A B2B Marketplace eCommerce Platform Approach Integrating Purchasing and Transport Processes

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Abstract. Business-to-business (B2B) marketplace eCommerce platforms have grown in number in the last years. While these platforms allow product/service discovery and purchasing, they are limited in terms of integrating transport processes via well-defined B2B interactions. We approach this problem from an holistic view by dividing it into four sub-problems: enriching product and service descriptions with adequate semantic annotations for smooth discovery; integration of product classification taxonomies and standardized supply chain data representations; integration between purchasing and transport processes at procedural and data model levels; and disconnection between eCommerce platforms and legacy information systems of platform users. In this paper, we proposed a solution for each of these problems and presented a unified approach to integrate purchasing and transport phases in B2B marketplace eCommerce platforms. Finally, we validated the proposed approach with a case study in the scope of the NIMBLE research project including integration of eClass and Furniture Sector Taxonomy classification taxonomies into NIMBLE, semantic annotation of products with the information embedded in those taxonomies and a B2B scenario covering purchasing and transport phases of a traditional supply chain.

Keywords: Interoperability, Taxonomies, Business Process Integration, B2B eCommerce Platform, Supply Chain.

1 Introduction

B2B marketplace eCommerce platforms, with many-to-many modality where multiple suppliers and multiple buyers exist simultaneously on the same platform (as opposed to Direct B2B eCommerce platforms with one-to-many modality), have flourished in the last decade as they provide supplier participants with increased visibility and customer access; and buyer participants with the ability to discover product/supplier alternatives and compare them. For both sides, such platforms facilitate communication and reduce transaction costs, help establishing trust and eventually accelerate overall supply chain activities [1][2].

Considering the relationship between a buyer and a supplier, purchasing and transport are two main phases in a supply chain through which several B2B interactions such as information inquiry, quotation or operation planning take place. In this sense, B2B marketplace eCommerce platforms mostly offer functionalities for requesting quotation and ordering in relation to the purchasing phase. However, shipment and transport options remain usually limited to a few alternative delivery types like express or regular options; and it is not possible for trading companies to agree on detailed delivery/shipment terms in a structured manner following the purchase activity.

We argue the following additional challenges towards an effective (leading successful trading activities) and efficient (reducing B2B interaction efforts) platforms. First of all, for better integration of purchasing and transport processes on a platform, products and services (will be referring these two concepts collectively as products from now on) must have well-defined representations that are also linked with the information models used in supply chain activities. Product representations must also have adequate semantic annotations so that users can discover them on the platform easily. Finally, companies' legacy systems must be kept synchronized with the activities performed on the marketplace e.g. in terms of updating inventory status or order records.

Addressing the challenges above, main contributions of this study can be summarized as follows: We first propose a product classification ontology. Second, we show how this product classification ontology is mapped to a Universal Business Language (UBL) [3] standard-based supply chain data model. Third, we show two B2B business process flows for purchasing and transport phases of supply chains respectively, based on the individual business processes defined in UBL. And last, we present a configuration mechanism that can be applied at each step of B2B business process flows to realize the synchronization between the platform and legacy systems of the platform users.

In the rest of this paper, in Section 2, we present related eCommerce platforms, product classification taxonomies and data representation standards for products and supply chain processes. In section 3, we present the main contributions listed above. In section 4, we present a case study implementing the proposed approach in NIMBLE [4], which is a cloud based B2B marketplace eCommerce platform targeting European industry actors such as suppliers, manufacturers or service providers. NIMBLE is currently being developed in a European research project with the same name in the Factories of the Future (FoF) area. We conclude the study after discussing limitations of the study, innovative business models enabled by the proposed approach and future work.

2 Related Work

B2B marketplace eCommerce platforms have emerged in number and variety in recent years. In addition to global platforms like Alibaba[1], Amazon Business[2] or TradeKey[3]

[1] https://fuwu.alibaba.com/gps/buyer.htm
[2] https://www.amazon.com/b2b/info/amazon-business
[3] https://www.tradekey.com/

providing any type of products as well as services, there have emerged regional and sectorial platforms like BeTimber[4] for timber trading only or wlw.at[5], which is an Austrian-based eCommerce platform. Although these platforms vary in size, geography or targeted sector, they usually support a limited B2B interactivity. This can be summarized as publish and sell modality for suppliers and search and buy modality for buyers without any means to communicate via structured B2B transactions throughout the supply chain activities.

As a superset of supply chain activities that can be supported in B2B platforms, UBL and GS1[5] initiatives define a set of supply chain activities including but not limited to tendering, quotation, ordering, fulfilment or transport execution plan along with data entities to be exchanged in B2B transactions throughout relevant activities.

