COMPARING SERVICES USING DEMO

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Abstract: The services industry is currently the fastest growing part of economic activity in the world and some companies are changing their business models from product manufactures to service providers. These companies acknowledged the role of services as connection points between them and their customers. Still some service providers have a perception of what their customers want that differs from the real expected service. In this paper, we use Design & Engineering Methodology for Organizations to compare two lists of services provided by a Human Resources department: one based on a description given by the head of the department and another based on the customers that use the department services. The differences between the two lists identify the gap between the customers' expectations and the provider perceptions of those expectations.

1 INTRODUCTION

Over the past few years, organizations have faced the challenge of providing services efficiently to their clients, whether they are enterprises or other departments within the same organization. Besides this constant pressure, there has been another growing business unit demand for new services and higher service levels (O´Loughlin, 2009). Nowadays services mean jobs and growth, but the companies that have been leading the charge lack a strong conceptual foundation (Chesbrough and Spohrer, 2006). This lack contributes to the gaps (Parasuraman et al., 1985) that reduce the services quality for, without a solution to specify it, it is difficult for the service providers and their customers to align their expectations about the services quality.

We believe that Enterprise Ontology (EO) (Dietz, 2006) is a theory that can be the beginning of this needed theoretical background. Therefore, we are using it and the corresponding methodology, the Design & Engineering Methodology for Organizations (DEMO), as foundation for our most recent proposals.

In this paper, we show how to identify the possible mismatch between what a provider thinks it provides to its customers and what is actually supplied to customers, thus emphasizing the importance of a correct identification, definition and documentation of services, for instance, in a Service Catalog. The design and development of a Service Catalog involves multiple activities such as the correct identification of the services that will be defined in this document. However, nowadays, there are no formal methods that allow to correctly perform this step (Hubbers et al., 2007).

Our study was conducted using the Design Science Research Methodology (DSRM) that aims at creating and evaluating Information Technology (IT) artifacts intended to solve identified organizational problems, in which these artifacts may extend the knowledge base or apply existing knowledge in new innovative ways. In this paper, we present a research that is focused in the second option (i.e. apply existing knowledge in new innovative ways). This research method includes the following phases, described in detail in (Peffers et al., 2008): problem identification, objectives definition, design and development, demonstration, evaluation and communication.

This paper is structured as follows. We will start by describing the problem concerning the identification of services in Section 2. Next, we provide a brief overview of the literature on ITIL and CMMI-SVC service models, on current methodologies to identify services and on DEMO methodology (Section 3). Subsequently, we explain our DEMO-based proposal to identify services (Section 4) and present an example, based on a real

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organization, where we applied our proposal (Section 5). We evaluated the obtained results using an empirical method and employees' feedback (Section 6) and we explain what we have learned from this project (Section 7). Finally, we present our conclusions (Section 8).

2 PROBLEM STATEMENT

While the Service Catalog is an element that is increasingly important for organizations, its implementation poses several risks (Hubbert and O'Donnell, 2009). One of the problems currently affecting organizations, and that this document proposes to solve, is the struggle to be able to identify what services they provide to achieve business goals and outcomes. Despite the effort made in recent years, a unified methodical approach for service identification has not yet been discovered (Hubbers et al., 2007). The incorrect identification and definition of IT services, due to their structural role, will affect other processes since they are largely based on these services leading to a Service Catalog that is ineffective and provides no real value to any part of the organization (O´Loughlin, 2009).

If the services are not identified, defined and catalogued, or due to an ineffective management of customer expectations, overpromising and others, the communication about the service will not match the actual service delivery. Consequentially, the customers may perceive the services differently from what is communicated by the provider (Zeithaml and Bitner, 1996). This section corresponds to the problem identification and motivation phase of DSRM.

3 RELATED WORK

Since this document focuses on the identification of services, it is important to define what a service is. We give a brief overview of the multiple existent definitions of service and by DEMO methodology, used in our proposal. Next, we analyze both ITIL and CMMI-SVC, each containing processes that deal with Service Catalogs and service identification as well as two of the most studied service identification approaches by researchers: Business Components Identification and Service Oriented Architectures. Finally, we analyse DEMO, used in our proposal.

