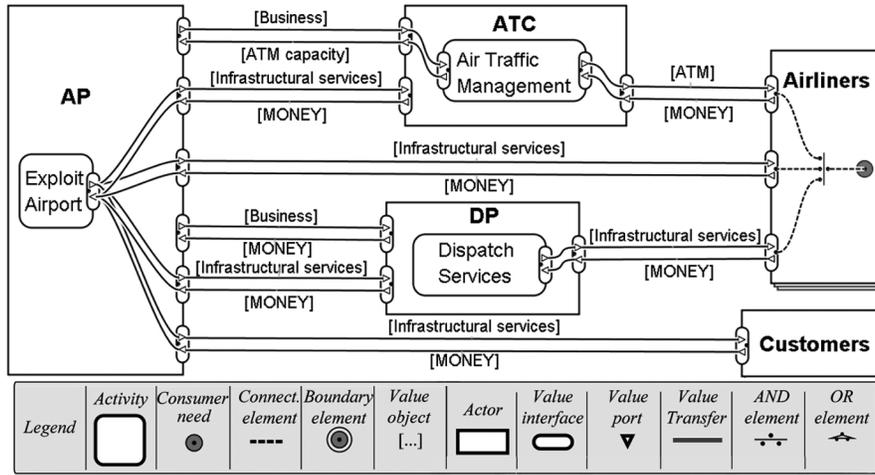


Fig. 1. Basic e^3 value model

3 The e^3 competences ontology

As with the e^3 forces ontology [7,8], we use the e^3 value ontology [3,4] as a base for the e^3 competences ontology. In the e^3 value ontology it is possible to model internal business activities of actors, but the e^3 value ontology mainly, and intentionally, focuses on value transfers *between* organizations. In the e^3 value ontology the construct “value activity” only intends to answer the modeling question “who does *what*, to create a profit” (as this is a design choice while developing constellations). Value activities are not used to understand internal working of actors. Furthermore, value activities can *only* be related through value objects they transfers, *decomposition* of value activities is for example not explicitly possible. Nor is it possible to distinguish between a “normal” value activity and a “core competence” value activity, making it impossible to identify which activities are key for the organization’s business strategy. For these reasons we introduce the following concepts in the e^3 competences ontology:

- *Core Competences*. The first additional construct is *core competence*. Core competences are: “activities that critically underpin an organization’s competitive advantage; they create and sustain the ability to meet customers need better than the competition “ [6]. Basically core competences are what makes an organization unique. Core competences will be modeled as rounded squares with an *extra bold line*.
- *Unique Resources*. Related to core competences are *unique resources*. To possess, or have access to, a unique resource is not sufficient to create competitive advantage [10]. Only if a unique resource is *adequately exploited* the activity of exploiting the unique resource will become a core competence. Unique resources can either stem from the organization itself or can be ac-

quired, via value transfers, from another organizations. We include “unique resource” into the model to be able to show that if an organization has unique resources, the organization does, or does not, adequately exploit these resources and therefore has, or has no, core competences. Unique resources will be modeled as rounded squares with a *dotted line*.

- *Sub-value activity*. We adopt the value activity construct from the e^3 value activity, but we want to be able to decompose this value activity into *sub-value activities*. We base our decomposition method on the decomposition of “tasks” into “sub-tasks” as done in i^* [11,12]. A higher level value activity can *only* be completed if *all* sub-value activities are completed. In addition, every sub-value activity belonging to one higher level value can be performed *independent* from the other sub-value activities. Sub-value activities will be modeled as rounded squares with *dashed lines* and are connected to value activities by a single value transfer.
- *Contributions*. Finally, we want to model *positive* or *negative contributions* of various value activities to core competences. It is our understanding that an organization can possess value activities which are not core competences, but who do, or do not, contribute to an organization’s core competences. For example, air traffic management is the core competence of “ATC”. Recruiting air traffic controller is not part of the core competence, but this value activity does positively contribute to the core competence. Would for instance “ATC” also have a web design value activity, then this value activity would not positively, thus negatively, contribute to “ATC” ’s core competence. We model this by including *contribution arrows*, who are labeled with either a “+” or “-”. Here we roughly follow i^* [12] and c3-value [10].