UBL, GS1 and GoodRelations[6] are initiatives providing widely used standards for describing products' master data(basic product characteristics) and supply chain data(dynamic information related to any trading activity). All these standards provide a base data entity representing individual products or services; and a set of generic properties that can be used to enrich the base representation. For instance, the base data entity in UBL is *Item* entity, which can be enriched with *ItemProperty* such that each *ItemProperty* can have multiple values in numeric, textual or quantity (number and unit pair) types. Similarly, GoodRelations ontology includes *ProductOrService* base entity which is a domain *qualitativeProductOrServiceProperty* and *quantitativeProductOrServiceProperty* properties. Although, GS1 has a base data entity to represent product or services, i.e. *Product* entity, it does not offer a generic property allowing enriching the base entity with arbitrary details but domain-specific properties like *textileMaterial*. However, as exemplified in the next paragraph, product classification taxonomies have much more coverage on diversity range of products and product properties. There exist several product classification taxonomies for thorough classification of products/services. Global Product Classification (GPC)[7], Google Product Taxonomy [8], eClass [9] and UNSPSC[10] are some of the product classification taxonomies. Varying in size and coverage, these taxonomies provide a classification hierarchy composed of thousands of product classes each of which can be associated with a set of properties, e.g. product class: *mechanical pencil* and product property: *ink type*. For instance, the latest version of the eClass taxonomy contains ~45 thousand of product classes and ~20 thousand product properties[6].collaborationa a moreOur approach differentiates from existing works by bringing B2B data exchange and eCommerce paradigms together, thus providing a structured manner for product discovery and B2B transactions.

Neither product representation standards, nor supply chain standards, nor product classification taxonomies by themselves are enough for a seamless trading experience in a B2B marketplace eCommerce platform. All these three concepts must be available in an integrated manner as addressed in the next section.

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[4] https://betimber.com/
[5] https://www.wlw.at/en/home
[6] http://wiki.eclass.eu/wiki/The_Release_Process

3 Integrating Purchasing and Transport in Supply Chains

We divide the main challenge of seamless B2B interactivity covering purchasing and transport phases in supply chains into four sub-problems: 1) definition of a product classification ontology, 2) integration of product classification ontology into the supply chain information models, 3) linking purchasing and transport phases of supply chains and 4) synchronization with legacy information systems. Each sub-problem is addressed in the subsequent sections:

3.1 Product Classification Ontology

eCommerce platforms must be extensible with respect to integration of external product classification taxonomies. There are many existing taxonomies as some of them were mentioned in the related work section, nevertheless they might still be inadequate in terms of coverage of domain-specific variety. In fact, this is what we faced in NIMBLE regarding the semantic annotation of logistics services. As a solution, we defined a new taxonomy coding the knowledge required to annotate logistics services. Having multiple taxonomies, a generic product classification ontology was required to represent the structure of the external taxonomies and knowledge incorporated in them.

For a basic usage, a product classification ontology requires a hierarchy of product classes, property descriptions that can be assigned to classes and unit/value lists that can be assigned to properties. We utilize OWL[15] semantics for capturing the semantics incorporated in the classification taxonomies. OWL is a valuable technology since it has built-in constructs for specification of the basic taxonomy elements. Using OWL, a hierarchical structure can be established via *rdfs:subClassOf* property. The listing below shows how the *Chair* class is defined as a subclass of *Seat* class.

```
<owl:Class rdf:about="#Chair">
   <rdfs:subClassOf rdf:resource="#Seat"/>
</owl:Class>
```

Product properties with literal value ranges are connected to the class via datatype properties. Below, the definition of *hasCertificate* datatype property is given. It has a domain of *Chair* class and range of *string*. This means that a Chair instance might hasCertificate property with string value.

```
<owl:DatatypeProperty rdf:about="#hasCertificate">
   <rdf:type rdf:resource="owl:FunctionalProperty"/>
   <rdfs:domain rdf:resource="#Chair"/>
   <rdfs:range rdf:resource="xsd:string"/>
   </rdfs:range>
</owl:DatatypeProperty>
```

