

# From E-commerce to Social Commerce: A Framework to Guide Enabling Cloud Computing

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## **Abstract**

Social commerce is doing commerce in a collaborative and participative way, by using social media, through an enterprise interactive interface that enables social interactions. Technologies such as Web 2.0, Cloud Computing and Service Oriented Architecture (SOA) enable social commerce. Yet, a framework for social commerce, putting Enterprise Social Interactions as central entities, would provide a strong business justification for social commerce design and adoption with these enabling technologies. This work first proposes a framework for social commerce-oriented business that captures: (a) three main entities: Enterprise social Interactions, Actors, and Business Processes (and their output: products/services), (b) the relationships between these entities, and (c) the constraints (if any). Then, it focuses on the conceptualization of the key entity, Enterprise Social Interactions, to shape the required enterprise interface that promotes openness, collaboration and participation, which enables the required knowledge emergence and intelligence for the value (co-)creation. A central component of the enterprise technology architecture, we refer to as Enterprise Social Interaction Manager (ESIM) realizes the interface. An example shows how the realization of the ESIM functionalities with Web 2.0, Cloud computing, and SOA enables the different categories of collaborative B2B integration that underlines and backs social commerce.

**Keywords:** Social commerce, Business model, Framework, Enterprise social interaction manager, Social media, Web 2.0, Cloud computing, SOA

## 1 Introduction

Information and Communication Technology (ICT), namely Web 2.0, Cloud Computing, and Service Oriented Architecture (SOA) enable business opportunities (e.g., product or service innovation, relationships in the value chain, or infrastructure management) and even drive changes towards new business models [5], [22], [25], [51], [54], [58], [64], [66]. From e-commerce perspective, these technologies and architectures enable a new kind of commerce referred to as social commerce [20], [24], [35], [39]-[40], [53], [65], [68], [72]. Social commerce involves multiple disciplines, including marketing, sociology and psychology, and computer science [35], which justifies the many definitions of the concept. Marsden [46] has enumerated more than twenty. For instances, [20] consider social commerce as "a noticeable trend in online marketplaces where businesses leverage social media as a direct marketing tool to support customer's decision making processes and buying behaviors." [68] Consider social commerce as "applying social media applications to shape business, hence transforming a market for goods and services into socially centered and user-driven marketplaces." In this paper, social commerce is doing commerce in a collaborative and participative way by using social media through an enterprise interactive interface. The interface enables social interactions that generate value for the whole value chain. The interactive interface may be any of the existing Web 2.0 applications, a combination of the existing Web 2.0 applications, or built on top of the existing Web 2.0 applications, depending on the specificity and requirements of the enterprise.

Social commerce differs from e-commerce (namely B2C) in many aspects, including business model, value creation, customer connection and communication, system interaction, design, and technology platforms. For instance, e-commerce sees only an individual, whereas social commerce sees the community built on conversation [35]. E-commerce is enabled by Web 1.0, where the communication is one-way, whereas social commerce is enabled by Web 2.0, a platform that supports social media and allows bidirectional communication (for the interactions), which results in creation and sharing of user generated content. However, a strong B2B integration (with partners and suppliers) would strengthen social commerce, i.e., a strongly integrated value chain with B2B integration will enable the enterprise to timely and perfectly interact with its customers.

In social commerce, social media such as blogs, collaborative projects (e.g., Wikipedia), social networks (e.g., Facebook), content communities (e.g., YouTube), or virtual social worlds (e.g., Second Life) generate value to the whole value chain (e.g., customers, enterprise that provides the social interaction platform, partners, suppliers, and even employees) and beyond (e.g., other businesses that use the interaction platform for advertising) [59]. Indeed, social media allow:

1. Enterprise to build relationships with customers, increase traffic to their web sites, identify new opportunities, create communities, distribute content, collect feedbacks from customers, and support their brand [27].
2. Users to be more connected, knowledgeable, participative and voluntary collaborative. Social media expand the experience, knowledge and power of the users as participants in business and social processes [20]. It results in new perceptions and behaviors of the users [36].
3. B2B companies to communicate with their customers and suppliers, build relationships and trust, as well as to identify prospective partners in terms of B2B selling [56]

Social media users are often allowed to not only to express their opinions on products or services, and even business processes (e.g., reviews and ratings) [69], but also able to contribute by making recommendations. For instances, Volkswagen has added a social layer to its online car configuration allowing people to share personal car configuration and get feedback from their social graph; of the 450K people using the configurator in November 2010, nearly 1/4 modified their design based on feedback [46]. Nokia uses internal wikis to update employees on projects status and trade ideas that are used by other employees.

