Value-based IT Decision Support - Towards a formal business value model for steering IT-business alignment

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Value-based IT Decision Support

Towards a formal business value model for steering IT-business alignment

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1. INTRODUCTION

Consider a given company – "Firm A" – that provides Internet access as one of its communication services. The access can be contracted to both home and business customer categories, and with different Quality of Service parameters, such us bandwidth, security and availability. If the access is interrupted, the user must contact Firm A's technical support through toll free phone numbers to a centralized service desk. This operates in a three level configuration, where i) recurring problems are addressed by template solutions at the first level, ii) more complex issues are dealt with by experts in the second level and iii) critical cases are passed on to third level, where in-loco (at the customer's premises) support is provided.

Occasionally, during demand peak periods, the number of first level attendants is inferior to the volume of incoming calls, and called customers will have to wait on line to be assisted on a first-come-first-served basis (FCFS policy). With this policy, customers to whom Internet access interruption may cause a larger loss (be it in productivity or financial terms) can experience longer delays before being assisted than customers to whom service interruption will impact nothing beyond a few instant messages being lost, or social networking site visits being postponed. Within the home category, customers working from home offices may require more networking services than non-critical home Internet users. Therefore, displeasing home office customers will have greater impact on Firm A's image. A similar impact will also happen when a small business gets access to support before larger companies.

The shortcomings found in the first-come-first-served policy adopted by Firm A's Service Desk offers us the opportunity to bring some insights concerning value to the fore:

- Different customers present different expectations and demands to the same service;
- Value derived from the support service varies according to the customer profile;
- The more a customer depends on the Internet access the higher the value he or she derives from the support service;
- Firm A wants to maximize revenue from its customers;
- Other conditions being even, higher paying business customers have more value than home customers to the provider;
- Other conditions being even, customers requiring less frequent intervention have more value to the provider;
- Within the business category, some business customers - possibly paying the same price for the service - are more valuable than others to the provider (this may be the case for companies with well known brands, for instance);
- Within the home category, home office customers have more value than ordinary home customers to the provider, because their satisfaction impacts more on Firm A's image;
- Customers with reach into the blogosphere or social networks have more value than others because of the potential damage to the company image that they might cause when voicing their dissatisfaction.

A few other insights can be extracted from the three-level support setting. When no template solution fits, a second level support operator proceeds with a long set of tests and standard procedures trying to solve the problem. This may take up to one hour of continuous interaction between the service desk expert and the customer. If all the procedures fail, an on-site support visit is then scheduled. Again, customers with distinct profiles will have distinct reactions. Business customers do not tolerate a one-hour phone call, usually, and are likely to prefer to have the on-site support solution provided. Home customers, however, may prefer to have the solution over the phone, rather than having to arrange for a house call and pay some extra fee for that service.

Complementary insights include:

- Business customers may be willing to pay extra fees for on-site support because, according to their perceptions, one hour of their time may be valued more than the extra fees;
- The same service (on-site visit) can be valuable to one customer and annoying to another.

These simple insights are, indeed, precious knowledge because taking them into account will enable Firm A to accomplish its major goal: increase revenues by **delivering value to the customers.**

The value delivery issue becomes more critical as Firm A is not an exception. The same value delivery concern applies to any business, of any magnitude, operating in any market segment, because (despite delivering a product or a service) it is actually driven by the value that customers perceive while they make a decision to pay for goods, or contract a service [1]. IT service providers – be they internal or external - are not the exception either. Delivering value to the business must be their ultimate goal. The problem is that IT managers – and any managers in other segments - usually have to base their decisions on insights, a great amount of intuition, subjectivity and personal analysis, which can vary a lot according to the managers' background. Unfortunately, the literature on business value is also informal, abstract and commonly consists of a set of imprecise recommendations and guidelines.

This paper aims to contribute a more formal, albeit preliminary, approach to the value delivery issue, to reduce the subjectivity faced by decision makers when they have to decide on how to provide value to their customers. Special emphasis is devoted to business-IT alignment, although the initial results presented here may be applicable to other business contexts as well.

The remainder of the paper is organized as follows. In Sections 2 and 3 we address two canonic IT management references (ITIL [2] and CObIT [3]) pointing out some of their shortcomings on the value concept. Section 4 presents related work, where Michael Porter's value chain framework [4] limitations are highlighted. In section 5 we present the proposed formal value model. Section 6 describes an illustrative example that applies the model to evaluate the service desk situation described earlier, and a real decision-support case study applying the model to procedures of the Brazilian Automated Electoral Process. In section 7 we offer conclusions and suggestions for further work.

2. Analysis of Value in ITIL V3

ITIL is self defined as a non-prescriptive set of processes and best practices for IT management, presenting ***what*** IT service managers must be aware of, ***what*** service providers must guarantee to the customers, and general guidelines to important service management processes. Little or no knowledge is provided by ITIL on ***how*** to implement the set of recommended practices and guidelines. For that reason, there is a great amount of subjectivity involved when one tries to implement ITIL´s recommendations. Implementation will strongly depend on subjective assets, such as personal interpretations, consultants, and IT managers' backgrounds. Where the value concept is concerned, the abstraction in which knowledge and guidance are provided reaches a more critical stage, in conjunction with a great deal of informality and imprecision. To illustrate the vagueness that has just been mentioned, we now present a summary of ITIL´s key statements concerning value, extracted word-for-word from its Service Strategy publication. After each sentence, some comments are provided to shed some light on the imprecision involved in the sentences.

"*A service is a means of delivering value to customers by facilitating the outcomes customers want to obtain ...*".