3.1 Definition of Service

The term "service" has many different definitions, depending on the context in which it is being used (O'Sullivan, 2006). Several definitions of service are based on technology. Some definitions of electronic services (or e-services) use the Internet and/or workflow as a conduit to new revenue or task completion. A web service has been described as an aggregation of functionality published for use. However, these definitions raise some concerns: they are focused on technology and they tend to ignore conventional services, in what is called "web service tunnel vision". It is important to notice that services are not just about technology and also include nontechnology aspects (Jones, 2005).

In the service marketing literature, there is a wide range of definitions of what a service entails. Usually, a service is defined as an intangible set of benefits or activities that are sold out by one party to another. Its main features are: intangibility, heterogeneity, simultaneously produced and consumed and perishability (Zeithaml and Bitner, 1996).

In (Albani et al., 2009) the definition of service is based on the standard transaction pattern proposed in Dietz's DEMO (Dietz, 2006). Though a service has many similarities with a transaction in Enterprise Ontology, they are not equal: A service is a universal pattern of Coordination and Production acts, performed by the executor of a transaction for the benefit of its initiator, in the order as stated in the standard pattern of a transaction. When implemented it has the ability:

- to get to know the Coordination facts produced by the initiator;
- to make available to the initiator the Coordination facts produced by itself.

This definition of service just given is a very generic one, since it holds for two kinds of providers: human actors and IT systems. Services executed by human actors and IT systems only differ in the way they are implemented; human services are implemented by human beings, whereas IT services are implemented by IT systems (Albani et al., 2009). These systems assist human actors in their activities; therefore parts of a human service may also be executed by IT systems.

3.2 Service Identification Techniques

As said, although a formal and unified method to identify services has not been discovered yet, some

approaches have been proposed over the years to solve this issue.

Information Technology Infrastructure Library (ITIL) (Bon, 2007) and Capability Maturity Model Integration for Services (CMMI-SVC) (CMMI for Services, version 1.3, 2010) provide a set of best practices for service provider organizations. While ITIL aims at controlling and managing all aspects of IT related operations, CMMI-SVC is a maturity model and a process improvement approach for general service providers. Even with different focus, both have specific areas which deal with Service Catalogs and, consequently, with service identification. However, they mostly deal with *what* processes should be implemented, and not so much with *how* they can be implemented, not providing a specific process to identify services.

In order to promote software reuse, Component-based Software Engineering (CBSE) techniques have been adopted to ease the development of large-scale complex information systems (Fan-Chao et al., 2005). As described in (Wang et al., 2005), there are three kinds of service identification techniques, based on components: Domain Engineering based methods, CRUD Matrix based methods and Cohesion-Coupling based Clustering Analysis methods. Instead of identifying services directly, these identify the components and, since each component provides services to the exterior, they claim we can also identify its services. Nevertheless, a specific process to perform this task is not presented.

Service Oriented Architecture (SOA) is an architectural approach for designing, architecting and delivering enterprise applications that support business operations as a set of meaningful services. Many researches are suggesting various methodologies to guide the migration to SOA, each with its own approach to service identification. In (Terlouw and Dietz, 2010) there is a review of some SOA methodologies such as SOMA (Arsanjani, 2008) and SOAF (Erradi et al., 2006). These methodologies provide a solid basis to achieve SOA, but they do not describe all phases very thoroughly or clearly. Moreover, they are technology-based, focusing on web services.

3.3 DEMO

Design & Engineering Methodology forOrganizations (DEMO) is a methodology for modeling, (re)designing and (re)engineering organizations and networks of organizations (Dietz, 2006). DEMO aims to develop high-level and abstract models of the construction and operation of organizations, independently of their actual implementations, by focusing on the communication patterns between human actors, i.e., models of organizations from a responsibility and communication oriented perspective. The theory that underlies this methodology is called Enterprise Ontology and consists of four axioms: Operation, Transaction, Composition and Distinction.