Therefore, enterprise needs to get involved and promote social interactions with its environment (e.g., customers, partners, suppliers, regulatory authorities, or even competitors) as well as employees, specially that: (i) the performance of an enterprise depends on how its parts interact, not on how they act taken separately [2], (ii) collaborative efforts of networked users and services usually lead to better output [16]-[17], [37], [57], (iii) the user perceptions, preferences, and decisions are influenced by the content generated by people interacting through social media applications, which may shift power from company to customer [35], and (iv) none of the major social media providers (e.g., Facebook, YouTube) has yet figured out how to bring commercial transactions directly to their platforms [46]. These kinds of interactions, we refer to as Enterprise Social Interactions, allow enterprise to capitalize on the intelligence and knowledge that emerge from the user generated content, which would enable a managed social commerce.

Promoting Enterprise Social Interactions, with respect to social commerce, is possible thanks not only to Web 2.0, but also to Cloud Computing, and SOA. Web 2.0 is a platform that enables social media, which facilitates: (i) collective action and social interactions with rich exchange of multimedia information [52], (ii) formation and management of online Internet communities [3], (iii) online interactions and user contributions to assist in the

acquisition of products/services [41], and (iv) creation and sharing of user generated content. Cloud Computing addresses the required infrastructure, platform and services [48] that allow enterprises not only to focus on their core business and adjust resources to meet fluctuating and unpredictable business demand [11], but also manage the more generated, linked, aggregated user generated content (from social media) and required services, expected in social commerce [34]. SOA promote agility and responsiveness to the changes [7], [22] by using the existing Cloud computing infrastructure, platforms and services on demand.

Yet, the few studies that have explored social commerce focus on the capabilities and role of social media and the enabling platform that is Web 2.0. They have neither focused on business modeling perspective of social commerce, nor on a framework that would provide a model for social commerce and guide its adoption and realization with social media and supporting ICT, including Web 2.0, Cloud computing, and SOA.

Therefore, a framework for social commerce, putting Enterprise Social Interactions as central entities, would provide a strong business justification for social commerce design and adoption with an enabling ICT that aligns with business.

This work advocates Enterprise Social Interactions as the glue of social commerce that should be presented as: (i) a critical, central element of business model, and (ii) a dimension (at different levels of abstraction) of the enterprise architecture. The business model emphasizes the relevance of the Enterprise Social Interaction entity and guides the enabling ICT. The enterprise architecture shows how this enabling ICT is aligned with business.

Accordingly, the work first proposes a framework for social commerce-oriented business that captures: (a) three main entities: Enterprise Social Interactions, Actors, and Business Processes (and their output: products/services), (b) the relationships between these entities, and (c) the constraints (if any). Next, it focuses on the conceptualization of the key entity, Enterprise Social Interactions, to shape the required enterprise interface that promotes openness, collaboration and participation, which enables the required knowledge emergence and intelligence for the value (co-) creation. Then, it provides guidance towards the development of such an enterprise interface. Finally, it shows, through a running example, how such an enterprise interface enables social commerce and the B2B integration (with partners and suppliers) that backs social commerce.

The conceptualization of the Enterprise Social Interactions aims at providing a specification of the enterprise interface that enables social commerce. This specification is then realized by an Enterprise Social Interaction Manager (ESIM), a central component of the enterprise technology architecture supporting social commerce.

The functionalities of the ESIM are implemented by combining Web 2.0 tools and Cloud computing in a SOA architectural style, depending on the specificity and requirements of the enterprise. Web 2.0 supports the embedded social media that create and share content related to business processes, products or services, and actors' profiles and interactions. Cloud computing provides the required infrastructures (e.g., Enterprise Service Bus, storage), platforms (e.g., database management systems, integrated environment development) and the applications (e.g., the functionalities of the ESIM) as services. It supports the management and storage of the content/knowledge generated by the ESIM (or the embedded social media). It also allows an efficient integration of business processes such as B2B that underline and back social commerce.

Cloud computing allows the enterprise to get its ESIM applications and services up and running faster, with improved manageability and less maintenance, and enables IT department to more rapidly adjust resources to meet fluctuating and unpredictable social commerce demand [11], [26]. In this new enterprise technology architecture, enabler of social commerce, the enterprise interface becomes a Cloud client that requests Cloud services depending on the enterprise specifics and requirements.