- How to capture, precisely, the outcomes customers want?
- How to keep that information up-to-date?
- If the IT industry is still scrambling to capture requirements (they are often ill-defined), will providers be capable of understanding the customer's environment in terms of outcomes?
- How to be flexible enough to produce outcomes demanded by customers in different industries?
- Would it be possible to generalize in a single and short list the distinct nature of outcomes? How?

"*Value consists of two primary elements: utility, or fitness for purpose and warranty, or fitness for use*."

- Which is more important? Utility or warranty?
- Could one be strong enough to compensate the weakness of the other one?
- How could this correlation (warranty-utility) be numerically expressed?
- Is the list of warranty components (availability, continuity, capacity and security) exhaustive?

"*The value of a service takes on many forms, and customers have preferences influenced by their perceptions*."

- How many forms exist?
- Which are they?
- How to capture customers' preferences?
- How exactly do perceptions influence preference? To what proportion?

"*Definition and differentiation of value is in the customer's mind*."

- One single but challenging question: How to fulfill or shorten the gap between an IT service and the customer's mind?

In addition to the questions posed above, ITIL does not provide any guidance on how to measure the value provided by a service, with an acceptable precision. We could not find any ready-for-use method or approach capable of objectively quantifying or qualifying the value offered by a service.

In the next section, we apply similar analysis to value concerns in the CObIT governance framework. Some of the limitations found in ITIL are also present in CObIT; we will point out additional drawbacks.

3. Analysis of Value in CObIT

Compared to ITIL, CObIT truly provides a more systematic and explicit approach to the value that IT should deliver against the business strategy. One could summarize CObIT as a set of cause-effect relations designed with the primary intent of associating IT processes to business value delivery. However, the cause-effect relation that ties business to IT is still loose, abstract, and informally stated. These characteristics set the IT-business association to imprecise and subjective trends, which end up transferring to business and IT managers a great deal of the task of materializing the relation expressed by the outcome-goal-metric linkage. By being informal and stated in common language terms, CObIT's IT-Business associations lack precision and, therefore, depend on the interpretation or consulting support to be properly applied. Based on artifacts provided by the framework, for instance, managers will not find answers to some key management questions, such as:

- What is the exact sensitivity of a given business goal to, say, a 5% variation in a specific IT metric?
- How the business-IT cause-effect relation behaves as time goes by (short, medium and long-term)? How much value does an IT process deliver to the business? How to compare the efficiency of two processes in value delivery terms?

In order to answer these questions, managers will have to either develop complementary artifacts and tools, or depend on consultants' advice. The later may not be easily available to smaller companies.

In the next section we discuss major related work, with special attention to the value chain framework.

4. Related Work

Michael Porter contributed greatly to value theory when he presented the framework by which one can map and analyze the value creation in an organization [4]. Porter groups activities into two basic categories: Primary Activities, focused on transforming incoming raw material into products and post selling services; and Support activities, responsible for enabling and empowering the Primaries (figure 1). After framing the organization in Porter's structure, one can perform value analysis, identifying how activities impact each other in terms of value creation (*links*), which are the value creation streams, and which activities or group of them contribute most to value creation (*value activities*). This analysis will enhance the organization's competitiveness, providing support to decisions such as where the organization shall pursue excellence, which activities should be outsourced (non value activities) or which dependencies shall be more closely monitored.

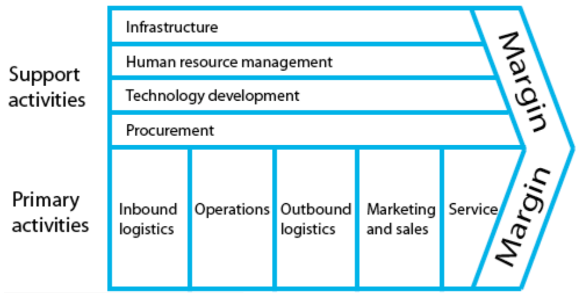

Figure 1. Porter's Value Chain

Porter's Value Chain (and its successive extensions, such as the Value Network), [4][5], enable important insights concerning value creation and how value flows in and out of an organization. Some limitations, however, are found in the Value Chain framework. We briefly address now those considered most expressive.

The first limitation concerns its heuristic nature. The framework is descriptive, capturing mainly where or when value creation occurs [6]. The Value Chain does not express for instance, how value is created, or why it is created in a particular set of activities and not in the other.

The second is the great amount of subjectivity and personal perceptions involved in the value analysis. Distinct managers will probably present distinct analyses on the same business scenario. Moreover, value analyses are presented in plain text documents, to be read and interpreted by managers and decision makers. Again, distinct readers will probably come up with distinct decisions from the same analysis.

Another limitation of Porter's chain is the absence of methods or techniques to quantify the value flow identified. The chain can express that an activity adds value to the product, but there is no direction on how one can compute numbers such as how much value was added in a phase of production, how much value the product had before the activity and how much does it have now. Value quantification is a determinant of turning a value analysis into a more precise and free of interpretation instrument.

Finally, how the value is created, how it flows and which are the dependencies among activities in the production process is not difficult to identify in industry/manufacturing businesses, which were predominant in the economy when Value Chain was proposed. But, two phenomena have dramatically changed production since then: i) services became the main focus, and there is little physical raw material transformation in the services production chain; ii) in many cases, knowledge and intellectual capital have became more valuable than tangible assets of the companies. In the present economic scenario, where intangible assets are combined and applied to produce intangible value (trust, image, sympathy and customer goodwill), value chains and value analyses based on Porter´s framework have became even harder to produce and fuzzy to interpret [7].