A set of fixed coded values and quantities with a set of fixed units are associated to the product classes via object properties that are interpreted specially. The listing below shows an example of defining a quantity property for a product class. *hasEstimatedDeliveryTime* property has a domain of *Seat* and range of *nimble:QuantityType*. Nevertheless, the property is available for *Chair* because of the subsumption relationship formed by *rdfs:subClassOf* property. The property definition also refers to a unit list including the units that are allowed for this property. The limitation of OWL for this case is that it does not offer a suitable construct to define value or unit lists. To enable systematic interpretation of such knowledge (i.e. allowed values or units for particular properties), we defined dedicated ontological elements: *nimble:hasCode, nimble:hasCodeList, nimble:hasUnit* and *nimble:hasUnitList.*

```
  <owl:ObjectProperty rdf:about="#hasEstimatedDeliveryTime">
      <rdf:type rdf:resource="owl:FunctionalProperty"/>
      <rdfs:domain rdf:resource="#Seat"/>
      <rdfs:range rdf:resource="nimble:QuantityType"/>
      <nimble:hasUnitList rdf:resource="#DeliveryTimeUnitList"/>
  </owl:ObjectProperty>

  <owl:NamedIndividual rdf:about="#DeliveryTimeUnitList">
      <rdf:type rdf:resource="nimble:UnitList"/>
      <nimble:hasCode                  rdf:datatype="xsd:normal-
izedString">day</nimble:hasCode>
      <nimble:hasCode                  rdf:datatype="xsd:normal-
izedString">hour</nimble:hasCode>
      <nimble:hasCode                  rdf:datatype="xsd:normal-
izedString">month</nimble:hasCode>
      <nimble:hasCode                  rdf:datatype="xsd:normal-
izedString">week</nimble:hasCode>
      <nimble:id   rdf:datatype="xsd:normalizedString">Delivery-
TimeUnitListId</nimble:id>
  </owl:NamedIndividual>
```

Benefiting from the OWL constructs, we also let taxonomy designers to relate two products via object properties. The listing below shows how the *Seat* class is extended with *hasMaterial* property referring to other products of *Material* type. This indicates that a *Seat* instance must refer to a *Material* instance via the *hasMaterial* property.

```
  <owl:ObjectProperty rdf:about="#hasMaterial">
      <rdfs:domain rdf:resource="#Seat"/>
      <rdfs:range rdf:resource="#Material"/>
  </owl:ObjectProperty>

  <owl:Class rdf:about="#Material">
      <rdfs:subClassOf rdf:resource="#Product"/>
  </owl:Class>
```

3.2 Mapping Category Data Model to UBL Data Model

This mapping approach is part of a larger data modelling effort as described in [16]. However, the initial study does not focus on definition of a generic product classification taxonomy.

As the base supply chain and product representation data model we use Universal Business Language (UBL). In summary, UBL is used as the common data model for describing product / services details as well as the messages exchanged via the business processes. UBL's data model library contains reusable data entities in varying granularities. In this sense, UBL has also a good coverage of the concepts such as companies, persons, products, product properties, trading terms, clauses or contracts.

As mentioned in the related work, in UBL, products or services are represented with the *Item* data entity. A product can be provided with additional details via the *AdditionalItemProperty* entities and can be classified with a *CommodityClassification* entity, which in turn contains a coded value for the classification value. Fig. 1 shows data structures for describing products with UBL and the proposed classification taxonomy as well as the mappings between these two models. A taxonomy *class* is mapped to the *ItemClassificationCode* entity of the *CommodityClassification* entity. In addition to the class mapping, each taxonomy class *property* (either datatype or object) is mapped to an individual *AdditionItemProperty*.

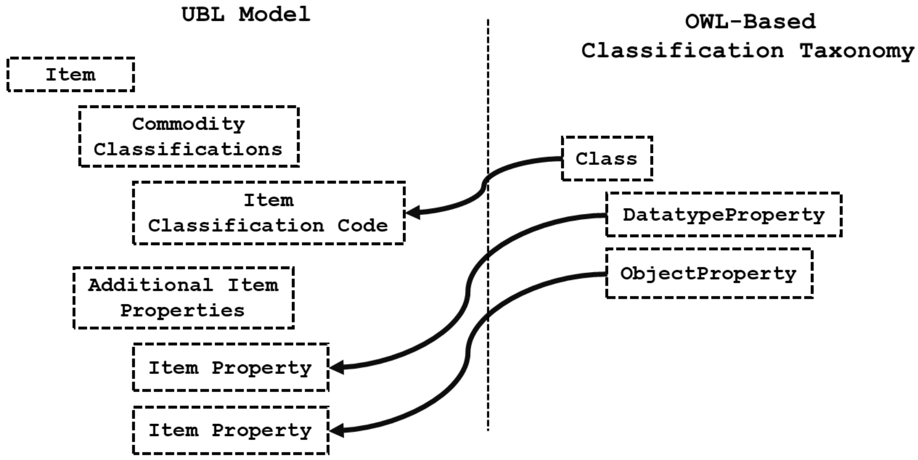

Fig. 1. Mapping knowledge from production classification taxonomies to UBL

3.3 Connecting Ordering and Transport Phases

Although business processes usually represent complex flows in conventional usage, we restrict business processes to bilateral data exchanges composed of a request and a corresponding response between trading companies. Using such business processes, we introduce two business process flows addressing the activities on purchasing and transport phases in supply chains as depicted in Fig 2.