This work would have an impact in both research and practice. The proposed framework guides the ICT-enabled social commerce model that would allow enterprise to focus on their core business, namely how to transform, change, and differentiate their businesses instead of focusing on technological infrastructures, platforms, and applications.

The remainder of the paper is organized as follows. The next section presents some related work. Section 3 presents the framework for social commerce, where Enterprise Social Interactions constitute a key entity. Section 4 conceptualizes the Enterprise Social Interactions perspective of a business modeling as an approach to specify the enterprise interface; specifies the functionality of the ESIM as a collaborative platform that enables and drives social commerce; details the design of the ESIM; and provides an application of ESIM, where the ESIM is realized as social media with Cloud computing. Section 5 presents guidance to develop such an enterprise technology architecture. Finally, a conclusion section summarizes the results showing the theoretical and practical implications, the limitations of this work, and presents issues that need further development.

## 2 Related Work

Social commerce is starting to attract the attention of researchers and a number of studies have been carried out, covering social commerce from different perspectives [35], [42]. This is mainly due to the proliferation of the social media applications supported by Web 2.0. In [41], the authors state that social media technologies not only provide a new platform for entrepreneurs to innovate but also raise a variety of new issues for e-commerce researchers that require the development of new theories. This could become one of the most challenging research arenas in the coming decade. The authors have introduced a framework that includes six key elements for classifying social commerce research: research theme, social media, commercial activities, underlying theories, outcomes, and research methods. The framework defines the scope and identifying potential research issues in social commerce.

However, most of the current research explores social commerce from the capabilities and role of social media and Web 2.0. In [40], the authors reviewed the properties of Web 2.0 and investigated the opportunities for small businesses in the Web 2.0 era. They came with four perspectives of Web 2.0: from a technological perspective, Web 2.0 platform allows information to be used in new ways; from a sociological perspective, Web 2.0 increases social interactions over the web; from economical perspective, Web 2.0 enables and requires new business models; and from legal perspectives, Web 2.0 brings new legal issues to the Web. They found that Web 2.0 applications can largely increase the competitive advantages of small enterprises. Their findings provide some guidelines for small businesses to begin using and leveraging Web 2.0. Indeed, when it comes to reaching customers with rich content, the authors argue that Web 2.0 applications give small enterprises some competitive advantages. In [20], the authors state that it is essential for marketers to look to Web 2.0 as a challenge rather than a threat and consider it as a new domain of commercial strategy. The authors provide some guidelines to integrate Web 2.0 into the corporate commercial strategy, including recognizing the effect of the Web 2.0 on the consumer's decision making process, understanding the sources of customers' value and the motives of the customers to use Web 2.0. According to the authors, the corporate can capitalize on Web 2.0 in three different ways: (1) understanding how social media function and integrate them, (2) listen-in to the customer's voice, i.e., what others say about the company, and (3) engage Web 2.0 for direct, personalized one-to-one marketing, seeking communication, interactions and customer feedback. The authors point out three research directions: (1) identification and classification of the different types of applications from both technological and commercial perspectives, (2) effects of the Web 2.0 on the consumer perceptions, needs and behavior, and (3) the value of the Web 2.0 applications as marketing tools and ways to maximize their effectiveness focusing on the questions on how these tools can be incorporated into marketing strategy and become source of business value. In [68], the authors examined the evolution of e-commerce and its capabilities to satisfy human needs. Accordingly, they explored customer needs for social commerce, and found fundamental needs that motivate customer behavior via Web 2.0 within a commerce context: (1) need for autonomy: independent, self-regulated individual, (2) need for competence: to feel successful and competent, and (3) need for relatedness: to feel one belongs and connected to others. The author show how these needs may be satisfied by the many services and applications available on the web, specifically Web 2.0, which shows how the world of doing business has changed to embrace social relationships, and communities and networks on the web. The authors conclude that if a firm wants to be active on the Internet, it has no choice but to find its appropriate role via Web 2.0.

In [47], the authors investigated the barriers and perceived benefits of social networking sites in B2B small and medium enterprises in UK. Their research highlights that the reasons for the use of social networks by B2B SMEs are to attract customers, cultivate relationships, increase awareness, communicate the brand online, receive feedbacks, and interact with suppliers. Most barriers are (i) non-importance of social networks within the industry in which the company operates, (ii) uncertainty about social networks, (iii) non-familiarity of the staff (including lack of the technical skills in using social networks), (iv) investment in terms of time, or (v) competitors are not using social networks. In [38], the authors studied the social influence focusing on online decision-making by using diversity of applications to increase social interaction, including product recommendation to friend, customer review provision, discussion board, and writing and rating a review. In [32], the authors reported on the effect of online social shopping on user behavior beliefs (perceived usefulness and enjoyment). They found that system functions such as quick access to the products and help option design such as the underlying message guiding use are strong predictors of the individual belief.