The Operation axiom states that an organization consists of human beings, in their role of social individuals or subjects, who achieve their goals by performing acts. A subject fulfilling an actor role, which is defined as a particular *amount* of authority and responsibility, is called an actor. An actor performs two kinds of acts: Production acts (P-acts) and Coordination acts (C-acts). On the one hand, by performing P-acts, the actors contribute to bringing about the goods or services that are provided or delivered to the environment of the organization. On the other hand, by performing C-acts, actors enter into and comply with commitments and agreements towards each other regarding the performance of P-acts. The result of successfully performing a P-act is a Production fact or P-fact, and the same applies to a C-act, creating a Coordination fact or C-fact.

The Transaction axiom states that C-acts are performed as steps in a universal pattern, called transaction, to successfully complete a P-act. Each transaction distinguishes two actor roles: the initiator, who starts the transaction and might complete it, and the executor, who is responsible for the performance of the P-act and the creation of the respective P-fact. A transaction evolves in three phases: the Order phase (O-phase), the Execution phase (E-phase) and the Result phase (R-phase). In the Order phase, the initiator and the executor negotiate about the intended result of the transaction (P-fact that the executor is going to create); in the Execution phase, the P-fact is produced by the executor; and finally, in the Result phase, the initiator and the executor negotiate and discuss the result of the transaction (P-fact actually produced).

The Composition axiom describes how these transactions can interact. According to this axiom, any transaction is either enclosed in some other transaction, initiated by an external party to the organization or a self-activated transaction. If there is an enclosed transaction, an information dependency usually exists between the enclosing and the enclosed transaction.

The Distinction axiom acknowledges three human abilities called Performa, Informa and Forma which are exerted both in C-acts and P-acts. The

Forma ability concerns the form aspects of communication and information (Datalogical layer); the Informa ability is related to the content aspects of communication and information, fully abstracting from the form aspects (Infological layer); the Performa ability involves the creation of new, original things, directly or indirectly by communication (Ontological layer). This last ability is considered as the essential human ability for doing business, and is the one in which DEMO focuses on.
We just gave a short summary of the Enterprise Ontology and discussed the parts relevant for our service identification proposal. A complete overview of the theory is available in book (Dietz, 2006) and many others publications (List: http://www.demo.nl/publications/).

4 PROPOSAL

In order to solve the problem described in Section 2, we intend to use the DEMO methodology to identify the services provided by organizations, or their departments, to their customers. Since best practices cannot help us, because they are too general and do not specify how to identify services, and the already existent methods which allow this task are focused on technology, we decided to use DEMO and the definition of service based on this methodology, because it provides abstract and high-quality models and has a strong theoretical foundation (Huysmans et al., 2010). Moreover, this methodology focuses on what really matters, i.e. the business layer, not considering the implementation details which are secondary to clients.

We propose to use the following steps, already defined by DEMO in (Dietz, 2006), to find the services of an organization:

- **Enterprise Description:** A textual description which summarizes the actions performed by the service provider to fulfill the customer's requests;
- **Performa-Informa-Forma Analysis:** Identification of the three kinds of human abilities (Performa, Informa, and Forma) performed in the context of the organization, according to the Distinction axiom, using the text of the previous step;
- **Coordination-Actors-Production Analysis:** The identified Performa items are split into C-acts/facts, P-acts/facts and actor roles who perform those acts, according to the Operation axiom;
- **Transaction Pattern Synthesis:** Identification of each transaction type, and the corresponding result, based on the identified acts/facts, according to the Transaction axiom;
- **Result Structure Analysis:** Check if there are any dependencies between the identified transaction types. Generally, these dependencies occur when the executor of a transaction is the initiator of another (inner) transaction, as already explained in the Composition axiom;
- **Actor Transaction Diagram/Service Identification:** Identification of the initiator and executor actor roles of each transaction type. When this mapping between transactions and actor roles is complete, it is possible to identify the services provided by the studied organization;

These steps are based on the EO explained in the last section and will be further detailed in the following one. According to the DSRM, this set of steps is the artifact that we will employ to identify services; we are using already existing knowledge (DEMO methodology) to show how to identify them. This section and the previous one correspond to the design and development step of DSRM.

