Using Feature and Orthogonal Variability Models to Design E-Commerce Model With (Software Product Line Engineering) technique

تصميم نظام تجارة إلكترونية باستخدام نموذج الخصائص ونموذج المتغيرات المتعامدة بالاعتماد على تكنولوجيا الخطوط الإنتاجية لهندسة البرمجيات

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1. Abstract

Software designers are looking for easy and special methods and designing tools to be easy to use, especially in large productivities designs and here launched the idea of using (Orthogonal variability model (OVM) and Feature Model(FM)) to analysis and design (e-commerce system) and building of a standard model using (FM) to facilitate the process of primary analysis and identifying the basic requirements to build (e-commerce) site and then use (OVM) to product the relations and identified with each other And find its connections that lead to the construction of the final designs for the e-commerce site. In this research we were able to determine the requirements analysis phase and design the first new and easy way in how to employ the analysis and design tools and find a semi-final models in e-commerce site design.

الخلاصة

مصمموا البرامجيات يبحثون عن طريقة سهلة وذات خصوصية وادوات تصميم تكون بسيطة وسهلة للمستخدمين والمستفيدين من البرامجيات. وخاصة في تصميم الانتاجيات الكبيرة ومن هنا بدأت فكرة نموذج المتغيرات المتعامدة (OVM) ونموذج الخصائص(FM) التي تستخدم لتحليل وتصميم انظمة التجارة الاكترونية وبناء نموذج قياسي باستخدام (FM) لتسهيل عملية التحليل الأساسي وتحديد المتطلبات الأساسية لبناء (مواقع التجارة الإلكترونية). من ثم استخدام نموذج المتغيرات المتامدة (OVM) في انتاج واستخراج العلاقات وتحديدها مع بعضها البعض و ايجاد الارتباطات التي تؤدي إلى بناء التصاميم النهائية للموقع للتجارة الإلكترونية. في هذا البحث تمكنا من تحديد مرحلة تحليل الاحتياجات وتصميم أول طريقة جديدة وسهلة في كيفية توظيف تحليل وتصميم الأدوات والعثور على نماذج الدور قبل النهائي في التجارة الإلكترونية تصميم الموقع.

2. Introduction

The softness in behavior of software became an important factor. The concept (Variability) led the changing in production and this concept includes all activities concerned with identifying and documenting changes and variation into all stages of design of systems based on Software Product Line (SPL). The Main goal for SPLE is to design a successful software product from domain engineering by managing SPL artifacts (variability modeling). There are many diagrams and models used to describe variability in domain engineering such as Feature Models, OVM, and use cases diagram and these diagrams used to produce an exact description to designers (SPL) have all adopted in this (report) and case study (E-Commerce)[1,2].

3. Case Description

Electronic commerce known for short as e-commerce and Case Study adopted by us included five Elements .These elements represent the diversity points inside e-commerce system. System consists of many of them. For instance, Services variation point that contain a range of different and varied operations, As in the process of search item there are a lot of process such as product search

methods of multi-delivery of product, multilingualism, key information about the customer and address and Contains notifications send to (customer and equipped) on the progress of procedures and results. The system also contains variation point called payment methods that specializes in the financial pay and payment [3]. There is important variation point in the system that ways to deal with the system for example, business to business, business to costumer, government to citizen and government to business. This variation point is one of the basics of the system. The system particularizes security which supports verification of the customer using biometric and traditional methods. The last system is being overwhelmed shopping card vie that Provide privileges to customers. In addition, the report implicitly all schemes required in mapping diagram that contain textual diagram, use case diagram, sequence diagram and dependences diagram [4,5].

4. Domain Engineering

In this phase, we describe and implement an OVM diagram that describes a formed detailed to the study case of E-Commerce. OVM described this case formed as proceeding more than feature model. As we design and built all diagrams domain requirement and include it with general mapping diagram that contain textual diagram, use case diagram, sequences diagram and feature model[6].