The theme business value is immensely popular in the business and economy literature. From the classical thinkers, such as Karl Marx and Adam Smith, to some more recent authors, like Michel Porter, discussed above, the value issue has attracted attention from practitioners and researchers from different segments. Some IT value models have also been published, [8, 9, 10, 11], and present some guidance on how IT delivers value to business. These however, depend on consulting advice in order to be implemented and lack formality, relying on the same imprecision trends as the frameworks discussed in Sections 2 and 3 rely on. In [12], an IT value model, with some level of formality, is presented. The model, however, considers only economic values exchanged between organizations that interact in an e-commerce setting. The model presented here will complement the work discussed in this section and in sections 2 and 3, in the sense that it will allow for the quantitative estimation of value in a formal way.

5. MODELING THE BUSINESS VALUE

In the work presented in this document, a set of requirements has been defined to be addressed by the business value model. The requirements correspond to a minimal set of characteristics that the model must exhibit in order to be trustworthy, useful, and be explored by decision supporting tools. With the aim of fulfilling the requirements, a simple methodology (figure 2) has been defined to direct the research efforts. An incremental cycle is performed, starting from a literature review combined with observations in organizations from the service, industry and commerce sectors. Based on the literature review, along with a set of processes catalogued in visits made to the organizations, some elements are defined to comprise the formal business value model.

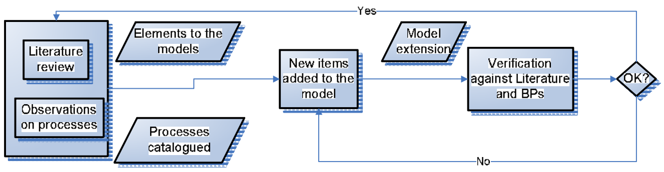

Figure 2. Modeling Approach.

Model Requirements

5.1. *The model should be formal*

The business value model (BVM) must be expressed through a non-ambiguous language. As a consequence, based on the BVM, different people of different backgrounds should reach equivalent conclusions if they carried out a value analysis on the same scenario. A value analysis entails identification and quantification of value creations, as well as modifications and deliveries occurring in the observed context. In order to accomplish this requirement, the language used by the model must guarantee unique association between form and meaning for each of its components.

5.1.1. *The model should provide an assessment method*

The model must provide a consistent method to calculate the total value transferred in a particular context. Based on this method, the BVM will permit one to quantitatively/qualitatively compare a set of analyzed contexts.

5.1.2. *The model should entail a partial order relationship over a set of scenarios*

The assessment method offered by the model must, at least, allow for a partial ordering of a set of analyzed contexts, based on value. In formal terms, [13], let S={A, B, C} be a set of scenarios under value analysis. Let $v(\partial)$ be the function that calculates the total business value transferred within scenario ∂. The function v (assessment method) defines a partial order on S if the following properties are present:

If $v(A) \leq v(B)$ and $v(B) \geq v(A)$, $v(A) = v(B)$ (antisymmetry)
If $v(A) \leq v(B)$ and $v(B) \leq v(C)$, $v(A) \leq v(C)$ (transitivity)

5.1.3. *The model should capture value in different grains*

Assume that an organization executes processes, which in turn are composed of activities. The model must have applicability at different level of detail. Some examples of value transfers at distinct levels are listed below:

- Value transfer from an activity to another, within the same process;
- Value transfer from an activity to another, across different processes;
- Value transfer from a process to another, within the same organization;
- Value transfer from a process to an activity, within the same organization (and vice-versa);
- Value transfer from an organization to a customer;

5.1.4. *The model should capture value transfers in several industries*

The model must be customizable in order to capture particularities from different organizations, operating in different market segments.

5.1.5. *The model should be simple*

The application of the Business Value Model must be straightforward to both customization and value assessment execution.

5.1.6. *The model should cover all types of value*

Anything considered valuable in a business context must be expressible by the Business Value Model.

5.2. *Model Items*

In order to address the requirements presented in section 5.1, some items have been conceived of to compose the proposed Business Value Model (BVM). This section presents, defines and provides some details of these BVM components.

5.2.1. *A definition for Business Value (BV)*

Definition 1: "Business value is <u>any</u> <u>benefit</u> <u>effectively</u> deliverable to an <u>addressee</u> and able to produce one of following outcomes:

- Satisfy a need (the addressee needs);
- Meet an expectation, desire or wish (that the addressee wants);
- Become an enhancement/advantage (the addressee will be thankful, for the benefit was neither needed nor expected).

The terms underlined in the definition have particular meanings, as follows:

- "any" - tangibles (goods, money, stocks, etc) and intangible (satisfaction, assurance, happiness, etc.);
- "benefit" - value is positive only;
- "effectively delivered" - received and recognized. There will be no value transfer, unless the addressee perceives it;
- "addressee" - can be a customer, an organization, a customer or a worker.

5.2.2. *Value entities*

Business literature sources [3,4, 5] have suggested – and a set of real processes which we have analyzed confirm - that the Business Value (BV) defined above covers a well defined life cycle, starting at its creation, passing through a set of transformations and transfers, until it finally disappears. A series of entities interact and contribute somehow to create the conditions and the events necessary for the life cycle to be fulfilled. Figure 3 captures the entities involved in the BV path from creation up to disappearance. Some of the entities and associations – most of them are named in the *v-entityname* form – are items of the value model presented in this work, and will, therefore, be defined subsequently. No definition is provided for the remaining entities (activity, process, actor, worker, etc.), since they are well known concepts, properly covered by the classical business literature [14].