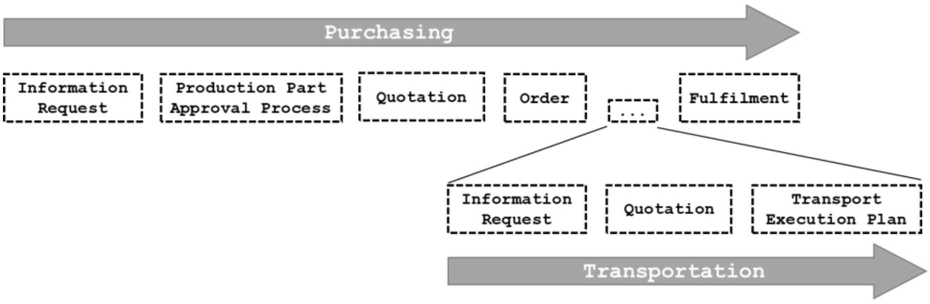

Fig. 2. Business process flows for purchasing and transport phases

The two flows represent interactions among three companies such that while the purchasing flow is composed of business processes between the buyer and supplier, transport flow is executed between the supplier and a transport service provider.

The label arrows show the direction of execution for each flow. Thus, the first two step in the purchasing flow, which are *information request* and *production part approval process (PPAP)*[7] can be classified as information inquiry steps where the buyer can request detailed information about the product of interest itself or production processes of the product respectively. The information inquiry steps provide the supplier with the flexibility to decide on the level of information to be shared with the customer considering the confidentiality or sensitivity of the requested information. From the buyer's perspective, on the other hand, the inquiry steps facilitate trust forming towards the supplier as the revealed information would validate the supplier's promises about the product or production processes. Following the inquiry steps, trading companies can negotiate on the trading terms via the quotation step. In case a successful negotiation, the flow continues with the order step. The next and last step in the purchasing flow is fulfilment. However, before proceeding with the last step, the supplier might optionally initiate a transport flow with a transport service provider with the eventual aim of organizing a transport service for shipping the ordered products to the agreed delivery address complying with the agreed delivery terms.

It is important to note that business process types included in these flows have been identified based on the requirements of use cases of the NIMBLE research project. We do not claim that the flows are complete in terms of the activities that can be performed in respective supply chain phases. For instance, UBL offers other processes such as tendering or billing that are not included in the proposed flows.

Most of the documents (messages) exchanged via the business processes are defined by the UBL standard such as UBL RequestForQuotation and Quotation documents are used in the quotation process, Order and OrderResponse in the order process and so on. We defined our own documents only for the PPAP process by following the convention of the standard e.g. by adding similar mandatory fields like *ID* or list of *DocumentReferences* to refer other documents exchanged throughout supply chain. The complete

[7] https://www.aiag.org/quality/automotive-core-tools/ppap

set of documents exchanged in the NIMBLE business processes can be found in the open source GitHub repository[8].

At the data model level, the integration between purchasing and transport happens by instantiation of a transport-related business process using the information available at the order step of the purchasing flow. Documents used in the purchasing flow contain a list of *LineItem* entities referring to the product(s) of interest as well as the trading terms agreed throughout the flow for each product. As depicted in Fig. 3, the supplier has flexibility to initiate transport process(es) for combinations of products included in the order. According to the figure, the same transport service is being used for the first two products, but another service is arranged for the last one. *Item 1* and *Item 2* configurations (as selected by the buyer), are mapped to the products to be shipped via *Transport Service 1*. Delivery related trading terms included in the order response are also mapped to the delivery terms of the *Request for Quotation Line* of the transport service quotation.

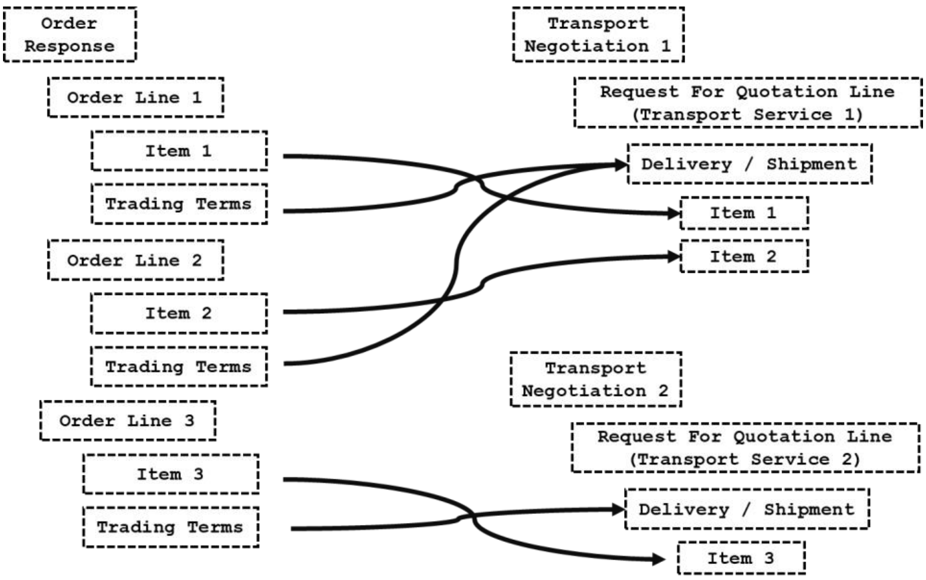

Fig. 3. Instantiating a transport quotation with order response

Furthermore, to keep a connection between the transport flow and purchasing flow, we create a document reference from the request document of the first transport process to the response document of the order business process using the *AdditionalDocumentReference* construct, which is available in all UBL documents.