4.1 Feature Model for E-commerce system (FM)

In order to give a comprehensive and broad vision to features and the interrelationship between the relationships in the technology of (SPLE) and for the production of (Mass Product) for any product, you must use the (FM) to indicate the overall vision for this product and through the use of the interrelationships between proposed characteristics we know any of these relations are mandatory or optional or alternative, using this model (FM) will have a clear vision by team work. In the proposed model (e-commerce), we find a set of mandatory, alternative and optional features[7]. The number of features reached (45) diverse feature included in building model of e-commerce system and the figure (1) below illustrates the features and relationships, we find the relationship between the (route) with (Shopping card vie) from type (Optional), while the relationship that linked (Root) and (security) from the type (Mandatory) and the relationship that linked (Notification) with (E-mail and SMS) from the type (Alternative). The (FM) is a visual representation in the form of the diagram is very widely used in (SPLE) and input to produce good assets can be derived other products as well as can be determined the Portfolio of which are also giving a good documentation and description of the architectural design and the definition of a comprehensive problem and give a vision of how to solve them and the possibility of shedding light on how to build the code or parts of it as well is the main part that helps to give a comprehensive view of product requirements[7,8].

4.2 Orthogonal Variability Model (OVM) for e-commerce

Orthogonal Variability Modeling (OVM) is one of the approaches for modeling variability in software product line. OVM diagrams contains many simples like Variation Point (VP) shape which represent variation features in Feature Model also contain Variant simple (V). The first step is to obtain the OVM from a given FM. The FM contains both the common and variable features of a SPL. The common features are those that form part of all products in a SPL, and the variable features are those that form part of some products. However, OVM only documents the variability of a SPL. Therefore, in order to transform a FM into an OVM, it is necessary that every variability represented in the FM is transformed into a variation point in the OVM. Figure (2) represent the Orthogonal Variability Model for proposed E-commerce system. The figure contains (OVMs) for main features that e-commerce model consists of them. As we see in this figure for example OVM for security feature contain Variation Point (VP) security which have tow Variant (V) Traditional and Biometric. The connection among them is a mandatory and the relation between VP and V is OR relation and same to other features [9,10].

4.3 Dependencies

The dependencies among features can be classified to static and dynamic dependencies. The static dependencies reflect hierarchical feature relations and static constraints among features in the same level. Static dependencies include decomposition, generalization, and static constraints. Static constraints include required and excluded, which reflect dependencies between peer features, especially different variants in one variable point. Decomposition and generalization reflect dependencies between parent and child features. Figure (3) represent the dependencies between Member (VP) and member (V) as a (required V-VP), Public (V) and personal rewards (V) as a (required V – V) and Delivery (VP) with Address (VP) as a (required VP – VP)[7,11].

5. New method using hybrid diagrams

The installation of the diagrams with each other and the process of getting the model to be able to give an accurate view to the designers and specialists in the (Software architecture) is not an easy job because it needed a deep understanding in how to use those diagrams and how they are fit to work and make it easy to understand. In our model (e-commerce), we used many diagrams and linked it in a form that enables designers and developers to make any modify or develop it easily. Researchers have suggested this new method in the designıng (e-commerce system) to act as a (standard model) can work on and develop it and therein the strength of this work where the composition of the model allow the designers and developers to change and update in any part of model using analysis tools and architectural design of software engineering [5,7,12].

This model has relied on technology (Software Product Lıne Engıneerıng SPLE) for the production and development of products of the type (Mass Product) intended to reduce the cost, effort, time and facilitate the work of designers and programmers.

6. Domain Requirement

Domain requirements encompass requirements that are common to all applications of the software product line as well as variable requirements that enable the derivation of customized requirements for different applications. Requirements are documented in natural language (textual requirements) or by conceptual models (model-based requirements). Figures (Fig4–Fig6) represent the domain requirements analysis (textual) and linking with OVM for proposed E-commerce system[8,13,14].

1. UML diagrams and linking with OVM model for Item search

As noted in the figure(4), we use (Variability model) diagram of (item search feature) with all its links with (UML) diagrams where it was giving an accurate description of the procedures for using the (Textual) diagram and the statement of all activities in this property through the (Sequence) diagram with a description of the use cases by using the (Use case) diagram. This diagram is a model for the rest of the schemes that characterized the new method for researchers in the hybrid scheme[5,11].