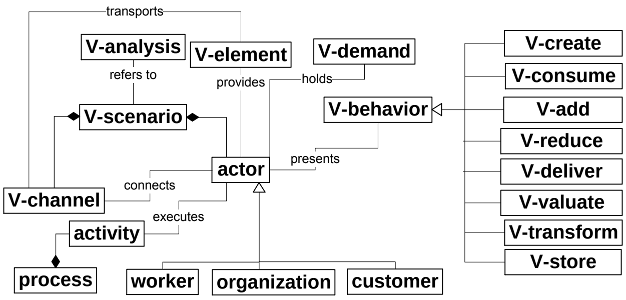

Figure 3. Value entities.

Value scenario (v-scenario) – is the scope within which a value analysis is performed, and is composed of a set of actors and the v-channels that connect them, through which actors exchange v-elements.

Value analysis (v-analysis) – is the identification and quantification of value transfers that take place within a v-scenario for a limited time interval.

Actor – is an entity capable of creating, transforming, storing, consuming (making disappear), and delivering business value. An actor may be a customer, a worker or an organization.

Value element (***v-element***) – a reification of the benefit received by an actor through a value delivery.

Value channel (v-channel) – a connectivity relationship between v-actors across which value is delivered;

Value demand (v-demand) – an expression of the needs of an actor towards meeting their goals in terms of value

Value behavior (***v–behavior***) **-** is the set of possible operations performed on a v-element by an actor:

- ***create***: creates a new v-element;
- ***consume***: destroys a v-element;
- ***add***: increase the value of a v-element;
- ***reduce*****:** reduces the value of a v-element
- ***deliver:*** delivers a v-element to another actor ;
- ***valuate***: quantifies a v-element;
- ***transform***: modifies a v-element;
- ***store***: adds a v-element to the bag of v-objects offered by an actor

Formalization

We formalize the value concept based on an actor's needs to accomplish his or her goals (actor's demand). We say that each actor has a set of goals G and a set of demands D. A demand is any element, tangible or intangible, able to contribute to G accomplishment. An actor also offers a set of elements **E**. An element will be considered valuable, *v-element* (representing the value concept), when there exists at least one other actor *demanding* this same element to accomplish one of its goals (figure 4). If this coincidence is present, we say that there is a value channel, *v-channel*, connecting the two actors, and value can be delivered from one to another, therefore.

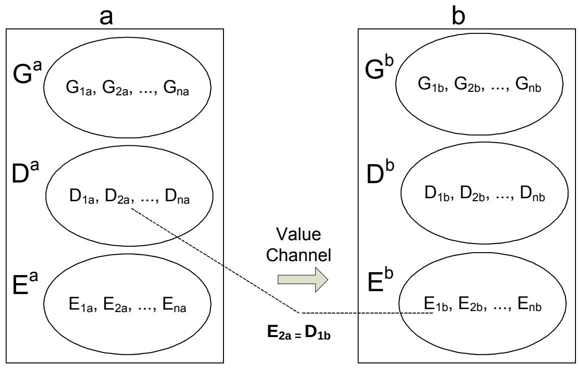

Figure 4. Value formalization.

Let:

a be an **actor**, which can be a **worker**, an **organization** or a **customer**.

S be a **v-scenario** hosting a set of actors and corresponding v-channels.

$\mathbf{E} = \{e_1, \ldots, e_i, \ldots, e_{|E|}\}$ be a set of existent elements (tangible or intangibles)

$\mathbf{E^a}$ be the set of elements offered by the actor **a**.

$\mathbf{G^a} = \{ g_1^a, \ldots, g_i^a, \ldots, g_{|Ga|}\}$ be the set of **a**'s goals.

$\mathbf{D_{gi}^a} = \{ e_k \mid e_k \in E\}$ be the set of elements demanded by **a** to accomplish the objective g.

$\mathbf{D^a} = \cup\, D_{gi}^{a}, \mid g_i^a \in \mathbf{G_a}$ be the set of all elements demanded by **a** to accomplish all of **a**'s objectives.

Definition 2 – (**v-element**): We say that an element $e \in \mathbf{E^a}$ is a v-element iff $\exists\, b \in S \mid \mathbf{e} \in D^{\mathbf{b}}$ and $a \neq b$

Definition 3 – (**v-channel**): Let **a** and **b** be two actors, where **a** and **b** Є S, and **a** ≠ **b**.

- We say that there is **v = (a,b)** –*v-channel v, connecting a to b* – iff $E^a \cap D^b \neq \emptyset$.

5.2.3. *Value behaviors*

Value behaviors comprise of a set of atomic and instantaneous operations performed by an actor on a v-element, or on a v-element's attributes (id, type, value). These operations define the behavior of an actor, and are expressed by the notation *a. operation ([list of parameters]).*

Let **a** and **b** be actors;
Let **e** be a v-element, where:

e.id stands for the unique identifier for the element e;
e.type stands for the type of the element e;
e.value stands for the e's value - e.value Є R*.