3.1 Case 1: Identifying core competences

The first use of e^3 *competences* is to identify the core competence(s) of an organization. We use a stepwise approach that will enable us to interrelate *unique resources* to *value activities*, which are connected to value transfers and thereby acquire or sell value objects. These relations enable us to identify the core competences of the organization. As a starting point we consider an actor, modeled in an e^3 value model, for which we want to understand its core competences. Because in an e^3 value model “value activities” are not intended for such analysis, we start with a clean sheet by removing all existing value activities and connection elements within the actor under investigation.

1. To enable us to consider the *complete* range of (sub-)value activities conducted to (1) acquire value objects (eg. resources) and (2) sell value objects, we connect *one* value activity to each of the *value transfers*.
2. We identify the (unique) *resources* an organization acquires from other organizations. If the organization has activities where a value object is *received*, other than money, we consider this to be a *resource* acquired by the organization and for now we replace the connected value activity with the (unique) resource acquired from the other organization.

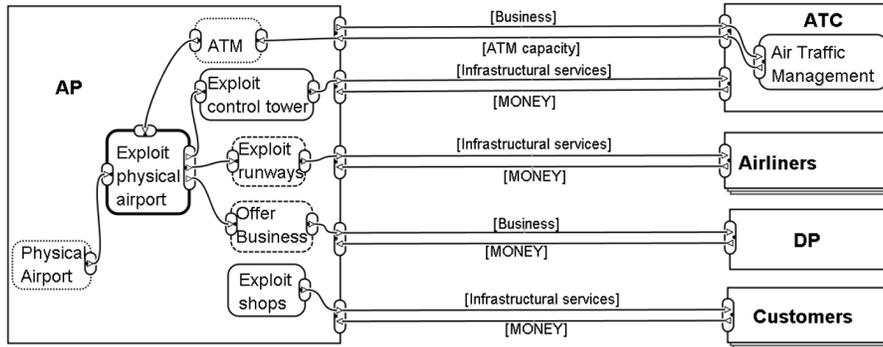


Fig. 2. e^3 competences : Identifying core competences

3. We determine if value activities, modeled in step 1, have a common denominator; are a number of these activities actually *sub-value activities* leading together to a “higher level” value activity? If so, then these sub-value activities are modeled as such and connected to the higher level value activity. If not, then the value activities are left alone.
4. We link the value activities (identified in the previous step) to resources (identified in step 2), but only if the resource is needed by the value activity for its execution.
5. We determine if the value activities require other resources than those acquired from other organizations. In this step we try to identify the (unique) resources an organization has within its organization. If there are unique resources within the organization, then they will be included and connected to the value activities.
6. Next, for each of the resources modeled in the organization, we determine to what extent the resource is an *unique resource*. If an organization acquires a resources from another actor we question if other organizations (eg. competitors) have *access* to the same or a similar resource. If the organization possesses the resource we question how likely it is that other organization possesses the same resource. If the resource is *not* an unique resource, the construct is removed from the model.
7. Value activities which are connected to *unique resources* and are connected (via sub-value activities) to value transfers are considered to be core competences. Value activities which are not connected to unique resources remain *value activities*.

Due to space considerations, we only consider “AP” in this case. Fig. 2 shows the e^3 competences model for the first situation. Following the steps above we were able to identify that “AP” acquires one unique resource, “ATM”, and possesses one, “Physical Airport”. Furthermore, the individual value activities, connected to the various value transfers, are, except one, sub-value activities that

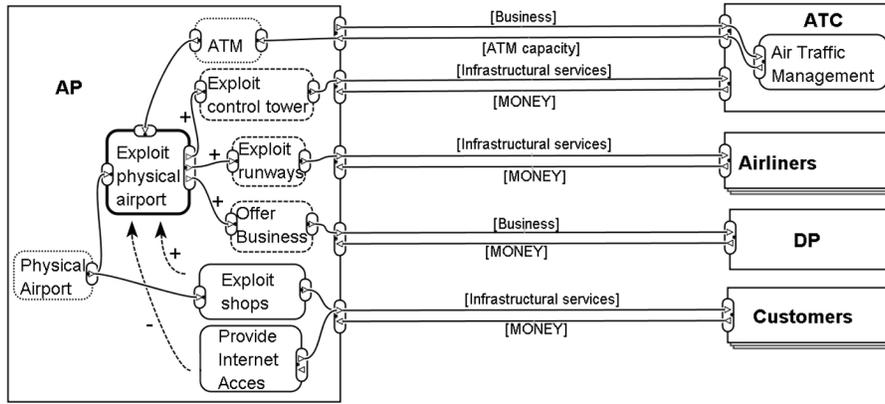


Fig. 3. e^3 competences : Contributions to core competences

lead to the value activity “Exploit Physical Airport”. Since this value activity is connected to both unique resources, it is a *core competence*.