2. UML diagrams and linking with OVM model for Delivery

Figure (5) show another example Delivery feature within the proposed method and show how to employ hybrid model for analysis and design schemes. Also we note in the diagram there is a set of links that bind the OVM with UML diagrams and that characterize the new method for researchers[9].

3. UML diagrams and linking with OVM model for Buying and selling

In the figure (6) , we note the OVM diagram of (**Buying and selling** feature) with all its links with (UML) diagrams where it was showing the connection with all other UML diagrams Textual diagram, Sequence diagram and Use case diagram[10,11].

6. Results

The technological development has made the society facing many challenges, especially in the business field. On the other hand, researchers and developers are making studies to find out new innovations that fit the development of the information society. This research has summarized the study of the (E-commerce) regarding constructing and building a standard model of an E-commerce system that fits the surrounding, requirements and needing of the market based on (software product line engineering) method and by applying two important steps in the 'Software Product Line Engineering ' which are (Domain Engineering & Application Engineering).

We started the research by studying the previous studies of (software product line engineering). Then, we designed and carried out the steps of the (Domain Engineering to specify the Domain Requirements for e-commerce model throw using a set of diagrams such as 'orthogonal variability model, textual diagram, use case diagram and the features of the model', and finally, linked all of them by hybrid method that proposed by researchers. This method produced a standard model for analysis and design domain engineering for e-commerce model.

7. Conclusion

Design a standard model for the E-commerce system in accordance with the standards of the (software product line engineering). This model has been prepared to develop and massively produce such systems to be considered as an integrated production line. The new applications production rapidly and widely relies on the satisfaction of the needing of both the clients and the market, which makes this option a big challenge. The ability of designing any product according to the standards of the (software product line engineering) easily, if the product department is subject to the specifications of the 'SPLE'. The researchers used the Software Engineering tools for analysis and design to produce a hybrid model by using a set of diagrams that can be used in (SPLE) applications. The researchers has been identified through this hybrid model how to build requirements to (Domain requirements of domain engineering requirement) and as expected use it to develop (Application engineering phase of e-commerce system) and with this, the researchers have produced a hybrid model for the development and renewal of the basic requirements for the form of e-commerce.

8. Future work

Developers that works in architecture software engineering field and using design software to produce (Mass Production) needs to define a vision and a general strategy for the required product by identifying the needs of the community for this product and this is based on the development or add some previous product's characteristics or updated products. Here, after the production of basic e-commerce system requirements in accordance with the researchers method above through their hybrid model by using analysis and design tools, this research will find ways to how to locate the right products according to the standard criteria, so we propose in the future to find a hybrid method fit with our model for the establishment of a road map that determine the basic requirements and characteristics of scalable in the proposed model (e-commerce) and can use results of this research to be real inputs to obtain the results with high specifications required.