5 ACTION

In order to show the feasibility of the DEMO methodology for service identification, we will explain its relevant notions on the basis of a small real-life example, which will allow to increase the practical relevance of our study and to obtain an in-depth insight into how DEMO can assist in the service identification process. This case study aimed to provide evidence against the importance of well identified services (for instance, in a Service Catalog), their definition and service levels. For that, we decided to study a Human Resources (HR) department and to identify the services it provided to the rest of the organization. The study focused on a European private company, leader in the wines and spiritual beverages distribution, which we will call from now on Company X. The head of the HR department (Gabriela) described the functions and actions she had to take to perform her job. In addition, we also interviewed an employee of the Marketing department (Rosario), in order to identify what interactions she had with the HR department, i.e. what services she thought the HR department provided her. So, the final objective is to prove that the services a provider thinks it offers differ from the

perceived services for a customer. This section corresponds to the demonstration phase of DSRM.

Firstly, we describe the actions undertaken by the head of the HR department. The starting point to fulfill this task is called Enterprise Description and is characterized by producing a text which summarizes the actions performed by the service provider, such as the presented below. This text should be based in all the available documentation and written by someone who will not be involved in the task, ensuring the validity of the exercise, but with enough knowledge about the performed activities. Due to space limitations, we will just present the text after applying the first two analyzes.

When the text is written, one should read it carefully and try to recognize and distinguish between the Ontological, Infological and Datalogical actions described, as referred in the DEMO's Distinction axiom (see Section 3.3). This step is called Performa-Informa-Forma Analysis. To do that, we should define a notation to differentiate those actions: in this example, we have highlighted the text, using Black, Dark Gray and Light Gray colors to identify, respectively, the Ontological, Infological and Datalogical actions.

The next step concerns the identification of C-acts/facts, P-acts/facts and actor roles, using the Performa (Ontological) items identified in the previous step. We also have considered a notation to differentiate between them, similar to the one used in the Operation axiom: square brackets "[" and "]" to identify actor roles, brackets "(" and ")" to identify C-acts/facts and angled brackets "<" and ">" to identify P-acts/facts. This step is called Coordination-Actors-Production Analysis and here there is a reduction of the complexity, relatively to other methodologies, because from now on, we will only be considering the Ontological actions identified in this step. The result of applying these two analyses to the original text is presented below:

The Human Resources (HR) department of Company X is responsible for the development of the monthly payroll, management of the vehicles distribution, infrastructure management, training of the various employees, recruitment of new employees, and insurance, among others. It is constituted by 3 other employees: Vitor, Patricia and Luisa. Vitor deals essentially with fleet management, post office and banks, Patricia assists the Finance department and General Manager(she is a personal assistant of these 2 areas), and Luisa is a receptionist who deals with phone calls and Proof of Deliveries (PODs). They both report to Gabriela, head of HR.

The recruitment process of Company X starts when both the [HR] and the General Manager agree that there is a (need) to <hire> [new employees]. This need can be obtained from previous feedback given by the responsible for each department. The recruitment can be internal or external. In case of internal recruitment, such as internal staff turnover, someone in a specific area can be <moved> to another one. However, in case of external recruitment, it is possible to use the support given by the [universities] to <hire> a [new trainee] and give him/her the necessary <training>, or, through advertisements or [temporary employment companies], <hire> [someone already established on the market] and with experience. When there is a need to hire a new trainee, the HR department of Company X contacts some specific universities, according to the function and pre-requisites to perform that function. After this first contact, some universities proceed to the selection of resumes, while others send them all to Company X, which will select the most promising candidates. Next, these candidates are directly contacted by Company X to schedule the first interview with HR. If the candidate is accepted into the next stage of the recruitment process, a second interview meeting is scheduled with the head of the department where the function will take place. Finally, in case of satisfactory performance, the candidate is accepted. This recruitment process based on interviews is similar to all candidates, whether they are graduates or people with work experience.

About the fleet management, the [HR] is responsible for the <rental> of certain types of vehicles, which will be used by employees with determined functions. This rental is made to an [external renting company], and HR has to deal with distance control, accidents, and further expenses related to these vehicles (highway, fuel). They negotiate a contract that has a certain time limit, and includes various options such as maximum distance that can be travelled. It is also necessary to <make an insurance> for the vehicles. After receiving the vehicles, one must regularly check if they have (mechanical) problems and if they occur, the car must be <taken> to a [workshop] for repair. Exchanging vehicles between drivers to guarantee a balanced use of each must also be considered. When the contract is about to end, the vehicle is <taken> to [inspection] to check if everything is fine.

