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Developing a Conceptual Relationship between Web Service Supply Chain Entities Using KPS Mining Algorithm

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Abstract
Globalization has led to a new class of service apart from the services that are offered offline and semionline (in which case part of the service transactions are online and part of it offline) as a result of collaboration of static entities resulting in static service supply chains. The advent of enablers like Service Oriented Architecture and development of web service applications has enabled online / dynamic service supply chain networks (SSCNs) formed by dynamic collaboration of many serving entities. The entities in web SSCNs are interdependent and the performance of one entity impacts the performance of other entities as well as overall performance of service network. It is important to study the relationship and dependency between each entity of web SSCNs. Once the relationship is identified, it will help in devising some composite performance indicator for the entire service supply chain considering the interests of service providers and clients. We take a scenario based illustration of such online service supply chains to show the feasibility of the concept.

Keywords, service supply chains, service quality, Web Service
http://www8.org/w8-papers/4a-search-mining/kps/kps.html -- KPS Algorithm

Introduction
A supply chain is a system of organizations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer. Supply chain activities transform natural resources, raw materials and components into a finished product that is delivered to the end customer. In sophisticated supply chain systems, used products may re-enter the supply chain at any point where residual value is recyclable. Supply chains link value chains

The Global Supply Chain Forum (GSCF) introduced another Supply Chain Model. This framework is built on eight key business processes that are both cross-functional and cross-firm in nature. Each process is managed by a cross-functional team, including representatives from logistics, production, purchasing, finance, marketing and research and development. While each process will interface with key customers and suppliers, the customer relationship management and supplier relationship management processes form the critical linkages in the supply chain.

If all relevant information is accessible to any relevant company, every company in the supply chain has the possibility to and can seek to help optimizing the entire supply chain rather than sub optimize based on a local interest. This will lead to better planned overall production and distribution which can cut costs and give a more attractive final product leading to better sales and better overall results for the companies involved.

With increasing globalization and easier access to alternative products in today's markets, the importance of product design in demand generation is more significant than ever. In addition, as supply, and therefore competition, among companies for the limited market demand increases and pricing and other marketing elements become less distinguishing factors, product design also plays a different role by providing attractive features to generate demand. In this context, demand generation is used to define how attractive a product design is in terms of creating demand.

In other words, it is the ability of a product design to generate demand by satisfying customer expectations. However, product design impacts not only demand generation, but also manufacturing processes, cost, quality, and lead time. The product design affects the associated supply chain and its requirements directly including, but not limited to: manufacturing, transportation, quality, quantity, production schedule, material selection, production technologies, production policies, regulations, and laws. From a broad perspective, the success of the supply chain depends on the product design and the capabilities of the supply chain, but the reverse is also true—the success of the product depends on the supply chain that produces it.

Existing system
Supply Chain Management is an integrating function with primary responsibility for linking major business functions and business processes within and across companies into a cohesive and high-performing business model. It includes all of the

logistics management activities noted above, as well as manufacturing operations, and it drives coordination of processes and activities with and across marketing, sales, product design, finance and information technology."A typical supply chain begins with ecological and biological regulation of natural resources, followed by the human extraction of raw material, and includes several production links (e.g., component construction, assembly, and merging) before moving on to several layers of storage facilities of ever-decreasing size and ever more remote geographical locations, and finally reaching the consumer.

- Globalization has led to a new class of service apart from the services that are offered offline and semi online (in which case part of the service transactions are online and part of it offline) as a result of collaboration of static entities resulting in static service supply chains. The advent of enablers like Service Oriented Architecture and development of web service applications has enabled online / dynamic service supply chain networks (SSCNs) formed by dynamic collaboration of many serving entities.

Proposed system

The entities in web SSCNs are interdependent and the performance of one entity impacts the performance of other entities as well as overall performance of service network. It is important to study the relationship and dependency between each entity of web SSCNs. Once the relationship is identified, it will help in devising some composite performance indicator for the entire service supply chain considering the interests of service providers and clients. We take a scenario based illustration of such online service supply chains to show the feasibility of the concept.

Service quality involves a comparison of expectations with performance. According to Lewis and Booms (1983) service quality is a measure of how well a delivered service matches the customers' expectations.

Generally the customer is requesting a service at the service interface where the service encounter is being realized, then the service is being provided by the provider and in the same time delivered to or consumed by the customer.

The main reason to focus on quality is to meet customer needs while remaining economically competitive in the same time. This means satisfying customer needs is very important for the enterprises to survive. The outcome of using quality practices is:

Understanding and improving of operational processes

Identifying problems quickly and systematically

Establishing valid and reliable service performance measures

Measuring customer satisfaction and other performance outcomes

Related Works:

Applying KPS Mining Algorithm for improve service Quality.

