

## eBIZ 4.0 new step to digitize the fashion supply chain: preliminary results

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**Abstract:** The paper deals with the preliminary research of the European Project eBIZ 4.0 – Enhancing textile/clothing sector by eBIZ and RFIDs technologies adoption. The objective of the work is to identify the main barriers and drivers in eBIZ adoption and its connection with RFID technology. The methodologies used in order to achieve the result are the explorative research and a single case based research. The main result of this paper is the approach used for the use case selection based on explorative research able to highlight weakness and strengths in approaching eBusiness standards for interoperability. This first part of the project focuses for one side on the lack of knowledge of the standard within both software houses than fashion brands and on the high effort in its implementation in fashion companies; for the other one on the possibility offered by economy solution with a multi process impact. Once the use case has started, benefits appear clear both to fashion companies than to software houses, and next steps of the project are be carried out with lower efforts.

**Keywords:** Fashion, Supply Chain, eBIZ, RFID, Standards, Interoperability

### 1. Background

European Textile/Clothing and Footwear (TCF) industry is the second product exporter in the world and the global leader in top and luxury fashion products, with more than 1.6 Million workers and more than 173,000 companies involved directly or indirectly in this market. Most of them are SMEs.

Also, the EU-28 is the second world exporter of textile products as well as in clothing and footwear thanks to its distinguishing features like continuous new design proposals, high flexibility and quality of product and services to the customer. A key enabler for the success of the unique European supply chains has been the special symbiosis between internationally acknowledged brands and networks of SMEs, which add flexibility, skills, creativity and reactivity for top quality products.

Nevertheless, the fashion industry is currently subject to new trends so, even if the supply chain cooperation model has been successful until now, it needs a new configuration to answer new market requirements and expectations.

On the supply chain, side two issues are emerging:

- the fragmentation of the supply chain, composed of small and medium enterprises with a lot of interconnections;
- the difficulty of manufacturing SMEs to keep up with demands of brands in terms of traceability (e.g. business data, data on raw materials, chemicals, etc.).

On the market side, other requirements must be managed:

- the fast increasing demand for small series and customized products;
- the increasing consumer attention to product sustainability and traceability;
- the new strategies to follow the less and less predictable consumer demands (the traditional two-seasons-based business model is obsolete);
- the reduction of the size of production lots, with more complex logistic and warehouse management.

The achievement of a strong integrated supply chain through the complete digitalization of the manufacturing processes is a crucial factor to face these new challenges.

In this context, an important role is played by standardized specifications for data exchange, like eBIZ, and Internet of Things technologies, like RFID. Regarding the standardization of data exchange, a significant step has been done in 2008, by the European Commission (DG Enterprise and Industry), promoting a first standard based interoperability initiative named eBIZ-TCF project, to “harmonise eBusiness in the European Textile Clothing and Footwear industry”.

Starting in the same years, RFID technology has been adopted in the fashion industry, in order to achieve benefits in terms of Accuracy, Productivity, Inventory management and Customer Relationship Management (Attaran, 2010).

Despite this, several authors highlight the existence of barriers to implement these technologies. In particular, here

are reported the most common cited problems (Keating et al, 2010, Gessa et al, 2016)

After 10 years from the launch of the eBIZ initiative, the purpose of the present work is to present the first evidence of a European Project named eBIZ 4.0, started in November 2016, whose goal is to take-up the well-known RFID technology in two key sectors of fashion industry (Textile/Clothing and Footwear) jointly with the eBIZ standard.

## 2. The European project eBIZ 4.0

Within this context, the work here presented, developed in the first phase of eBIZ 4.0 European project, aims to provide a further contribution to the identification of drivers and barriers towards the adoption of eBusiness standards.

The general objective of eBIZ 4.0 is to take-up the well-known RFID technology in two key sectors of fashion industry (Textile/Clothing and Footwear) jointly with eBIZ common standards, in order to allow the flow of digital information along smart and flexible supply chains that reinforce and deepen the quality of collaboration between SMEs and large industry and retail, and turns the paradigm from just supplying a quantity of SKUs (Stock Keeping Units) into sharing design, production and distribution of products with a digital identity; it enables companies in managing logistic processes, having *fresh* information about stocks orders and location of the goods.