The <insurance> is also related to HR. For instance, there are several types of insurance: life insurance, health insurance, vehicle insurance and others. In case of a trainee, the work accidents insurance is the only one to be triggered, if it is a

temporary contract, it includes health and work accidents insurance, and if it is a permanent contract, it includes life, health and work accidents insurance. In both cases, the HR communicates with the insurer and Social Security to deliver tax and documents.

The payroll is determined using the budget that was established for that year. The monthly salary for each employee is calculated and pre-determined from the company politics, and it is affected by absences, product discounts, among other factors which will be uploaded to the software that calculates each month's salary. To determine every factor, the head of each department must inform the HR.

The [HR] <establishes> telecommunications contracts with specified [operators] to ease the communication of the employees and checks if these contracts are fulfilled by the operating company which affects the monthly payment that has to be taken. HR is also responsible for the development of the employees' vacation map, control of the documented internal politics of the company and check if they are being carried out by employees, and occupational medicine to ensure that some employees meet certain requirements to perform some actions.

At the end of every year, the performance appraisal process is executed, during which the job performance of each [employee] is <evaluated>. The [HR] develops specific forms for each department, which must be filled in by the employees until a certain date (Self evaluation). After this phase, the head of each department gathers the feedback given by their employees and then schedules meetings with all members to discuss the performance during the last year.

When the performance appraisal process has finished, it is time to check if [someone] (needs) a particular <training session> in a specific subject. When this need is identified, one tries to identify a group of employees that also needs the same training. After that, it is necessary to plan the training session. This way, the HR starts by checking the availability of the employees, possible dates to execute it, text books, proofs of participation and other logistics steps. In case of internal training, the HR verifies who, inside the company, has the know-how to develop that training session, and then, the chosen employee will be held responsible for developing the module. In case of external sessions, the HR also needs to contact an accredited external company to execute the training session.

The infrastructure management (office equipment, chairs, tables) and overall function of the headquarters is conducted by the [HR]. When employees (need) office equipment, they ask Vitor for it. Then, he will <order> this equipment in the office store. When the equipment arrives, the store sends it to Company X and it is delivered to the employees. The [HR] also <deals> with the logistics of the company's events (Christmas dinner, company day and answers the employees' general doubts.

After these analyses, it is time to define the existent transactions in this text, by clustering the identified C-acts/facts and P-acts/facts, in what is denominated by Transaction Pattern Synthesis. The Transaction axiom can be helpful in this step, because it guarantees that each P-act/fact or C-act/fact previously found corresponds to a complete transaction. Then, for each identified transaction type, the result type (i.e., the Production fact created) should be correctly and precisely formulated, which can be achieved by uniquely identifying an entity, using variables. This result is represented in the table below, called Transaction Result Table (see Table 1).

Table 1: Result table – HR point-of-view.

Transaction Types	***Result Types***
T01 – Hire a new employee	R01 – Employee E has been hired
T02 – Rent a vehicle	R02 – Vehicle V has been rented
T03 – Repair vehicle	R03 – Vehicle V has been repaired
T04 – Inspect vehicle	R04 – Vehicle V has been inspected
T05 – Insure a vehicle	R05 – Vehicle V has been insured
T06 – Insure an employee	R06 – Employee E has been insured
T07 – Establish communication contracts	R07 – Telecommunication contract T has been established
T08 – Evaluate job performance	R08 – Job performance J has been evaluated
T09 – Give training session	R09 – Training session S has been given
T10 – Fulfill equipment requests	R10 – Request R has been fulfilled
T11 – Order and receive office equipment	R11 – Office equipment O has been received
T12 – Organize company events	R12 – Event E has been organized

After having defined the transaction types and the respective result types, one must check if there are any dependencies between the transactions/ P-facts (results), as the Composition axiom describes. This step is called Result Structure Analysis and can be executed by carefully reading the text one more time. The following dependencies were found:

- There is a dependency between T01 and T06: after hiring a new employee, the HR department has to insure him/her. T06 is mandatory;
- There is a dependency between T02 and T05: when a vehicle is rented to an external renting company, the HR department is responsible for insuring that same vehicle. T05 is mandatory;
- T10 depends on T11: in order to fulfill the employee's general requests, the HR department contacts the Office Store to order the necessary equipment. T11 is optional;
- There are no dependencies involving the remaining transactions.