In this Frame, Web Service Oriented technologies and protocols are deployed for modeling managing and executing business-oriented functionalities**.**

Different companies are involved in a supply chain, information flow passes different systems of the companies in the supply chain.To automate the process of the information flow, the systems of different companies in the supply chain must be integrated in a global network.

As communications protocols and message formats are standardized in the web community, it becomes increasingly possible and important to be able to describe the communications in some structured way. WSDL addresses this need by defining an XML grammar for describing network services as collections of communication endpoints capable of exchanging messages. WSDL service definitions provide documentation for distributed systems and serve as a recipe for automating the details involved in applications communication.

A WSDL document defines **services** as collections of network endpoints, or **ports**. In WSDL, the abstract definition of endpoints and messages is separated from their concrete network deployment or data format bindings. This allows the reuse of abstract definitions: **messages**, which are abstract descriptions of the data being exchanged, and **port types** which are abstract collections of **operations**. The concrete protocol and data format specifications for a particular port type constitutes a reusable **binding**. A port is defined by associating a network address with a reusable binding, and a collection of ports define a service. Hence, a WSDL document uses the following elements in the definition of network services:

- **Types**– a container for data type definitions using some type system (such as XSD).
- **Message**– an abstract, typed definition of the data being communicated.
- **Operation**– an abstract description of an action supported by the service.
- **Port Type**–an abstract set of operations supported by one or more endpoints.
- **Binding**– a concrete protocol and data format specification for a particular port type.
- **Port**– a single endpoint defined as a combination of a binding and a network address.
- **Service**– a collection of related endpoints.

These elements are described in detail in Section 2. It is important to observe that WSDL does not introduce a new type definition language. WSDL recognizes the need for rich type systems for describing message formats, and supports the XML Schemas specification (XSD) [11] as its canonical type system. However, since it is unreasonable to expect a single type system grammar to be used to describe all message formats present and future, WSDL allows using other type definition languages via extensibility.

In addition, WSDL defines a common **binding** mechanism. This is used to attach a specific protocol or data format or structure to an abstract message, operation, or endpoint. It allows the reuse of abstract definitions.

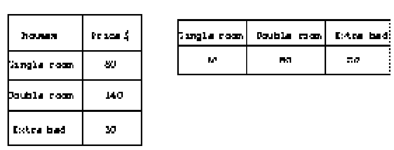
In addition to the core service definition framework, this specification introduces specific **binding extensions** for the following protocols and message formats:

- SOAP 1.1 (see Section 3)
- HTTP GET / POST (see Section 4)
- MIME (see Section 5)

Although defined within this document, the above language extensions are layered on top of the core service definition framework. Nothing precludes the use of other binding extensions with WSDL.

1. Keyword-based Mining
Keyword-based mining is used to extract a value associated with a *keyword*, e.g. *E-mail*, *Publication*, or *Research interests*. When a keyword is specified, we first look for the keyword in the pages. Once it is located, the following heuristic rules will be applied to mine the target information automatically.

- If the keyword is in a label of a link, the target information is the content of the page pointed to by the link. For example, the target information of *publications* is in the pointed page if there is a link label containing *publications*.
- If the keyword is included in a title (i.e. <H1> - <H6>), the target information is the string after it until the next title. If this is the last title in the HTML file, the target information ends when a blank line or the tag <HR> or
 appears.
- If the keyword is an item of a list (i.e. <LI> or <UI>), the target information is the string after it until the next <LI> or <UI> or the end of the list.
- If the keyword is a field in a table (i.e. <TD> or <TH>), the target information is the field on the right for the first column of a 2-column tables which do not contain tags <TH>(the head of table). Otherwise, it is the field under it. For example, in Figure 1, the target information for *single-room* is 80 for the table on the left; but the same field on the right is 50.



[illegible]	Price $
Single room	80
Double room	140
Extra bed	30

Single room	Double room	Extra bed
[illegible]	[illegible]	[illegible]

Figure 1: Two tables on the Web.

- If the keyword is at the beginning of a textual line, which itself consists of an independent paragraph (e.g. HTML tags separate it from the preceding and subsequent texts) and there are some HTML tags (e.g. <B> and </B>) or more than two spaces to separate it from the subsequent words, the target information is the string after it until the end of the line. For example, in the following line:
- <B> Office: </B>
  CW308.2
  The target information for *Office* is CW308.2 since it is separated by the tags <B> and </B> in the HTML page.
- If the keyword is in a textual line and the verb immediately after it is "is" or "are", the target information is the first *noun phrase* after them.