Very few studies focus on the social commerce from perspectives such as modeling, design, or adoption. In [35], the authors conducted a systematic review, explaining the social commerce concept, presenting a state of art, and describing the relevant features in social commerce design. They presented a conceptual model for social commerce design. Their model is made up of four layers: (1) Individual, (2) Conversation, (3) Community, and (4) Commerce. They presented design features for each layer, and common design features for the layers. In [21], the authors present the concept of social e-business to define the innovative e-business vision, which integrates web-based collaborative tools, emphasizes the importance of social capital and social networking. The concept of social e-business emerges to enhance collaboration and trust relationships in e-business, integrating and adapting common social network collaborative tools and emphasizes the role of SCM in e-business. They have developed Social Network Model. The authors have developed PLAGE platform, an industrial R&D project led by a Portuguese e-procurement service provider, as case study to move towards social e-business by providing a collaborative environment via multiple social platforms. PLAGE reveals that having interoperable social platforms improves

commerce collaboration, develops trust, and implements strategic approaches to leverage networked relationships in social e-business. They conclude that organizations should see e-business as an effective instrument to enhance relationships and generate social and economic capital.

With respect to ICT, except Web 2.0, other enabling technologies are not given the role they deserve. In [5], [70], the authors analyzed the implications and impacts of the Cloud computing on the e-commerce research and practices but not on social commerce. In [55], the authors integrated a variety of social media they refer to as Web 2.0 services such as forums, wiki, blogs social networks, or RSS in collaboratively developing a ERP system for small and medium enterprises (Openbravo project), which results in significantly improving business, social and collaborative capabilities. They also show the necessity for expanding Web 2.0 with Cloud technologies such as Amazon EC2 and Google App Engine that offer a way to easily deploy service without dealing with hardware problems.

This work attempts to fill this gap by providing a framework for social commerce, putting Enterprise Social Interactions as key, central entities, which would provide a strong business justification for social commerce design and adoption with the enabling ICT that aligns with business.

### 3 A Framework for Social Commerce-Oriented Business Model

The framework is an abstract model that captures the main entities of a social commerce environment, the relationships between the entities, and the constraints (if any). This requires a comprehensive understanding of what is a business model, what is social commerce, as a specific model, and what are the enabling and driving technologies.

#### 3.1 Business Model

A business model describes the design or architecture of the value creation, delivery, and captures the mechanisms it employs [60]. There are many definitions of business model and many business models (Site 1). Each definition or model considers a specific perspective or aspect. For instances, [61] described many types of business models (e.g., e-procurement, e-auction, brokerage model, virtual communities). Later, [45] provided 16 types of business models. In [15], the authors compared different business model definitions, and distinguished four components of a successful business model: Service, Technology, Organization and Finance (STOF). Service domain describes the value proposition and the market segment at which the offering is targeted. The technology domain describes the technical functionality required to realize the service offering. The organization domain describes the value chain, notably the focal firm position. The finance domain describes the way a value network intends to generate revenue from service offering. The STOF model shows how these concepts are related to each other. The service domain guides the technical design that addresses architecture and infrastructure. The service requires organizations to collaborate, which describes the value chain. The organization domain has to address the network and actor aspects as well. The finance domain is the bottom line of any business model [28].

In [31], the authors categorize the different interpretations of the notion of business model into two categories: (1) taxonomy, i.e., enumeration of a finite number of business model types, and (2) conceptual model, i.e., the way to do business.

The conceptualization describes a meta-model or a reference model for a specific industry, allowing an infinite number of business models. For instances, e<sup>3</sup>.Value [4] and Business Model Ontology [49]-[50] are two ontologies.

In addition, it is worth noting that linking business model to enterprise architecture frameworks/models such Zachman's framework [71], TOGAF process (Site 2), or Archimate (OpenGroup (Site 3)) will power the modeling. This linking would allow a better alignment of ICT on business [13]-[14], [30], [63]. In general, business models focus on the service value generated by a business, whereas enterprise architecture shows how a business realizes these services by using ICT [62]. For instance, [30] show how Archimate can be linked to business model ontology.