[8] https://github.com/nimble-platform/common/tree/master/data-model/ubl-data-model/src/main/schema/NIMBLE-UBL-2.1/maindoc

3.4 Configurable Business Processes

For a seamless data exchange between the trading companies by also keeping their legacy systems in sync with the activities performed on eCommerce platforms, we divide each step of a business process into three sequential tasks named *Document Creator*, *Document Processor* and *Document Sender*. As depicted in Fig. 4, both request and response steps of a business process are divided in this manner. The aim of each task can be summarized as follows:

- *Data Creator*: The message to be sent to target company is generated using own representation format of initiator company.
- *Data Processor*: The message generated in the *Data Creator* task may be stored based on the data management strategy of the initiator company and it can be transformed into representation format of the target company via dedicated transformers.
- *Data Sender*: The message that can be consumed by the trading company is sent to a preconfigured endpoint. Access control policies can also be applied in this step to ensure the privacy and security of the information included in the message.

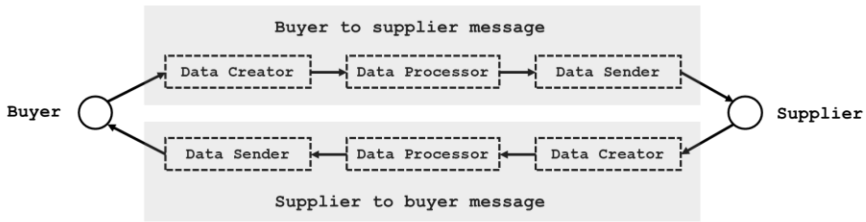

Fig. 4. Realization of a business process data exchange

As data sharing is subject to security and privacy concerns, it should be possible to skip the platform and send the data directly to the recipient. Targeting this requirement, we propose a *business process client* component that would contain company-specific logic for creating, processing and sending the message content to be implemented both for the buyer and supplier side. From a deployment perspective, a business process client might be deployed both on the platform and in companies' premises. This approach provides sharing sensitive data directly with the trading company bypassing the platform as show in Fig. 5. However, users may prefer platform to access the exchanged data on which value-added services e.g. real-time monitoring can be built as shown in Fig. 6. In either cases, clients would inform the platform so that the platform can track the status of the overall business process flow.

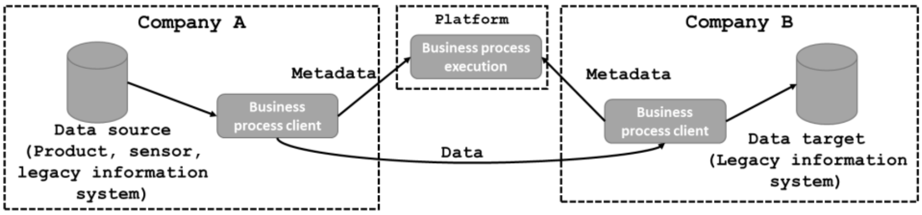

Fig. 5. Deployment topology for B2B data exchange bypassing the platform

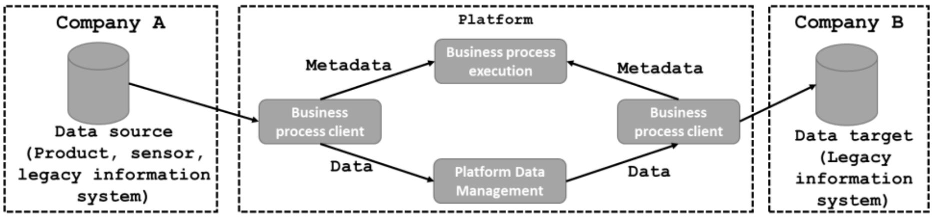

Fig. 6. Deployment topology for B2B data exchange via the platform

4 Case Studies

We present three case studies based on the NIMBLE research project (accompanying a B2B marketplace eCommerce platform addressing the four sub-problems addressed in Section 3). In the first case study, we explain how to integrate product classification taxonomies into NIMBLE and how to use them to semantically annotate and classify products. In the second one, we present a scenario covering purchasing phase. In this scenario, the supplier arranges the transport activities out of the platform after purchasing phase is completed in the NIMBLE platform. The third case study shows how to integrate both purchasing and transport phases in NIMBLE.