  For example, consider the textual line:
  ... My name is Tom Frank

and my email is tfrank@hotmail.com.....

The value for the keyword *Name* is *Tom Frank* and *tfrank@hotmail.com* is the *Email*.

If the keyword denotes a number (in a conditional expression), the target information is the first number occurring in the string obtained from the above rules.

In addition, synonyms or hyponyms are also considered in locating keywords. Here, word A is the hyponym of word B, if A and B refers to the same semantic class and B describes something more general than A. For example, *father* is a hyponym of *parent* and the *parent* is a hyponym of *relative* (see Figure 2). If one is looking for the keyword *parent*, the word *father* could be a match. Our synonymy and hyponymy dictionary is based on WordNet[22], which is the product of a research project at Princeton University. It is a dictionary which models the lexical knowledge of a native English speaker.

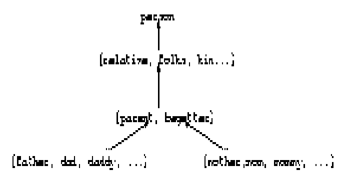


Figure 2: Network representation of synonyms and hyponyms among words.

2. Pattern-based Mining

Pattern-based mining performs string matching on the WWW based on the patterns specified by the users. A *pattern* entails a number of *constant words* or *variables* (started with /) and is delimited by a pair of brackets. When it is specified, the system first locates the strings from pages which match with *the constant words* in the pattern. If the matching is successful, the corresponding values on the page will be assigned to the variables. For example, the pattern [Dr. */Name*] matches with a string starting with the sub-string "Dr." followed by a *noun phrase*. The *noun phrase* after "Dr." will then be assigned to the *Name* variable, e.g. in the string "Dr. Jack Boan is ...", "Jack Boan" will be assigned to *Name*.

The reason why we focus on *noun phrases* is that we assume most interesting information is represented in *noun phrases* or *number* (verbs usually indicate an action or a state). The definition for *noun phrases* is as follows:

NP -> NP2 | *Det* NP2 | NP *Conj* NP
NP2 ->*Noun* | *Noun* NP2 | *Adj* NP2 | NP2 PP
PP ->*Prep* NP

where NP denotes *noun phrase*, *Det* denotes determiner, *Conj* denotes conjunction, *Adj* denotes adjective and *Prep* denotes preposition.

Two or more patterns may be linked using boolean operators. For example, the expression "[Mr. */Name*] or [Ms. */Name*]" means the word matches with any one of the patterns can be set to the variable *Name*. Of course, it is possible that more than one word can be assigned to a variable. In this case, we will count the number of matches of a word and choose the one with the highest frequency or the first one if two or more words have the same maximum frequency count.

In addition, wildcards can be used in a pattern, i.e. "*" and "-", where "-" denotes a word and "*" represents any number of words. For example, the pattern [Dr. */Name* received */Degree* from * in */Year*] is to extract information on variables *Name*, *Degree* and *Year*, while the *university* is ignored.

3. Sample-based Mining

The sample-based mining method extracts information based on a sample specified by the users. It is based on the assumption that a small group of Web pages is likely written in similar structures and styles. This is typically the case for the intranet of an institute in which all Web pages are designed by a webmaster. Therefore, when a user is looking for something (e.g. email address), he/she may first locate one (i.e. the *sample* in this paper) from a page manually and informs the system that he/she would like to obtain similar pages. The system will then help him/her search other pages automatically.

4.1 The Formal Model

Let W={*w1*, *w2*, ..., *wn*} be a group of Web pages which have similar style. Each page (source code, i.e. a HTML file) wi can be broken into a list of fields:

wi=(fi1, fi2, ..., fik);

Where each field may be:

a word, e.g. Good, Kelly, CL506;

- a number, e.g. 189.23, 67, 0.67;
- a date, e.g. Jun 30, 1998, 30/06/98, 30-06-1998;
- a time, e.g. 12:00, 1:00pm, 15:45:56;
- a price, e.g. $26.99, CND$78, HK$56.89;
- a specific ASCII character except '0'-'9', 'a'-'z', 'A'-'Z' and ' ', e.g. +, -, : ;
- a HTML tag, e.g. <B>, </B>, or <P>;

Note that the above-mentioned definition of a field is not exhaustive. More definition will be introduced in the future.

Conclusion:

We discuss how to mine and extract information from the WWW in this paper. The novelty of our method is the employment of *keywords*, *patterns* and *samples* to extract information from semi structured textual Web pages. Although it cannot mine all desired information, our experiments show that it is more efficient than other existing methods. In the future, we will apply more semantic knowledge and NLP techniques to mine complicated concepts, e.g. biography.

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