On the other side the diffusion of RFID outside the boundaries of the own Information Management System is hampered by the difficulties in exchanging all the information associated to the identifiers set on the goods.

These goals can be reached by the commercialisation of new smart services based on the use of eBIZ standard of communication among industries of the textile/clothing sector, allowing interoperability among different company systems (ERP, SCM) and logistics management systems using RFID tags, focusing on business models similar to those used in the Open source software development. The eBIZ 4.0 solution, based on the parallel use of RFID and interoperability standards, will support textile/clothing producers in increasing the traceability of products, improving the time to market and warehouse management and, at the same time, reducing data exchange barriers with external providers shortening the distances along the supply chain. The adoption of eBIZ 4.0 will enable the industries in creating and managing large networks of relationships inside and outside the supply chain, implementing new business models in traditional production chains and boosting the fast response process for EU enterprises.

Starting from this point, in the first phase of the eBIZ 4.0 European project the identification of market barriers and benefits perceived by software houses and their customers (i.e. fashion companies) have been achieved through a specific activity, and have been used as basic elements to identify the requirements for a case study to implement the eBIZ approach. The results are reported within this paper.

## 3. State of the art

The TCF industry represents traditional manufacturing in some of the European Union (EU) member countries. As reported in the literature, the TCF industry tends to locate production in territorial industrial districts. In addition, the various production tasks that integrate the TCF value chain have a heterogeneous and interrelated character (Bindi et al, 2016).

Recently, however, this industry is facing important challenges that may have strong impact on its own ability to survive and perform at an efficient level, particularly regarding operational function. Due to this transformation, in the last fifteen years, many initiatives have been carried out in order to increase the exchange of information between small and medium enterprises and brands, and the traceability of goods between suppliers and brands (De Vries et al, 2009).

Regarding the first topic, previous studies investigated the crucial role that eBusiness standards for data exchange play at this purpose, especially in production contexts with high number of SMEs, like the TCF one (De Sabbata et al, 2010; Gessa et al, 2005).

The topic of the standard adoption in TCF supply chain has been tackled from different points of view and by different projects and initiatives (Asuman et al, 2008; De Sabbata et al, 2008; De Sabbata et al, 2009; Duque et al, 2009; Rishad.et al, 2014). Standards are widely recognized as interoperability enablers that can favor the integration across the supply chain, increase the quality and extend the collaboration between brands and SMEs, avoiding these last ones low involvement. Nevertheless, the use of standards is still too low related to potential benefits coming from their adoption but, as reported in the literature, this is due to several reasons. A lack of information and awareness on the importance of the standardization process is highlighted in (De Vries et al, 2009).

The complexity of the specification as an entry barrier in interoperability standards' adoption, the definition of User Profile and the adoption of methodologies and tools to facilitate their adoption are evidenced and proposed by (Brutti et al, 2010).

The adoption of a testing strategy in order to speed up the deployment of interoperable solutions is suggested in (Brutti et al, 2011; Brutti et al, 2014). Despite this, the lack of the adoption of a standard from SMEs to support the interoperability and the exchange of the information among the Supply Chain remain critical aspects in the TCF Industry (Gessa et al, 2016).

On the other hand, the well-known RFID technology is one of the most used solution in the fashion Industry in order to facilitate the track & trace of the product and its raw materials. Tracking systems are generally developed using different types of barcodes or based on RFID-technologies. According to IDTechEx, the fashion and apparel industry has been the most active in integrating RFID tracking as part of its SCM operations, with RFID penetrated about 7% of the total apparel market (Harrop and Das, 2013).

RFID solutions aim to reduce errors in handling operations and shipments, bringing better inventory accuracy to stores and DCs, reduce the probability of out-of-stock, improve the customers experience, etc. RFID technology can also assist in collecting data on store inventory and consumers' shopping and buying behaviors (Azevedo and Carvalho, 2012; Sarac et al, 2010). However, implementing RFID technologies cannot be easy due firstly to the poor awareness about the technology and its potential (Visich et al, 2009); secondly many retailers could have difficulties in the implementation of actual business cases because they must be connected to logistic networks of different suppliers without a common standard.