4.1 Case Study 1 - Product / Service Discovery on NIMBLE

4.1.1 Integration of Classification Taxonomies into NIMBLE

We have integrated two external product classification taxonomies namely eClass and Furniture Sector Taxonomy (FST)[17]. eClass is a cross-sector ISO/IEC compliant industry standard for product and service classification including thousands of product classes and associated properties. Despite being such a large taxonomy, it was inadequate in capturing furniture sector related concepts. Furthermore, the coverage of the logistics service classification was also not sufficient for the furniture and eco-house use cases of NIMBLE. Therefore, we defined FST based on the ISO Standard for the Exchange of Furniture Product Data (funStep)[9] including concepts related to industrial

[9] https://www.iso.org/organization/275604.html

processes, machinery, techniques, materials, components as well as products and product categories.

eClass is originally represented with a relational model[10]. We have transformed the relational model into the classification ontology structure proposed in Section 3.1. We defined the FST from scratch by using the proposed structure directly. Once taxonomy integrations were complete, we persisted them in a free-text index to be served to semantically annotate products while publishing them to the NIMBLE platform.

4.1.2 Classifying Products with the Integrated Taxonomies

Once the taxonomies are integrated, we were able to classify products published on NIMBLE with classes from both taxonomy. Fig. 7 shows how a transport service is annotated with classes and properties from multiple taxonomies. After the annotation phase, products become discoverable on the platform with the knowledge integrated from the taxonomies.

Now, a supplier, who would like to use the services available on the platform for an incoming order, can initiate a transport flow on them. NIMBLE provides faceted and semantic search mechanisms where the search filters are dynamically generated based on both the classes and properties ingested from the classification taxonomies. Considering the example in Fig. 7, users will be able to filter search results by service class; and duration, quality level and maritime load properties.

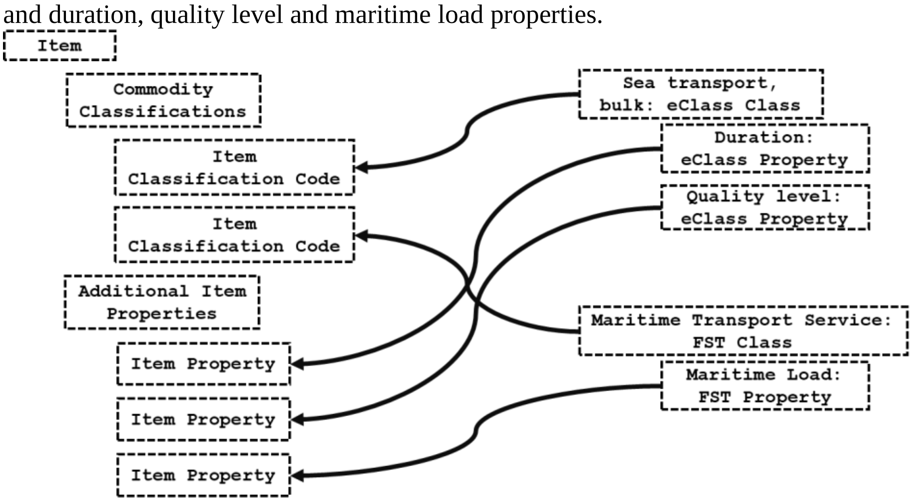

Fig. 7. Semantic annotation of transport service with knowledge from multiple taxonomies

4.1.3 A Scenario Covering Product Discovery on NIMBLE

This scenario contains the following artificial companies:

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[10] http://wiki.eclass.eu/wiki/Category:Structure_and_structural_elements

- Company A is a Russian company searching for dining chairs with specific characteristics on NIMBLE,
- Company B is a Spanish supplier of such chairs in NIMBLE platform,

The scenario has the following sequence of activities:

1. Company B publishes a product named "Wooden dining chair" by annotating it with "*Glue laminated timber*" eClass category and "*Chairs*" FST category and properties defined for those categories.
2. Company A searches for *waterproof, glued, laminated dining chairs made of timber* on NIMBLE by using the corresponding search filters generated based on eClass and FST properties
3. Company A selects a chair named "Wooded dining chair" whose supplier is Company B among many alternatives.

4.2 Case Study 2 - A B2B Scenario Covering Purchasing Phase

This scenario builds on the first scenario. After the purchasing is completed in NIMBLE, the supplier uses an external transport service provider to ship its products.

The scenario has following sequence of activities:

1. Company A initiates a purchasing flow with Company B resulting in ordering of the '*Wooden dining chair*' product. The flow might contain several sub-processes related information inquiry (via Item Information Request and PPAP) and negotiation (via quotation). Negotiation step might be repeated until an agreement is reached.
2. Company B uses an external transport service provider to ship its products by initiating a fulfilment process with Company A.
3. Upon receiving the shipped products, Company A concludes the fulfilment process initiated by Company B.