3.2 Case 2: Value activity contribution to core competences

The second use of e^3 competences is to analyze if value activities positively or negatively contribute to the, earlier identified, core competence(s) of the organization. Again we use a stepwise approach. By analyzing the relationship between core competences/unique resources and value activities, we are able to determine positive or negative contributions of value activities. Again we start with a clean sheet by removing all existing value activities and connection elements within the actor under investigation.

1. Include the core competences (earlier identified) into the organization.
2. To enable us to consider the *complete* range of (sub-)value activities conducted to (1) acquire value objects (eg. resources) and (2) sell value objects, we connect *one* value activity to each of the *value transfers*. At this point we do *not* link the core competences to the individual value activities.
3. We identify the *resources* acquired from other organizations. If the organization *receives* a value object, other than money, we consider this to be a resource *acquired* by the organization and for now we replace the connected value activity with the (unique) resource acquired from the other organization.
4. We determine which of the value activities, remaining from step 2, are sub-value activities of the core competences. Those that are, are modeled as such. We assume that sub-value activities have a positive contribution to the core competence, since the core competence can only be executed if all sub-value activities are executed.
5. Next we identify the (unique) resources an organization possesses, which are needed to execute the core competence and connect them accordingly. Most

commonly the unique resources identified should not equal those acquired from other organizations via value transfers.

6. At this point we identify if the remaining value activities from step 3 contribute positively or negatively to the core competences. We use the following criteria: If the value activity *utilizes* one of the unique resources, then it positively contributes to the core competence. If the value activity does *not* utilize one of the unique resources, then it negatively contributes to the core competence. Which does not mean it is a “wrong” value activity, it just does not contribute to the core competence of the organization.

Fig. 3 provides the e^3 competences model for this case. Again we only focus on “AP”. The model shows that there are two value activities which are not sub-value activities: “Exploits Shops” and “Provide Internet Access”. “Exploit Shops” does however utilize the unique resource “Physical Airport”; the shops are part of the physical airport. The value activity “Provide Internet Access” utilizes resources such as IP access, routers, etc. It does however not utilize the physical airport and therefore does not contribute to the core competence. According to business literature [6], “AP” should focus on its core competence and seize or outsource its “Provide Internet Access” activity.

3.3 Relevance for IS development

At first business strategy concepts such as core competence might seem distant from IT/IS development. But the role of IT on developing and executing a business strategy is becoming more important [5]. Furthermore, understanding the *context* of IS is becoming increasingly important (eg. [11, 12]). Models such as e^3 competences and e^3 forces, but also i^* [12], aid (chief) information officers to *explore* how the organization’s IT/IS infrastructure (can) positively or negatively contribute to the organization’s core competences and *design* the organization’s IT/IS infrastructure accordingly. For instance, investing in IT for Internet access for customers might sound as a valid and profitable idea, it does however not contribute to the core competence of “AP”. Outsourcing such services might be more profitable. In addition, deploying IT to acquire “ATM” from “ATC” faster/better might be a better investment due to its unique nature and importance to the core competence of “AP”. Finally, deploying IT to “sell” the core competence to buyers (eg. airlines) using for instance an electronic marketplace could increase the potential range of buyers. Such understanding and exploration of the organization on a business strategy level should aid in developing a better IT strategy and better business-IT alignment.

4 Conclusion

In this paper we have presented the e^3 competences ontology, which has enabled us to (1) identify the core competences of an organization and (2) analyze if value activities positively or negatively contribute to the core competences of an

organization. The e^3 *competences* ontology is an first attempt in better understanding organizations from a business “competences” perspective, yet IS developers could use an e^3 *competences* model to *explore* how the organization’s IT/IS infrastructure can positively contribute to the organization’s core competences and *design* the organization’s IT/IS infrastructure accordingly. In addition, we position the e^3 *competences* ontology, which has an *internal* view on an organization’s business strategy, next to the e^3 *forces* ontology, which has an *external* view on an organization’s business strategy. The combination of both ontologies (e^3 *strategy*) enables us to fully analyze and understand the *strategic motivations* of an organization participating in a networked value constellation. Further research is however needed to examine and conceptualize the exact relationship between an e^3 *competences* model and an e^3 *forces* model, and even an e^3 *value* model.

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