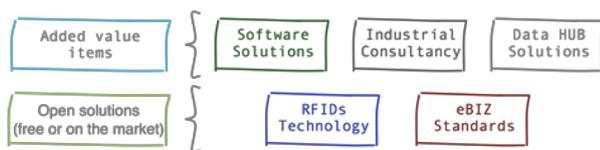


Figure 1. RFID and eBIZ relationship.

#### 4. Objective and Methodology

To achieve the preliminary eBIZ 4.0 European project's goals, a 2-steps implementation has been conducted.

The first step has been the market analysis in order to identify the market adoption of RFID and eBIZ solutions, highlighting drivers and barriers. To reach this objective, together with literature analysis and focused interviews, an online survey has been defined based on a previous eBIZ-TCF project [8] internal questionnaire on the main results from eBIZ perceived by software houses and their customers (i.e. fashion companies).

As second step, the case study has been implemented in order to highlight how to overcome some of the main barriers related to the eBIZ implementation collected from the analysis, enhancing strengths and opportunities offered by the eBIZ standard summarized in a SWOT analysis.

#### 5. The analysis

Regarding the context analysis, as main instrument, a survey has been developed in order to understand the adoption level of RFID and eBIZ standard and the reasons why a company decides implementing or not these technologies. This analysis has been conducted on both software houses and fashion companies.

We have decided to submit the survey to these two main categories of stakeholders because, on one hand, the feedback from the software houses will show the reasons why they are developing or not developing IT solutions that include standardized flows and/or interfaces to RFID technology. On the other hand, the analysis on the fashion companies will show if these technologies are perceived as enablers for competitiveness or not. Another purpose, regarding both software houses and fashion companies, is understanding how much companies, operating along the fashion supply chains, know about these two technologies.

The survey has been translated into four different language, English, Italian, French and Spanish, and has been

distributed into the following countries: Bulgaria, Croatia, France, Germany, Italy, Romania, Spain, and Tunisia. 82 answers have been collected (12% rate) and the sample is composed by 75% of fashion companies, the remaining by software houses.

Some other interesting results have been collected from specific interviews on Germany market, where traditional EDI standard (EANCOM mainly) and RFID are widely used in the downstream of TCF supply chain; on the other side there is a very low implementation in the upstream (from final product brands up to their suppliers) even though the benefits of interoperability solutions are clear. In order to have a full vision of the market a SWOT analysis has been implemented starting from data of survey, literature and interviews. Analyzing the SWOT the project partners have identified a specific “case study” composed of 11 SMEs (located in Italy and China) interested in quick implementations and cheap IT solutions in order to speed-up the operations, reduce errors (in orders and advancements for example) and improve their networking cooperation at international level (Italy-China). The members of the supply chain did not know eBIZ standard and were also interested in implementing RFID in the future

#### 6. The case study

The case study analysis has been carried out during the development of the first Italian pilot of the eBIZ 4.0 project that involves a big brand owner operating in the fashion industry. The involved supply chain actors have been the brand owner itself and 11 labor suppliers located in Italy (10) and China (1).

According to one of the main evidences from the survey results, the pilot brand owner has been chosen among the fashion companies that did not know eBIZ before, in order to better understand both perceived and real benefits and barriers in the implementation of the standard.

In the same perspective, the choice of the flows to digitalize has been based on the brand's priorities in terms of benefits (reduction of time and costs) coming from the flows automation; so, the implemented standardized information flows have been three: master data, commission orders, advancement.

Objectives for the conduction of the case study are the following: (i) the validation of the preliminary results from the survey, (ii) the extension of the eBIZ standard application and knowledge in the fashion market segment, and (iii) the validation of an easy-to-apply procedure for standard implementations (guidelines).

As preliminary step for the pilot, a meeting with all the involved suppliers was organized for identifying the expected benefits. The reason, it is important to remark this point, is that one of the main barriers for a standard implementation resulting from the survey is the high effort needed for the implementation compared to the perceived expected benefits. According to this, during the meeting the expected benefits have been highlighted, summed up in enabling suppliers to exchange information to other companies that use the eBIZ standard without developing

specific SW interfaces for each business partner, and drastically reducing manual errors in the data entry.

Then the pilot implementation has been developed following the procedure developed during the first phase of eBIZ 4.0 project; some steps of the procedure are shown in Fig.2.