4.3 Case Study 3 - A B2B Scenario Covering Purchasing and Transport Phases

This scenario again builds on the first scenario. Compared to the previous case study, the supplier searches for a suitable transport service provider in NIMBLE and uses it to ship its products. Thus, we add the following company which represents a transport service provider in NIMBLE:

- Company C is a Spanish transport service provider which has a certificate to ship products from Spain to Russia.

The scenario has following sequence of activities:

1. Company A initiates a purchasing flow with Company B resulting in ordering of the '*Wooden dining chair*' product. The flow might contain several sub-processes related information inquiry (via Item Information Request and PPAP) and negotiation (via quotation). Negotiation step might be repeated until an agreement is reached.
2. Company B searches for a transport service provider providing a cheap service (probably a sea-based transport service) with '*Eco-Label certificate'* to ship the ordered products from Spain to Russia
    a. Company B selects "*Sea transport door to door delivery service from Spain*" service from Company C out of the search results
3. Company B initiates a transport flow with Company C to ensure that the delivery planning complies with the delivery terms promised to Company A such as delivery delivery period, incoterms, location or tax coverage. The flow results with the arrangement of the transport service for shipping the ordered dining chairs.
4. Company B ships products using the transport service provided by Company C by initiating a fulfilment process with Company A.
5. Upon receiving the shipped products, Company A concludes the fulfilment process initiated by Company B.

Fig. 8 shows a summary of an example sequence of B2B interactions from the suppliers (Company B) point of view. As a supplier, the user is able to track the sequence of activities both with the buyer and with the transport service provider. As the two set of process flows are linked to each other, we were able to visualize them easily.

4.4 Configuration of Business Process Steps

In relation to the second and third case studies, we did not perform any integration with real legacy systems and therefore did not require any transformation between different data representation formats. Instead, the following default configurations are used:

- *Data Creator*: The messages to be sent to target trading company are generated based on the UBL standard by mainly using the user interface modules of the NIMBLE platform dedicated to visualizing the data for each business process step in the purchasing and transport flows.
- *Data Processor*: In this step, the generated message is persisted in a relational database in NIMBLE along with metadata containing information related to the business process instances that the message is related to. This indicates that the *business process clients* were included within the NIMBLE platform.
- *Data Sender*: As the complete supply chain data is managed in the scope of NIMBLE, this step is only used to notify the target trading company with the B2B activities happening.