Primitive operations:

- a.create(**e**) – if **e** does not exist, creates the element e and inserts it into E^a .
- a.consume(**e**) - removes the element e from E^a.
  Precondition: e Є E^a.
- a.add(**e**) – increases the value of **e** (**e**.value'> **e**.value)
  Precondition: e Є E^a.
- a.reduce(**e**) – decreases the value of **e** (**e**'.value'< **e**.value)
  Precondition: o Є E^a.
- a.store(e) – adds o to E^a
- a.valuate(**e**) – assigns a numerical value to **e**.value. (**e**.value' ≠ **e**.value)
  Precondition: **e** ∉ E^a.
- a.transform(**e**) – modify **e**.type (**e**.type' ≠ **e**.type).
  Precondition: **e** Є E^a

Composed operation:

- Deliver
  a.deliver(**e**, **b**) – deliver the **a**'s element e to the actor **b**.
    1. **b**.valuate(**e**)
    2. **a**.consume(**e**);
    3. **b**.store(**e**);

  Preconditions: **e** Є E^a and **e** Є D^b**.**

5.2.4. *Valuating an element*

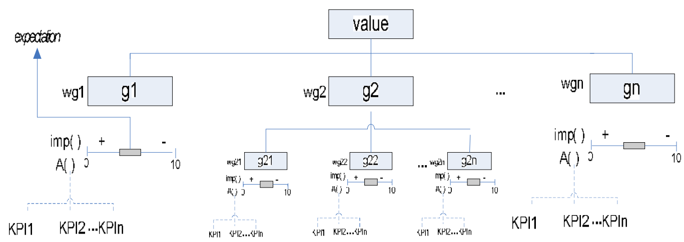

Figure 5. Valuation method

The process applied to valuate a v-element delivered by an actor **b** to an actor **a,** during a scenario analysis, quantifies the value of the v-element e as the sum of ***e***'s contribution to the accomplishment of every one of ***a***'s goals (figure 5). The contribution is calculated by means of the *accomplishment function **A( )***, which maps the set/sub-set of KPIs, applied to capture the goal´s achievement by a numeric value within the [0, 10] interval - 0 corresponding to total failure and 10 to total success. A goal ***g*** may be decomposed (or not) into lower level goals. If so, a goal tree structure is defined, having leaf goals also associated to one or more KPIs. In this case, the computation is performed recursively through the tree of sub-goals. Each goal ***g*** has a weight ***w***, representing the goal´s priority or importance to the total actor satisfaction (accomplishment of goals). The sum of all ***w*** must be 1 for any set of goals at the same level.

A range of expectation is associated to each goal ***g***, corresponding to the level of accomplishment expected by the actor for that goal (based on history or previous experiences, for instance). When the accomplishment for ***g*** is set within the expectation range, a collateral impact – ***imp( )*** – is caused on the goals at the same level. The impact will be positive if ***A( )*** goes beyond expectation, and negative if otherwise. Section 6 brings some numerical illustrations that will help clarify usage of the valuation process above.

Formalization

Let:

- S be a v-scenario analyzed during the time interval **t**;
- **a** and **b** be actors present in S;
- e be a v-element delivered by **b** to **a** during **t**;
- $\mathbf{G_a} = \{ g_1^a, \ldots, g_i^a, \ldots, g_{|Ga|} \}$ be the set of **a**'s goals;[1]
- $\mathbf{w_i^a}$ be the weight of **a**'s i[th] goal, where $\sum_{i=1}^{|Ga|} \mathbf{w_i} = 1$
- $\mathbf{g_i^a}$ be **a**'s i[th] goal;
- $\mathbf{K_i^a} = \{KPI_1^a, \ldots, KPI_i^a, \ldots, KPI_{|K^a|}\}$ be the set of KPIs used to measure $\mathbf{g_i^a}$ achievement;
- $\mathbf{Ao(K_i^a)}$ be the function that maps K_i^a or a sub-set of K_i^a into the range [0-10], according to the contribution of element e to $\mathbf{g_i^a}$ accomplishment. $\mathbf{Ao(K_i^a) = 0}$ **if e** ∉ $\mathbf{D^a}$
- $\mathbf{imp(A_i^a)}$ be the function that captures the collateral impact caused by $\mathbf{g_1^a}$'s accomplishment upon objectives at the same level.

Let also, $\mathbf{v_{ei}^a}$ be the value delivered by a v-element e to the actor **a** through the contribution of **a**'s i[th] goal accomplishment. We have:

$$\mathbf{v_{ei}^a} = \max [imp(A_i^a) * \mathbf{A} (\mathbf{K_i^a}), 10]$$

Let finally, $\mathbf{V_e^a}$ be the total value delivered by the v-element e to the actor **a.**

$$\mathbf{V_e^a} = \sum_{i=1}^{|Ga|} \mathbf{w_i} * \mathbf{v_{ei}^a}$$

5.2.5. *Value Notation*

In order to allow for easier composition and clearer comprehension of value scenarios, a visual notation of the

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[1] A multi index notation will be applied in the presence of decomposed goals. For instance:
g_{13}^a = 3 [th] sub-goal of **a**'s goal 1; g_{231}^a = 1[th] sub-goal of 3 [th] sub-goal of **a**'s goal 2;

value elements, defined in 5.2.2, will be presented next. The notation is supposed to be applied in the design of value delivery diagrams (VDD). These diagrams express the value deliveries occurring between the different types of actors present in a scenario. The symbol set applied (Table 1) has been adapted from the Business Process Management Notation (BPMN) [15], used to represent business-to-business and business-to-consumer processes. The original semantics of BPMN symbols has been preserved as much as possible. This is intended to provide easier understanding of value scenarios when interpreted by BPMN-skilled readers.