The implementation procedure started with the analysis of the three selected information flows and the definition of the Abstract Data Models representing the information to be exchanged. In order to define them, a processes analysis has been required to readapt the existent Abstract Data Models for the textile industry (focused on yarn, fabric and knitwear production) according to the peculiarities of the multiple good production and complex marketing strategies of the brand such as specific product variants (model, part, color, drop, size and other product classifications), production for specific events or preferential origin country certification in multi-tier supply chains.

After that, each Abstract Data Model has been mapped in an eBIZ document type and the corresponding three *use profiles* have been defined. In detail, a use profile of eBIZ document is a conformant customization tailored for the specific supply chain: it restricts the eBIZ document to data sets and values required for the specific implementation context while maintaining the conformance to the general specifications.

The reason for this action is that eBIZ documents are designed to support any kind of TCF supply chain, so they include also information used in some specific real cases but, at the same time, they cannot be too much peculiar for a scenario. The definition of the use profiles resolves this matter and is an important step of the eBIZ implementation procedure in order to reduce the implementation costs that is perceived as one of the main barriers for a standard implementation.

Finally software applications, able to produce and use eBIZ documents that are conformant with the defined use profiles, have been developed both brand and suppliers side.

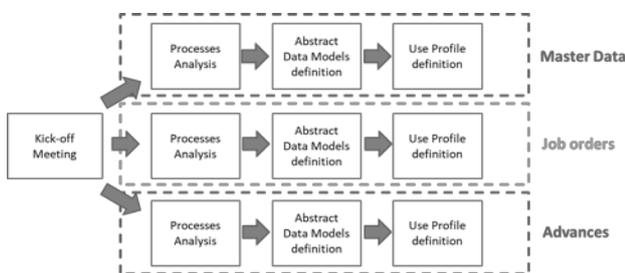


Figure 2. Some steps of the eBIZ implementation procedure.

## 7. Results

Regarding the context analysis, the main evidence of the questionnaires regards the knowledge level of RFID and eBIZ and their application area. Even if RFID and eBIZ are

not recent innovations, their benefits and in some case the technologies, they are still not known enough in the fashion industry. In general, terms, RFID is more known than eBIZ, but there is still the 10% of solution providers that declare they do not know anything about eBIZ, and the 9% of Fashion Companies that still are not informed about RFID. Analyzing in detail the results of the companies that know this standard and technology, the benefits in their adoption is not always clear.

In the detail, Figure 3 shows the RFID and eBIZ respectively level of knowledge (distinguishing results between Fashion Companies and Software Houses).

Regarding the implementation, the cost of hardware and software equipment contributes to limit the spread of RFID technology. In fact, while the most important companies can deal with RFID costs (tag, reader and software platform), for small, ones investment is not always sustainable.

On the contrary, the awareness about eBIZ in small companies is probably due to two factors:

- eBIZ has been designed specifically for the Textile, Clothing and Footwear sector that is characterized by SMEs with strong need to operate in network to reduce costs and errors;
- the implementation costs of eBIZ are lower than those required for the implementation of RFID technology and therefore result accessible and sustainable by SMEs.

2.1 knowledge level	Fashion companies		Software Houses	
	RFID	eBIZ	RFID	eBIZ
I am an expert	8%	3%	29%	10%
I use it	13%	7%	10%	10%
I know how to use it	7%	2%	24%	15%
I know its applicative domain	28%	33%	24%	30%
I am finding out about how to use it	18%	5%	10%	10%
I know just the acronym	17%	18%	5%	20%
I don't know anything about it	8%	32%	0%	5%
Not considering	0%	0%	0%	0%

Figure 3. RFID and eBIZ knowledge level.

As a regards the RFID and eBIZ adoption level, the RFID adoption for the Fashion Company is at least considered for Traceability and Inventory Management though the implementation is almost equally distributed between the different areas (from 14% to 48%), as shown in Figure 4 splitting by different areas (e.g. inbound and outbound

logistics, inventory management, production advances monitoring). For the Software Houses the highest rate of RFID adoption is for Inbound/Outbound Logistics and Inventory Management but the percentage of Traceability and Production monitoring does not look much smaller.