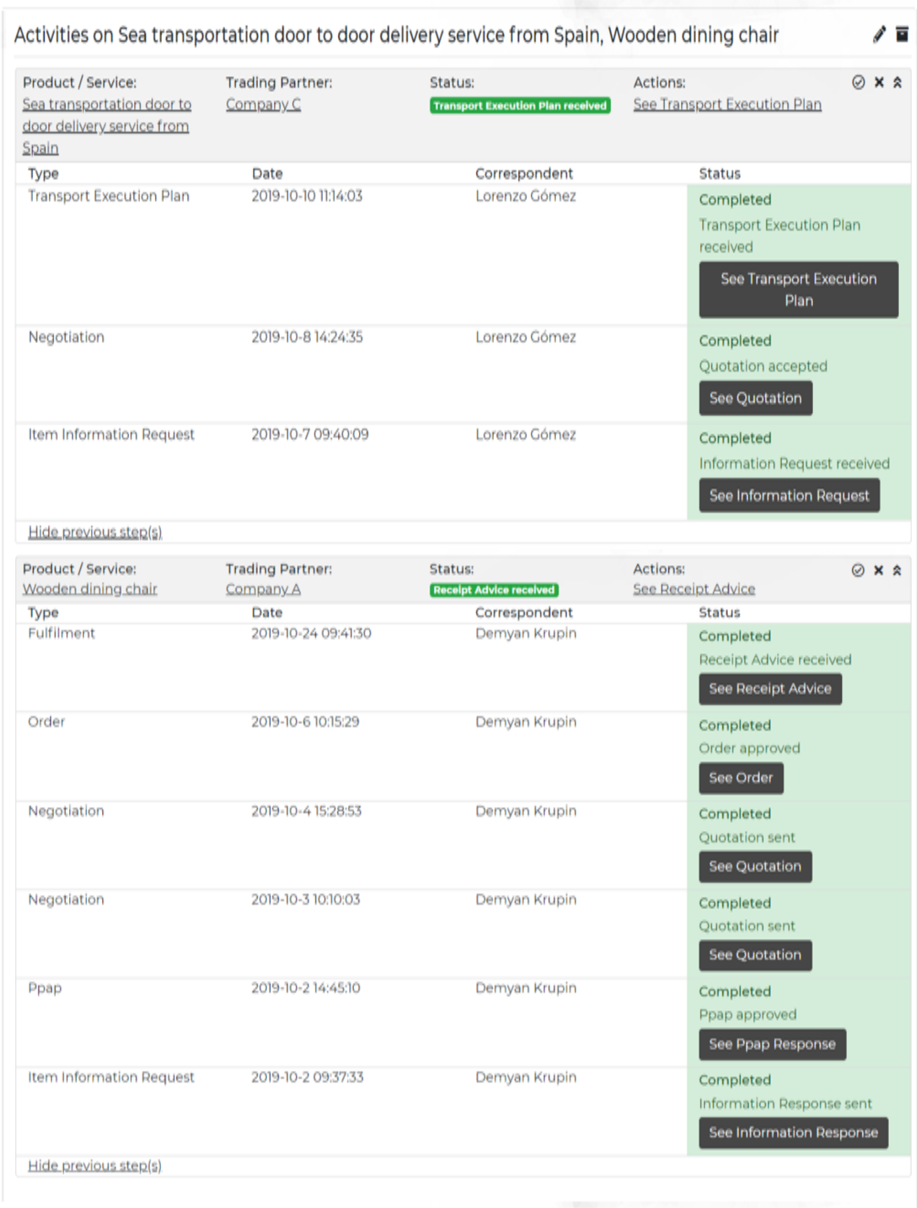

Fig. 8. Summary of B2B interactions of a supplier (Company B) with a buyer (Company A) and a transport service provider (Company C)

5 Discussion, Limitations and Future Work

By nature, NIMBLE combines B2B data exchange and eCommerce concepts. In this respect, NIMBLE features (e.g. domain-specific and semantic knowledge-based discovery of products, progressive negotiation on strategic agreements or operational planning) enabled by the proposed approach go beyond *publish* -> *sell* and *search* -> *buy modalities* offered by the available eCommerce platforms for supplier and buyer users respectively.

Trust is a critical factor for sustainability of eCommerce platforms [18]. Many eCommerce platforms including AliBaba take support from independent third-party organizations for validating their suppliers. As indicated by the end users of NIMBLE in the furniture and eco-house sectors, it is even a frequent practice to visit suppliers' premises to validate the supplier, product and production processes. In this respect, Information request and PPAP processes allow companies to establish trust as they allow acquiring more details about product and production processes, reflecting the identity and capabilities of the supplier.

Going beyond the integration of purchasing and transport flows, the business processes can be configured in more advanced ways such that a synchronization between production and transport flows can be achieved. In fact, NIMBLE already supports data channels (which are out of the scope of this study) through which production data are shared in real-time. This capability provides NIMBLE users with just-in-time supply chain operations.

A limitation of this study is partial integration of knowledge from external classification taxonomies. For instance, in addition to the class hierarchy and properties, eClass taxonomy defines synonyms for classes and property labels. So, a future work would be to extend taxonomy model can be extended to represent such additional knowledge.

Another limitation of the proposed approach is that the business process flows are composed of fixed set of business processes. It it contains Another extension might be related to provide flexibility for defining new business processes on a platform as apposed to the fixed set of current processes offered to the users.

6 Conclusion

In this study, we proposed a B2B marketplace eCommerce platform approach for a seamless B2B interactivity covering both the purchasing and transport phases in a supply chain. We decomposed the overall problem into a set of sub-challenges, each of which is addressed individually. Addressing the first challenge, which is inadequate semantic annotation of products / services, we introduced a generic product classification taxonomy model and represented two taxonomies namely eClass and Furniture Sector Taxonomy with this model.

The second challenge we addressed was integration of the classification taxonomy model into the UBL data model, which is the supply chain data representation standard used in the NIMBLE research project encapsulating this study. We defined mappings between data entities that are used to represent products and their products.

Third challenge was to integrate purchasing and transport phases of supply chains. Addressing this challenge, we first defined dedicated workflows for these two phases representing respectively the sequence of B2B interactions for ordering / receiving a product; and carrying the products from manufacturer to buyer. In addition to this high-level definition of B2B interaction flows, we presented the mechanism, at the data model level, to initiate a transport flow based on the information (i.e. details about the products to be transported, delivery-related terms agreed between the buyer and supplier) available within the purchasing workflow.

Lastly, we addressed the synchronization of legacy information systems of eCommerce platform users with the activities happening on the platform. We proposed a configuration mechanism for each data transmission step such that the creation of the message to be sent, transformation into other data representation formats, storage / transmission of the message to any endpoint and access-control rules can be configured.

We presented a case study by exemplifying product publishing supported by the semantic annotation mechanisms thanks to the integration of external classification taxonomies. Organized around the published products, we defined a use case scenario including international purchasing and transport that can be realized with the proposed approach.

Acknowledgments

This research has been funded by the European Commission within the H2020 project NIMBLE (Collaborative Network for Industry, Manufacturing, Business and Logistics in Europe), No. 723810, for the period between Oct. 2016 - Mar. 2020.

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