After identifying the transaction types, its results and dependencies, it is time to determine the environment surrounding the HR department, considering the organization context. The first model to be developed is called the Actor Transaction Diagram (ATD), represented in Fig. 1. In this type of diagrams, a transaction is represented using a symbol, more specifically a diamond in a disk, which contains the respective combination of C-acts and a P-act. Each transaction is connected to two gray boxes, representing the initiator and executor actor roles. The initiator is connected to the transaction symbol using a solid line, while the executor is connected to the transaction using a solid line ending in a black square. These gray boxes refer to composite actor roles, i.e. elements whose exact structure is not known. All the environmental elements, i.e. elements outside the organization that we are studying, are represented with gray boxes for that reason. This also means that we can represent the studied organization with a gray box when referring to the kernel of the organization, which can be further specified using elementary actor roles (represented by white boxes). In this example, for simplicity reasons, the HR department has been considered as composite actor role. The gray-lined rectangle in the back represents the boundary under consideration.

As depicted in Fig. 1, and following the service definition based on EO, we can identify four services provided by the Human Resources department of Company X, according to Gabriela: hire a new employee (T01), give a training session (T09) to Company X's employees, fulfill requests of the employees related to general office equipment (T10) and finally, organize Company X's events to its employees (T12).

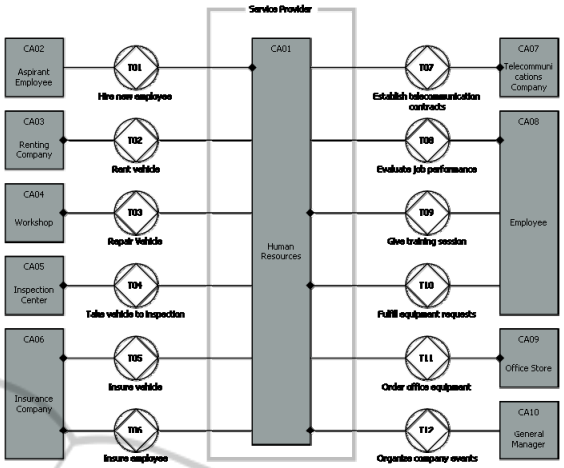

Figure 1: Actor Transaction Diagram – HR point-of-view.

Until now, we have thoroughly described all steps to find the services from the HR's point-of-view. We will now describe these steps more briefly in order to find the services provided by the HR department, but now from the Marketing department's point-of-view (customer). After collecting the textual description and applying the first two analyzes, Performa-Informa-Forma and Coordination-Actors-Production Analyzes, we have obtained the following text:

According to Rosario, when she was hired to work at Company X, there wasn't any Human Resources (HR) department yet. She was <hired> with the assistance of an external company. She had a first interview with [Vera Ribeiro] (Marketing dept.) and an agent of the external company, followed by a second meeting to discuss the working conditions and sign documents. The first week on the job was called Integration Week, when the new employees can understand what is the done by the various Company X departments.

Nowadays, regarding the <evaluation process>, [Rosario] receives emails from the HR containing the forms that must be used in the self-evaluation phase, as well as the internal procedures and politics of the company. About the training sessions, all the logistics <is arranged> by the [HR], as well as the management of the number of training hours. The head of the department is responsible for informing the HR that a specific training might be needed.

Every month, she receives the phone bill. Each employee has a limit that he/she can spend monthly, and if the limit is overreached, then the [employee] has to <pay> the difference.

To <schedule> her vacation, [Rosario] needs to send her proposal to Vera Ribeiro, who analyzes and approves it or not. Then, Vera Ribeiro sends the proposal to Vera Martins (Marketing dept.) to guarantee a consensus between the whole departments. From here on, the HR is informed.

When she wanted to change her NIB code, she had to call HR to let them know about the new one and complete the necessary documents. The same thing happened when [she] (wanted) to <include> another beneficiary in her insurance.