To analyze the eBIZ adoption level, we have used the same approach that has been previously mentioned for RFID technology. In this case, the considered areas for the standard adoption are the ecommerce platform feeding, production forecast, sales reporting and inventory.

The different results for Fashion Companies and Software House are shown in the Figure 5. The first evidences is that the implementation of eBIZ standard, for the Fashion Companies, is equally distributed between 3% and 10% in the different areas of application. The subcontracting and production monitoring area is the strongest implementation area with the 10%.

Adoption Areas	FC		SH	
	Impl	Not impl	Impl	Not impl
Inbound / Outbound Logistics	17%	30%	43%	0%
Inventory Management	13%	42%	48%	5%
Anti-theft control / Security	18%	57%	14%	38%
Traceability	18%	25%	33%	10%
Production advances monitoring	12%	37%	33%	19%

Figure 4. Percentage of RFID adoption level in different areas of implementation

Adoption Areas	FC		SH	
	Impl	Not impl	Impl	Not impl
eCommerce platform feeding	7%	55%	14%	24%
Production forecast	5%	58%	14%	33%
Purchases	3%	53%	19%	33%
Transport and logistics	7%	52%	29%	24%
Production planning	5%	53%	29%	29%
Quality control	7%	50%	29%	29%
Invoice management	7%	52%	19%	33%

Subcontracting and production monitoring	10%	58%	38%	24%
Sales reporting and Inventory	3%	55%	19%	31%

Figure 5. Comparison of eBIZ adoption level between Fashion Companies and Software Houses

Even if no confirmatory results can be demonstrated, due to the explorative nature of the survey and the dimension of the sample, the following hypothesis can be done:

- RFID is a well-known technology within the fashion industry.
- The main important barrier is that eBIZ standard is almost unknown in the fashion industry.
- For companies that know RFID and eBIZ, using a standard information flow that automatically takes information at the single item level reading an RFID tag is a quite common perceived benefit.
- One of the main barrier for a standard adoption is the efforts needed during its implementation.

Collecting the survey results, the literature analysis and the main results of the focus done on the German market, we summarized the first part of the project with a SWOT Analysis for Fashion Company and Software Houses.

SOFTWARE HOUSES

- **Strengths:**  
 RFID: improve performance solution and services  
 eBIZ : reduction of issue of non-interoperability with third parties and  
 eBIZ: integration with foreign or international systems  
 eBIZ : economy solution  
 RFID : common vision of impacts between FC and SH  
 eBIZ : reduction of software implementation costs
- **Weakness:**  
 eBIZ Low Knowledge level  
 eBIZ :not clear vision of standard benefits  
 RFIDs adopted only by large client-company  
 eBIZ: Lack of involvement of SH costumers  
 eBIZ: more easy ( in time and resoucers) to creat own solution
- **Opportunities:**  
 Sme interested in eBIZ  
 eBIZ: Standard data format is chosen to solve problems of communication/interop and data exchange  
 adoption in own product of standard data format  
 eBIZ: definition of "Use profiles"  
 eBIZ: development of methodologies and tools for conformity
- **Threats:**  
 RFID: Managing issue regarding IT infrastructure ( data management and integration wit other systems)  
 RFID : technical risk ( false reading, interferences, ec..)  
 RFID: Popularity of bar code  
 RFID: Privacy regulations and laws not aligned  
 Relevance of GS1 standard  
 eBIZ: standard specification are abstack /complex and there is lack of examples