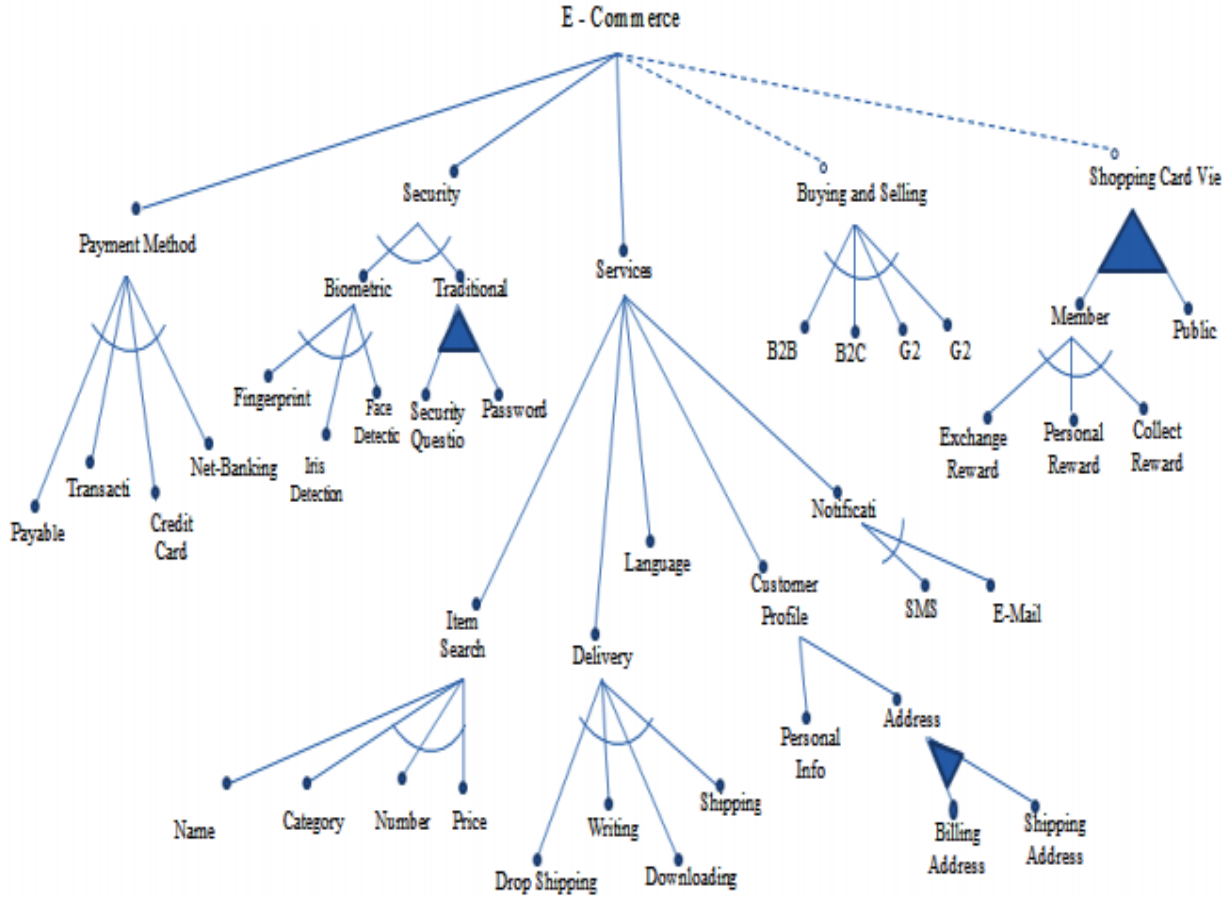

Fig 1. Feature Model diagram for e-commerce model

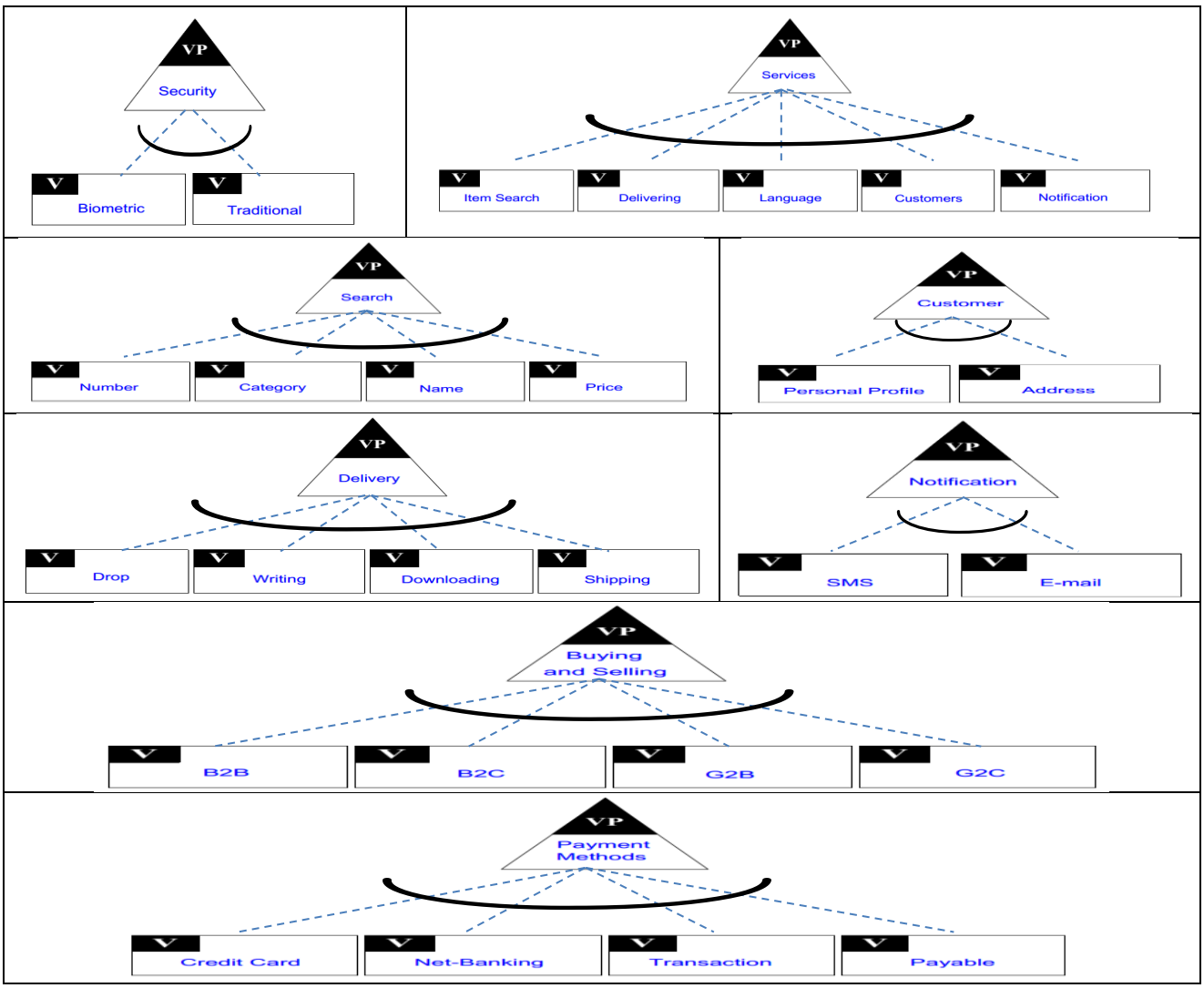