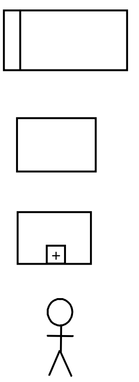
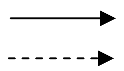
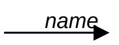
Symbol	Meaning
	Actor - Actors are represented by the BPMN pool symbol. Activity and process preserve the same BPMN notation and are restricted to business actors. Thereby, customer will always be represented by an empty pool, duly labeled. According to BPMN, the "+" symbol indicates that the process has collapsed and can thus be expanded to a finer grain view (activity). Since BPMN does not provide a symbol for worker actor, the UML actor symbol will be applied.
	V-Channel – a continuous line arrow denotes v-channels connecting Actors within the same organization, while v-channels, crossing an organization boundary, are represented by dashed line arrows.
	V-Element - Value elements correspond to the labels placed on the v-channels.
	Specific **V-Scenario** – the BPMN group symbol (a dashed rectangle) will be applied to define a particular scope of the v-scenario to be analyzed. This symbol should be used to put emphasis on value transfers that have occurred among a subset of actors, enabling a progressive comprehension of the scenario.

Table 1. Value notation symbols.

6. Applying the Model

An illustrative example – Internet Access Service Desk

Now we apply the value model in order to analyze the support service provided by Firm A, as discussed in Section 1, in terms of value creation and deliveries.

6.1.1. *Describing the scenario*

Actors:

- Home customer
- Business customer
- Firm A

Value elements considered in the analysis:

- *Voice technical support*
- *On site technical support*

Behavior of value elements:

- *Voice technical support*
  - In the first level support activity value is **delivered.** *Voice technical support* is the value element;
  - In the Second level support value is **added to** *Voice technical support* by the experts (workers);
- *On site technical support*
  - In the on site support activity *On site technical support is* **delivered to the customers***;*

6.1.2. *The Value Delivery Diagram (VDD)*

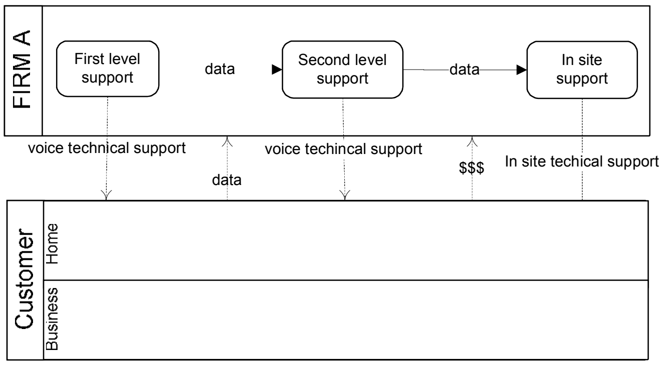


Figure 6. Value delivery diagram for Internet Access service Desk

6.1.3. *Quantifying the value*

KPI	Indicator used to measure the accomplishment of an actor´s goal
A_{iA}	The satisfaction of the ith goal of the actor A, according to KPI values – A(KPI)
Imp( )	The impact caused by the satisfaction of this goal to the other actor ´s goals (if any)
(shaded)	The number in the shadowed column express the actors expectation for that goal

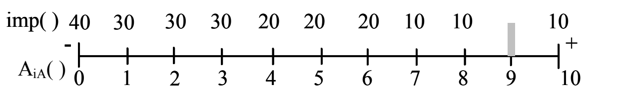
Table 2. Legend to valuation method.

Home customer (h)

G_{h1} Get the service restored soon (**w G_1: 7)**

- KPI_{1-1}: Time to restore the service

t(h)	10+	9	8	7	6	5	4	3	2	1	0,5-
A_{1h}	0	1	2	3	4	5	6	7	8	9	10
Imp( )	*100*	*90*	*80*	*70*	*60*	*50*	*40*	*30*	*20*	0	15



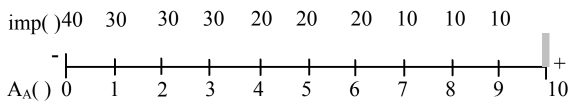
In order to guide the reader, we briefly interpret the first numbers concerning the Home customer actor, presented above. The same applies to the subsequent results.

The home customer actor (h) has "*Get service restored soon*" as one of its goals. This goal has weight 7 (*w G_1: 7*), meaning that if the goal is accomplished the actor h is 70% satisfied. "*Time to restore the service*" is the KPI used to estimate G_1 accomplishment. The calculus is made by function A( ), that maps KPI values to values within the 0-10 range. If this accomplishment is out of expectation (shadowed mark), actor h's global satisfaction is impacted according to function Imp(). For instance, if Imp( ) = +10 (right of the expected value), the actor's global satisfaction grows by 10%. If Imp( ) = - 10 (left of the expected value) the actor's global satisfaction falls by 10%.

G_{h2} Be free of extra payment for the service (**w G_1: 3**)

- KPI_{1-1}: extra fee charged for on site visit.

US$	0	10	15	20	>20
A_{2h}	10	9	6	3	0
Imp( )	0	*10*	*20*	*30*	*40*

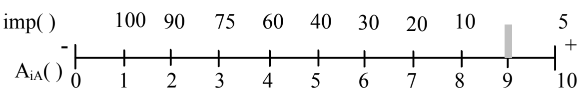


Business customer (b)

G_{b1} Get the service restored soon (**w G_1: 8**)

- KPI_{1-1} : Time to restore the service

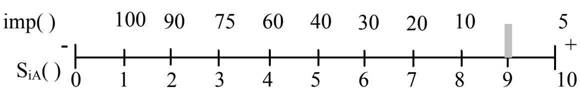
t(h)	0,5<	1	1,5	2	2,5	3	3,5	4	4,5	5	>5
A_{1b}	10	9	8	7	6	5	4	3	2	1	0
Imp( )	5	0	*10*	*20*	*30*	*40*	*50*	*60*	*75*	*90*	*100*