In order to correctly calculate her salary, in case of absences, she has to deliver some documents to the HR, and then this department proceeds to the correct discounts. In case of expenses the same procedure must be followed. When these aspects are known, the software automatically calculates the output.

Problems with office equipment <are dealt> with by [Vitor]. When she wants to send a letter, she provides it to Vitor, who is now in charge of delivering it at the postal offices. Letters received at Company X are delivered to the respective recipients by Patricia.

After identifying the Ontological activities and the involved actor roles, we can identify each transaction and its result, on the Transaction Pattern Synthesis (see Table 2).

Table 2: Result table – Marketing point-of-view.

Transaction Types	*Result Types*
T01 – Hire a new employee	R01 – Employee E has been hired
T02 – Evaluate job performance	R02 – Job performance J has been evaluated
T03 – Give training session	R03 – Training session S has been given
T04 – Pay telecommunications invoice	R04 – Invoice I has been paid
T05 – Schedule vacations	R05 – Vacation schedule S has been developed
T06 – Change insurance status	R06 – Employee E has changed its insurance status I
T07 – Fulfill equipment requests	R07 – Request R has been fulfilled

From Rosario's point-of-view, there are no dependencies among the identified transactions. The explanation for this occurrence is due to the fact that Rosario works at the Marketing department, so, she does not know how the HR actually performs those transactions. This step corresponds to the Result Structure Analysis.

The ATD from the point-of-view of the Marketing department is represented on Figure 2. As we can see in Fig. 2, it is possible to identify three services provided by the HR department of Company X, according to Rosario: give a training session (T03), change the status of the insurance (T06) and finally, fulfill requests of the employees related to general office equipment (T07).

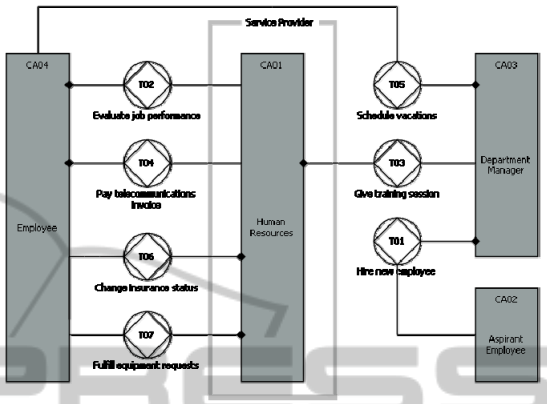

Figure 2: Actor Transaction Diagram – Marketing point-of-view.

After analyzing both points-of-view, we can conclude that there are similarities and differences between them. On the one hand, we found two services which are similar, "Give training session" and "Fulfill equipment requests". On the other hand, there were also some mismatches: while in the HR's point-of-view we identified "Hire new employee" and "Organize company events", from the Marketing's point-of-view we found "Change insurance status". These differences will be discussed in the following sections.

6 EVALUATION

After applying our proposal to identify the services provided by the HR department, from a HR's point-of-view and a customer point-of-view, we can evaluate the obtained results. This way, we used the Moody & Shanks Framework (Moody & Shanks, 2003) to assess the quality of the Actor Transaction Diagrams and collect the HR and customer's feedback about the results. The evaluation phase of DSRM is achieved in this section.

To evaluate the quality of the produced models, we used the Moody & Shanks framework, which has been empirically tested and is composed by a set of eight quality factors:

Completeness: refers to whether the model contains all user requirements. This factor is influenced by the person who describes the organization or

department which is being studied. Thus, in the HR perspective, if the person who described the department has forgotten to mention some details about its functions, as consequence, it would not be possible to identify all the transactions / services. From the Marketing perspective, it is not possible for Rosario to identify all the services provided by the HR, because it depends on what are the main interactions between the HR and Marketing. For instance, it is normal that the Marketing employee did not have any idea about the organization of events (which was identified as a service by the HR itself), because in her daily functions, she had never been involved in this kind of transaction;

Integrity: indicates the extent to which all business rules have been included in the model. The ATD does not express any business rules, but it was possible to gather the dependencies between transactions;