Fig.2 Orthogonal Variability Model

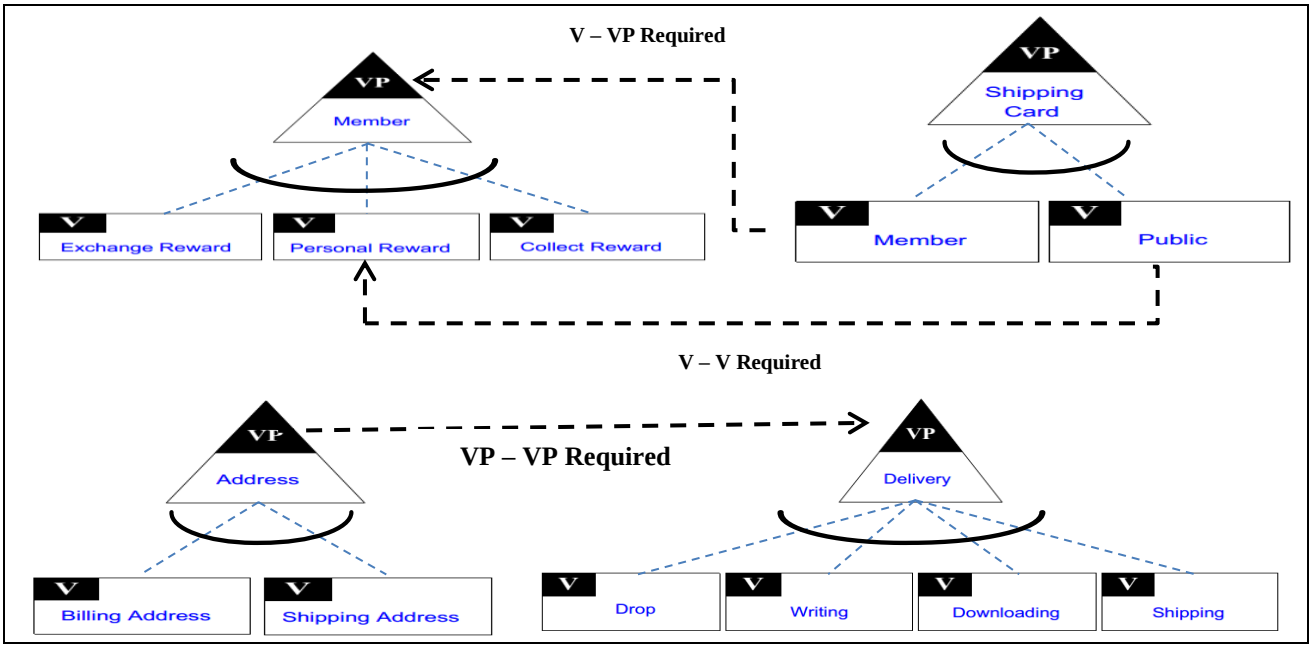

Fig. 3 Dependencies between (V-VP), (V-V) and (VP-VP)