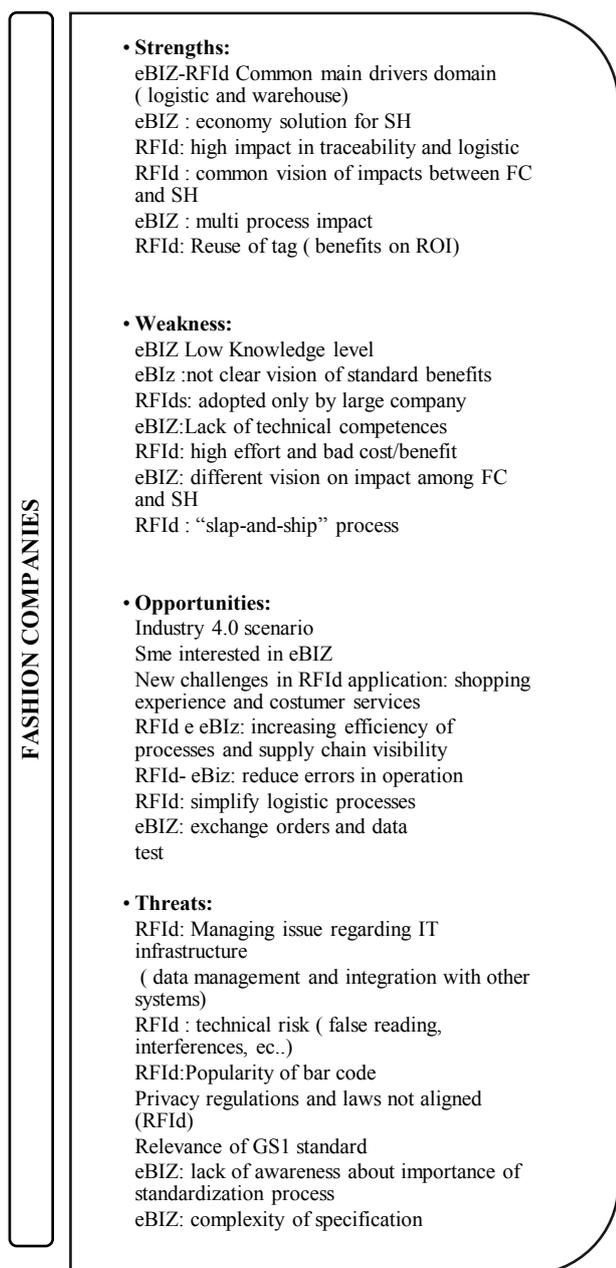


Figure 6. Swot Analysis

Starting from this result, the case study has been conducted in order to better understand how to gather opportunities and threats, to test how to improve strengths and reduce weakness. The partner is a fashion company who didn't know the eBIZ standard before and interested also in implementing RFId solution in the future. The case study started at the beginning of 2017 and now the three selected information flows have been implemented: master data, job orders and advances.

An eBIZ implementation has been defined, composed by three different steps: data flow analysis and Abstract Data Models definition, use profile definition and software application development.

Thanks to a preliminary meeting with the involved suppliers the main expected benefits and barriers for a standard implementation had been identified. Then, training actions had been addressed both for the users and for the software houses involved in the pilots, in order to explain them how to read and write eBIZ flows for their clients.

The potential benefits, on the other hand, are well defined since the beginning of the project to the entire stakeholder: suppliers will be enabled to exchange information flows with other companies that use the eBIZ standard not developing specific SW interfaces and manual errors in the data entry will be drastically reduced.

These benefits will be tangible and measurable both to the brands and to suppliers only in the second step of the project, when the implementation phase will be completed.

### 8.Conclusion

The present paper presented the preliminary results of an ongoing research on the identification of drivers and barriers in the adoption of eBIZ standard and RFId technology in the TCF industry.

The methodology used is an explorative research followed by a single case based research. The main result of the explorative result is represented by the fact that eBIZ is a still not kown standard, both between fashion brands than on software houses. After the survey, a case based research with a fashion company implementing three different eBIZ information flows has been followed. This second part of the research confirms that the main barrier in eBIZ adoption is the high effort in training needed in order to conclude the adoption of the standard.

As next step of this research, we need to test the validity and completeness of the use profile with the brand owner and suppliers, in order to evaluate if also the generic XML Schema has to be adapted.

Moreover, the application of the online eBIZ validator will be required, allowing the involved SC actors to independently test the validation of the generated information flows. More in detail, the online eBIZ validator is a web application to automatically check if an XML document is compliant with the eBIZ specification and it is based on an XML Schema, to check the syntax and the conformance with the standard, and a Schematron, to check the compliance with the use profile.

The definition of a XML-based test bed platform that allows the involved SC actors to execute test activities designed to verify the conformance of their solutions and also their capacity to interoperate will be another next step of this research. The main goal of this is to support the developers in testing their implementation in order to improve their correctness in terms of alignment between the real and the expected output.

Finally, we are planning to enlarge both the number of developed information flows for the clothing industry and the sample, in terms of new case studies inside and outside the clothing market segment.

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