G_{b2} : Demand support through a brief phone call (**w G_1: 2**)

- KPI_{1-1}: Time on the phone.

t(min)	5<	5	10	15	20	25	30	35	40	45	>45
A_{2A}	10	9	8	7	6	5	4	3	2	1	0
Imp( )	5	0	*10*	*20*	*30*	*40*	*50*	*60*	*75*	*90*	*100*



6.1.4. *Simulation of support request calls*

We have simulated a flow of support request calls being answered by different support arrangements. For this simulation, numbers set to A_{iA} and Imp() have been arbitrarily defined. Then, the average value delivered by each configuration is calculated. Simulation details:

- Configuration A – Typical three-tier support. The problem is passed on to the next level when no solution is found in the current one;
- Configuration B - second level is by-passed. If level 1 fails, on site support is requested.
- A_{CN} – A, with home and business customers calling a common support number;
- A_{DN} - A, with home and business customers calling distinct support numbers;
- B_{CN} –B, with home and business customers calling a common support number;
- B_{DN} - B, with home and business customers calling distinct support numbers;

Customer/Support	**A_{CN}**	**A_{DN}**	**B_{CN}**	**B_{DN}**
Home	7,8	8,4	6,5	7,1
Business	5,9	6,8	7	8,2

Table 3: Average value delivered by the technical support

The results presented in Table 3 express in numbers some facts intuitively discussed in the Introduction. Manipulating variables from this simple simulation scenario, one can decide how to configure the support service (numbers of attendants in each level, for instance) according to the impact on the value delivered to the customers.

6.2. *A case study – Brazilian Automated Election Process*

Since 2000, both voting and result computation in Brazilian elections have been thoroughly supported by IT services. The main benefits provided by the Brazilian automated election process are i) a fraud-free process, which guarantees vote inviolability and accurate result computation, and ii) the prompt publication of results (in less than 3 hours for local elections; and in less than 6 hours for national elections).

In the case study presented below, IT managers had to choose between two options of IT services in order to fulfill the needs of the Electoral Judiciary authorities for computing and publishing election results:

- A centralized service, which works in the justice offices[2], and using appropriate communication infrastructure (and therefore presenting good performance);
- A distributed service, which can be operated locally in very small municipalities, away from the central office. In such cases, the limited communication capacity available has considerable impact on computation and publishing service performance.

The analysis compares the outcomes of these two options in terms of IT-based metrics and value delivery to the main stakeholders involved (candidates/party and judges).

6.2.1. *Describing the scenario*

The value delivery diagram is shown in figure 7.

Actors:

- Electoral justice;
- Workers who perform activities 1-3;
- Workers who execute the vote computing service;
- Judge – in charge of the whole process;
- Customers
    - o Candidate/Party.

Value elements considered in the analysis:

- Results;
- Local operation.

Behavior of the value elements:

- Results

[2] Each office is located in the main city of the legally defined Electoral Zone (a geographic area covering around 50.000 inhabitants).

- One site Result is **created** at the each Electronic Voting Machine (EVM) (activity 2), shortly after the ballot casting period ended;
  - The Results are **delivered** to activity 4;
  - In 5, the element is **transformed** into partial/final results, having its value **added**;
  - For a few minutes, the value is **stored** by Electoral Justice 5, until it is **delivered** to activity 6/7;
  - In 6 and 7 the element is delivered to the customer.
- Local operation
  - The value is **created** when a distributed computation site is defined in activity 1;
  - In activity 2 the value is **added** and the local operation is ready to be delivered;
  - In activity 4 the value is **delivered**to the customer.

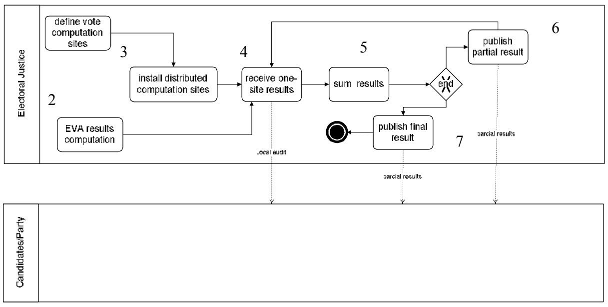
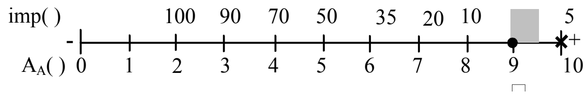


Figure 7. Value delivery diagram for the Brazilian automated elections

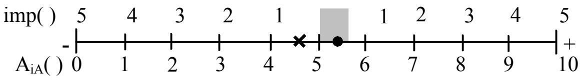
6.2.2. Actor: Judge

(Legend: centralized vote computation "• " distributed vote computation " x")

G_2 Publish the results quickly (**w G_1: 3)**



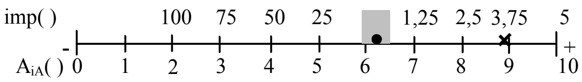
G_4 - Coordinate the staff (**w G_4: 1)**



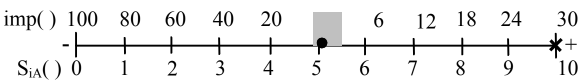
A( ) and Imp ( ) results for G_1 (assure process inviolability) and G_3 (assure order in voting sites) are not shown because they were not impacted by the vote computation service.

6.2.3. Actor: Candidates/Party

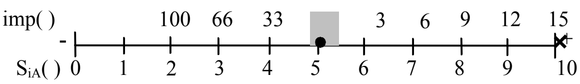
G_2 - Free access to audit the process (**w G_2: 3)**



G_3 - Fast and easy access to the results (**w G_3:2)**



G_4 - Fast and easy access to the justice officers/authorities (**w G_4: 1)**



A( ) and Imp ( ) results for G_1 (run under fair conditions) are not shown because they were not impacted by the vote computation service.