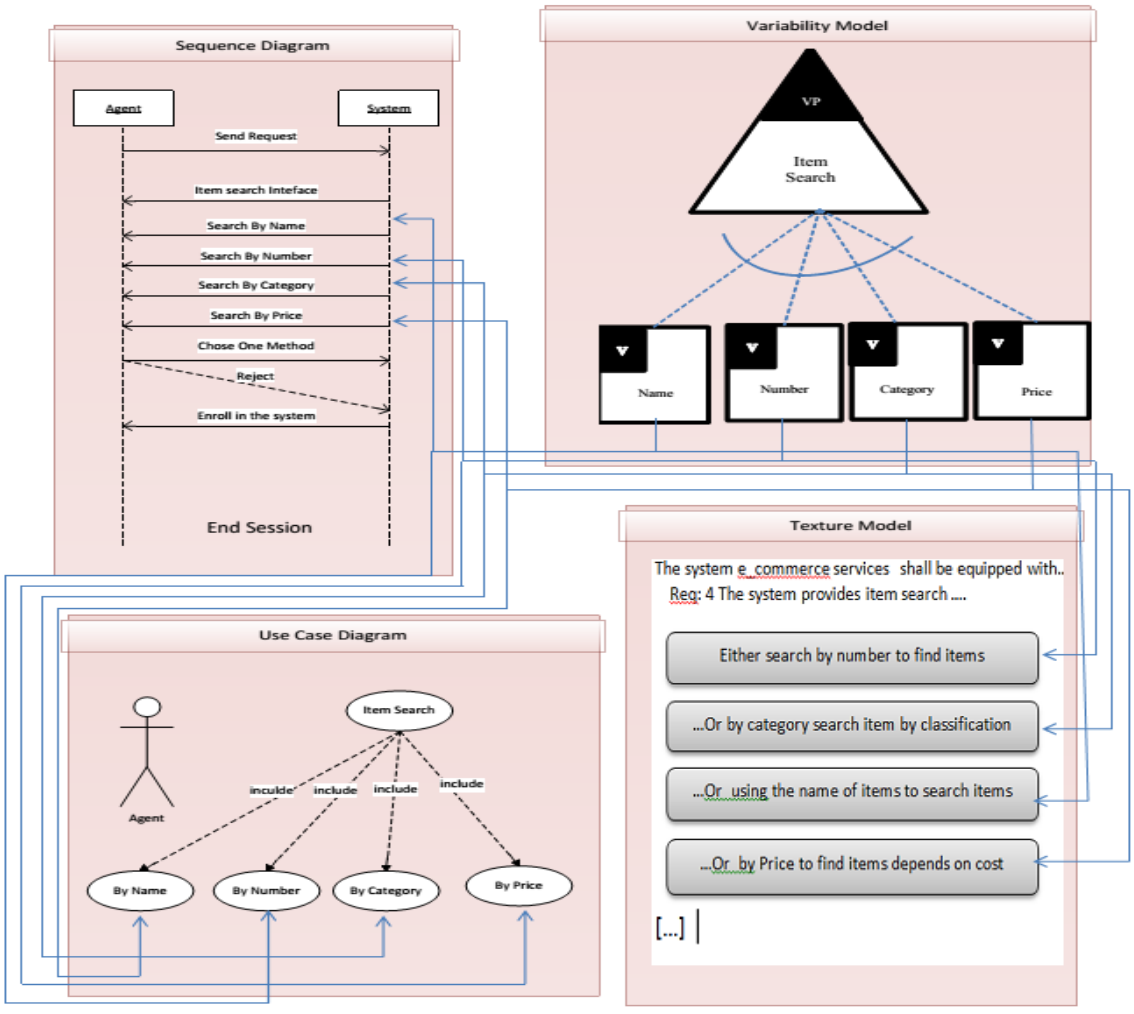

Fig. 4 UML diagrams and linking with OVM model for Item search