Flexibility: describes the ease with which the model can cope with business and/or regulatory change. One can claim that the ATDs are stable against changes in the composition of members of the environment which interact with the HR department, since these structural changes do not reflect themselves on the ontological level. For example, actor roles such as Insurance company and Workshop, among others, are general enough. From the HR perspective, there are three dependencies between transactions that can diminish this aspect. Contrasting, from the Marketing perspective there are no dependencies at all;

Understandability: refers to the ease with which the concepts and structures can be understood. The produced models were shown to HR and Marketing, after being developed, and the initial reaction revealed some confusion. One may find it difficult to understand the ATD, if not familiar with the notation; however the reduced number of element types that composes each model can contribute to a fast learning;

Correctness: describes the extent to which the model conforms to the rules and conventions of the modeling technique. Since the model uses a diminished number of elements and the basic transaction pattern, it is possible to easily verify the accuracy of the ATD model

Simplicity: refers to the extent to which the model has a minimum number of constructs. Since DEMO is focused on the Ontological level, there is a significant reduction on the number of elements when we consider the original source, in this case the description, which has several Datalogical and Infological aspects. For instance, the ATD of the HR perspective has twelve transactions and ten actor roles, while the ATD of the Marketing perspective has seven transactions and four actor roles;

Integration: with respect to this particular case study, integration is concerned with the extent to which the two different models can be integrated or compared to each other. This quality factor depends on the textual description provided by both parties. Despite the differences which were found and explained, there were also some common points (two services / transactions and several actor roles);

Implementability: denotes the ease with which the data model can be implemented within the time, budget and technology constraints. In DEMO models, we are dealing with the Performa (Ontological) elements performed by actor roles, which are implementation independent. So, it is possible to conclude that DEMO models are not the best way to represent the implementation details.

The evaluation of the obtained models and results was also performed by asking for the HR and Marketing employees' opinion. In general, the provided feedback was rather positive, because they understood the obtained services. Nevertheless, a general complaint was that our list of services did not include all the functions the employees perform. This is due to the already referred feature of DEMO being implementation-independent, not considering the Infological and Datalogical activities. If one revises the textual descriptions of the HR, from both points-of-view, it is possible to conclude that the majority of the actions are included on the Forma and Informa categories (Datalogical or Infological, respectively). These actions have great potential to be automated by IT systems (Dietz, 2006). No Actor role performing Forma or Informa activities can ever be completely automated, but the effort that these subjects have to make in fulfilling the role can be reduced to a minimum.

7 LESSONS LEARNED

After applying the proposal, it is possible to understand how it can reduce the complexity of enterprise models: by layering it in three parts, and focusing only on the part which refers directly to the creation of new original facts (Ontological layer). Despite these advantages, there are also some downsides. To be able to apply this methodology, there is a need for a textual description, about the organization that is being studied and the surrounding environment, as input for the identification process. This text is written in natural

language, by someone who has some insight about the tasks performed by the organization, which can lead to misunderstandings due to the lack of expressivity.

One also has to consider that the models produced by DEMO just contemplate the Ontological aspects performed by employees. This way, actions which are categorized as Infological or Datalogical are not directly included in these models. So, in order to have a complete overview of the actions performed by an actor, one has to consider those three kinds of abilities. This case study revealed that in some situations it would be useful to model the most relevant infological and datalogical transactions.

An important lesson that we managed to prove is that different people have different notions of what is performed by one another. This is well showed considering the different textual descriptions and, consequently, the different services we obtained from the HR and Marketing's points-of-view. This difference represents the gap between the customers' expectations and the service provider's perception of those expectations. This gap was first identified two decades ago (Parasuraman, Zeithaml, & Berry, 1985) and the fact that, nowadays, it still occurs in companies proves the importance of the service identification process. Companies still struggle to identify and manage their services and this kind of problems is motivating a new field of research: Service Science.

8 CONCLUSIONS

In this paper we have stressed the problems related with the service identification using DEMO, namely the issues that the text description can raise. We have concluded that the textual description of the organization is a critical step in the service identification process. Having it wrong may lead to gaps between the customers' expectations and the provider's perceptions of those expectations, such as in the studied organization.

As future work we intend to overcome the problems related to the text description. We will evaluate the possibility of using graphical representation of business processes, such as BPMN models, as input for the DEMO analyses and synthesis.

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