6.2.4. Value Results

For simplification, we have considered the value delivered by both local operation and results publication v-elements as a single v-element, named **local** results computation and publication (lcp). The traditional computation policy will be referred to as **centralized** results computation and publication (ccp).

Modality 1 – Results computed and published in the central office

Candidates/Parties

ccp.valuate = $(imp(G_1) + imp(G_2) + imp(G_3) + imp(G_4)) * (w_1A_{1CP}(\ ) + w_2A_{2CP}(\ ) + w_3A_{3CP}(\ ) + w_4A_{4CP}(\ ))$

ccp.valuate = (0,4*10 + 0,3 * 6,2 + 0,2*5,2+ 0,1*5,1)

ccp.valuate = **7,41**

Judge

ccp.valuate = $(imp(G_1) + imp(G_2) + imp(G_3) + imp(G_4)) * (w_1A_{1J}(\ ) + w_2A_{2J}(\ ) + w_3A_{3J}(\ ) + w_4A_{4J}(\ ))$

ccp.valuate = (0,4*10 + 0,3 * 9 + 0,2*5+ 0,1*5)

ccp.valuate = **8,2**

Modality 2 – Results computed and published locally in each small municipality

Candidates

lcp.valuate = $\max[(imp(G_1) + imp(G_2) + imp(G_3)) * (w_1S_{1A}(\ ) + w_2A_{2A}(\ ) + w_3A_{3A}(\ ) + w_4A_{4A}(\ )), 10]$

lcp.valuate = imp(0,0375 + 0,3 + 0,152) * (10*0,4 + 9*0,3 + 10*0,2 + 10*0,1)

lcp.valuate = 1,4875 * 9,7

lcp.valuate = max[14,43 , 10**]**

lcp.valuate = **10**

Judge

lcp.valuate = $(imp(G_1) + imp(G_2) + imp(G_3) + imp(G_4)) * (w_1A_{1J}(\ ) + w_2A_{2J}(\ ) + w_3A_{3J}(\ ) + w_4A_{4J}(\ ))$

lcp.valuate = (1,05 – 0,03) * (0,4*10 + 0,3 * 9 + 0,2*5+ 0,1*4,7)

lcp.valuate = **8,33**

Summary of results

The results of our case study on the Brazilian Automated Election Process are summarized in Table 4.

Results comp./pub.	mt1po-sr	mtnr	mtpnr	cand/ party	judge
Centralized	7 sec	23 sec	46 sec	7,41	8,2
Distributed	28sec	73sec	330 sec	10	8,33

Table 4: Results of Brazilian Automated Election Case Study

mt1po-sr: Mean time to transfer one package of one-site results.

mtnr: Mean time to compute new results.

mtpnr: Mean time to publish new results.

judges: Value delivered to Judges.
cand/party: Value delivered to candidates/party.

6.2.5. Discussion

The results extracted from the case study above allowed for important insights and decisions by the Electoral Justice IT managers. Well-established positions have been reviewed, and new options have been chosen due to the value delivery results presented. Major insights are listed below:

1. Candidates and Parties (customers) do not mind poor software performance, therefore it does not impact on their satisfaction;
2. Having access to results computation locally is paramount to candidates/parties;
3. Judges can exert a certain amount of control that is not impaired by the geographical distribution of remote operations;

These three first insights have made State Electoral Judiciaries fully reconsider the current logistics applied to municipal elections. Distributed results computation will be the default configuration in next elections (2012).

4. Lowering the time to publish the final result is not important to the customers, contrary to what IT managers had originally imagined.

A great amount of operational resources and intellectual efforts used to be spent by Electoral Justice IT teams in order to reduce the time to publish final results. Value analysis has shown that customers do not value a shorter time to get the results, since current wait times (2 to 3 hours, maximum) are already beyond their expectation. Resources and efforts applied to lower the waiting time for final results can be reallocated, to improve other KPIs of the democracy process, such as population involvement and political awareness.

7. Conclusion and Future Work

We have presented a formal and quantitative approach to model value creation and delivery. The model may support business/IT decision making, thus helping steer the alignment of IT and the business. We foresee the model, in a more mature stage, serving as base for Business-Driven IT Management (BDIM) business-IT linkage models that will use value delivery as the single metric, from the business point of view. The model is still under construction and some restrictions must be addressed to allow wider application of its numeric results. The quantification method needs improvement, such as assigning a monetary correspondence to the value quantified, and valuating a set of combined elements instead of a single one (*the value of a single shoe is not half that of a pair usually*). Moreover, we will need to address scenarios where the value delivered to the customer is subjected to some restrictions on the firm's side – profitability, ROI, cost. However, even in its preliminary state, the model was shown to be useful, when it expressed in numbers what had previously been subjective-only knowledge related to the automated voting process in Brazil.

As future work, we suggest improving the quantification method to address the above mentioned restrictions. In order to address the composability of v-elements to deliver value, we observe that we might associate bundles of v-elements with meeting goals, similarly to what is done in combinatorial auction theory [16]. We might be able to put to use some definitions and hopefully results from that domain. In addition, one should further explore the Value Chain framework, with the aim of combining the finer-grain, formal and quantitative value analysis proposed here with the structural view of an organization, expressed by Porter's model. Validation efforts are also in need, applying the model to new IT-Business scenarios.

Acknowledgement

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