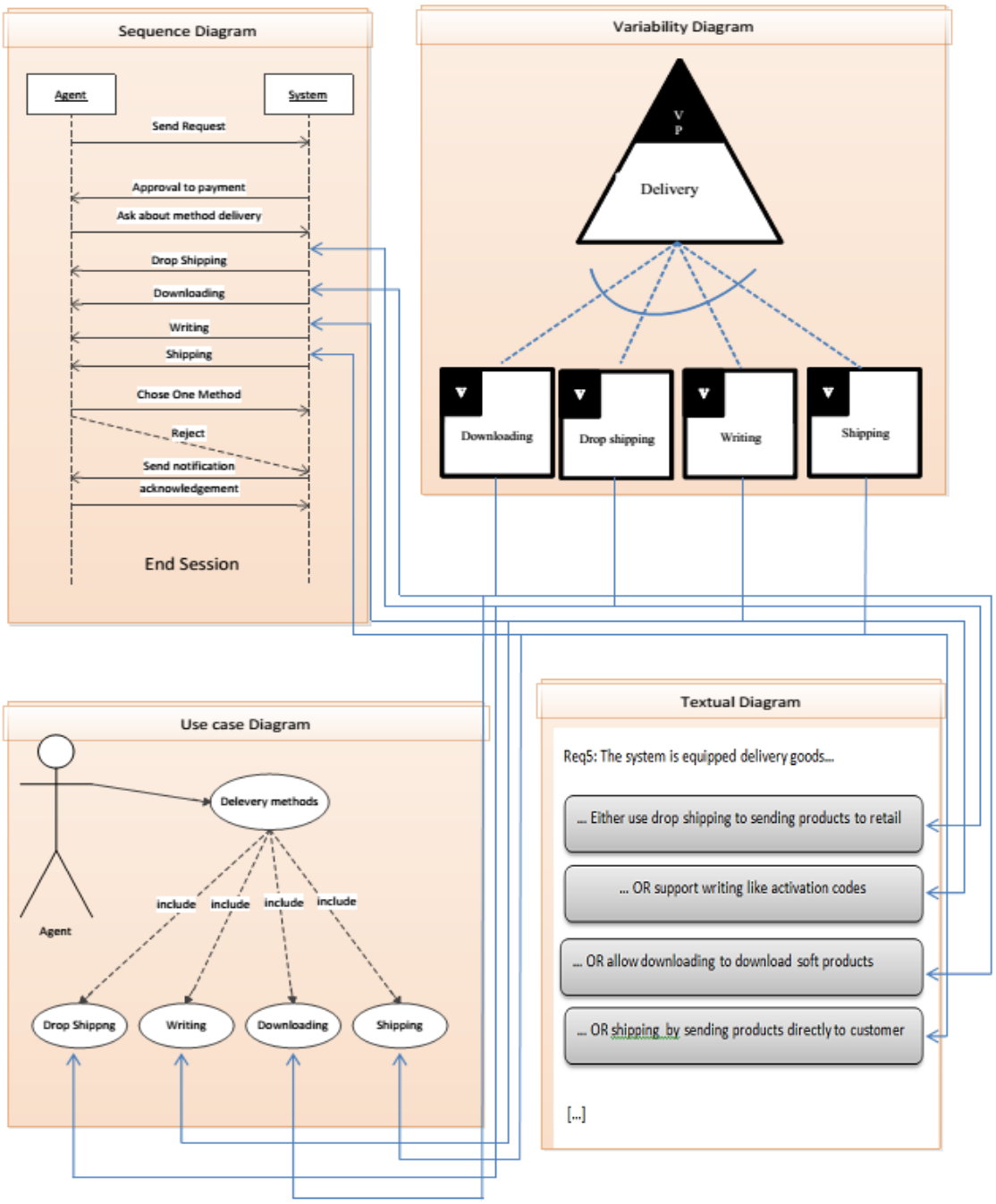

Fig. 5 UML diagrams and linking with OVM model for Delivery

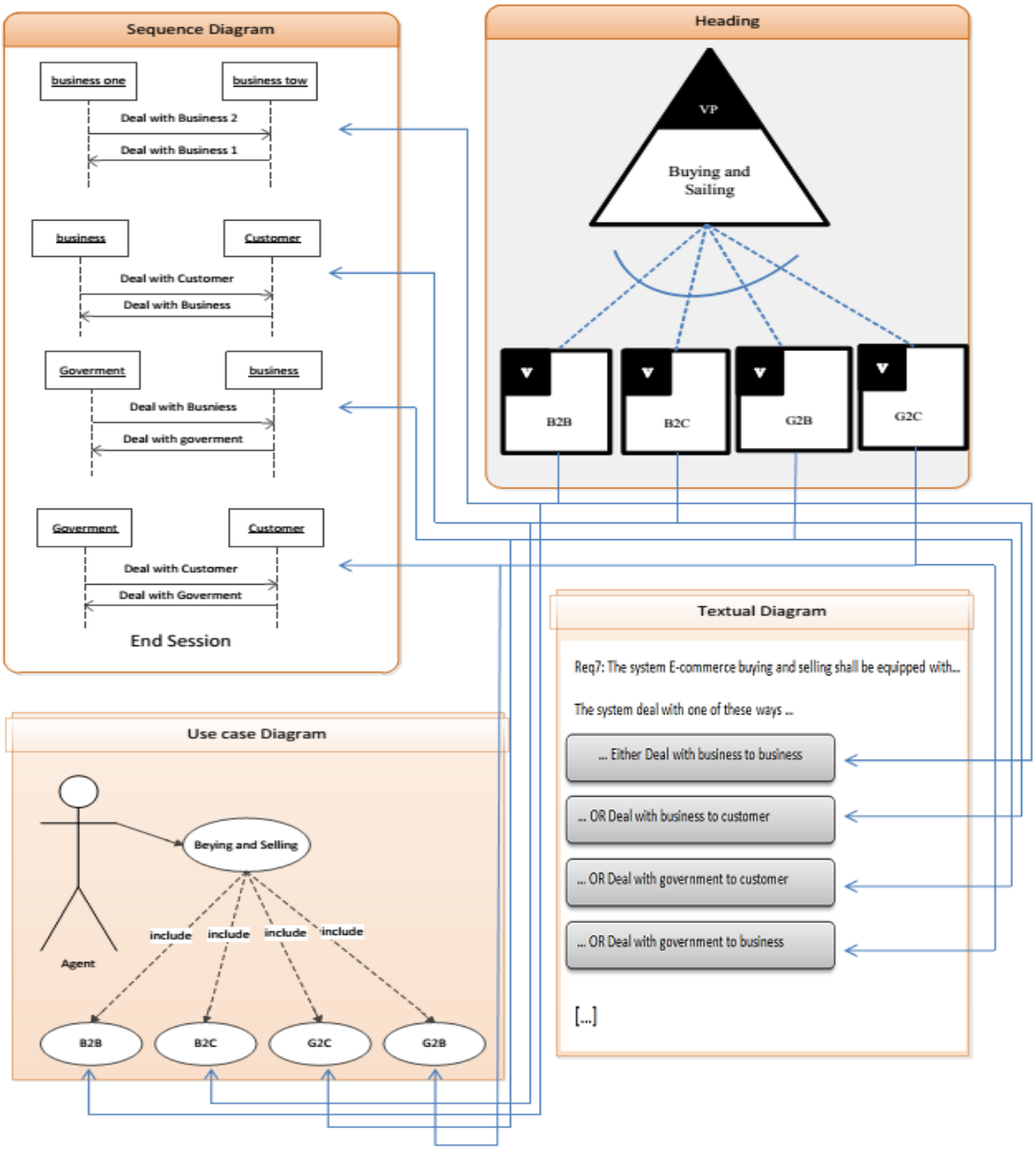

Fig. 6 UML diagrams and linking with OVM model for Buying and selling

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