The current business models are critical to understand and derive the corresponding business processes and the role of enabling technologies, specifically Web 1.0, but they do not focus on the interactions among the actors involved in business (to create value), specifically their enabling technologies such as Web 2.0, Cloud computing and SOA.

Although, the established business models can integrate these technologies, future business models will need to consider interactions as a strategy for the value generation. Chen [18] points out that "the business model in the twenty-first century has to take into account the capabilities of Web 2.0, such as collective intelligence, network effects, user generated content, and the possibility of self-improving systems."

This work is based on the conceptualization approach, as it aims at providing a framework for social commerce that integrates interactions and their enabling ICT as key entity.



## 3.2 Social Commerce

This section presents the concept of social commerce, focusing on its definitions, its differences with e-commerce, its benefits for all the actors, and its enabling technologies.

### 3.2.1 Definitions of Social Commerce

Social commerce involves multiple disciplines, including marketing, sociology and psychology, and computer science [35], which justifies the many definitions of the concept. For instances, in marketing, [20] consider social commerce as "a noticeable trend in online marketplaces where businesses leverage social media (or Web 2.0) as a direct marketing tool to support customers' decision making processes and buying behaviors." In [24] social commerce is defined as "word-of-mouth applied to e-commerce." In [53], social commerce refers to "a more creative and collaborative approach used in online marketplaces." In [68], social commerce is considered as "applying social media applications to shape business, hence transforming a market for goods and services into socially centered and user-driven marketplaces." With respect to sociology, [38] define social commerce as "utilizing web-based social communities by e-commerce companies, focusing on the impact of social influence which shapes the interactions among consumers." Marsden [46] addresses social commercial in terms of the psychology of social shopping, where people are influenced by salient information cues from people within a networked community when they shop online. Later he enumerated more than twenty definitions, and defined social commerce as "a subset of electronic commerce that involves using social media, online media that supports social interaction and user contributions, to assist in the online buying and selling of products and services." From a computer technology perspective, [40] describe social commerce as "an online mediated application combining Web 2.0 technologies such as AJAX and RSS with interactive platforms such as social networking sites and content communities in commercial environment." For [65], social commerce is "an innovative business model, which results from the combination of social media and e-commerce." [35] Define social commerce as "an Internet-based commercial application, leveraging social media and Web 2.0 technologies which support social interactions and user generated content in order to assist consumers in their decision making and acquisitions of products and services within online marketplaces and communities."

This work extends these definitions and characteristics to define social commerce as doing commerce in a collaborative and participative way by using social media through an enterprise interactive interface. The interface enables social interactions that generate value for the whole value chain. The interactive interface may be any of the existing Web 2.0 applications, a combination of the existing Web 2.0 applications, or built on top of the existing Web 2.0 applications, depending on the specificity and requirements of the enterprise.

Social commerce aims at enhancing enterprise openness and actor participation and collaboration to achieve greater economic value.

### 3.2.2 Difference between Social Commerce and E-commerce

Social commerce differs from e-commerce in many aspects, including business models, value creation, customer communication and connection, system interaction, design, and platforms as summarized in Table 1.

### 3.2.3 Benefits of Social Commerce for the Actors

The benefits of social commerce for the actors in the value chain are as follows:

- Enterprise is able to capture customer's behaviors, which gives them insight into their shopping experiences and helps them develop successful business strategies [20]. Social media support of social commerce can influence business transactions, strengthen business relationships with customers, increase traffic to company websites, identify new business opportunities, and support product and brand development [47].
- Customers have access to social knowledge and intelligence generated by social interactions [24]. Social media can affect customer control and value creation. Customers are helped by the community in their decision-making.
- Suppliers will better understand the needs of the customers and participate in the elaboration of the products or services. Partners will have more non-core functions delegated to them.
- Employees can access crossing business processes and the architecture of the products and services to be able to innovate and get rewarded
- Regulatory authority will have more visibility on the enterprise, suppliers and partners
- Other businesses may benefit from the social commerce platform provided by the enterprise by inserting less expensive ads for focused communities

Table 1: Differences between social commerce and e-commerce

Aspects	e-commerce	social commerce
Business Models	<ul style="list-style-type: none"> <li>▪ Traditional</li> <li>▪ R&amp;D</li> <li>▪ Products/Services/Business Process-oriented</li> </ul>	<ul style="list-style-type: none"> <li>▪ Need new business models or build on the existing ones more technology-enabled (Web 2.0, Cloud computing and SOA)</li> <li>▪ Co-design</li> <li>▪ Social and customer-oriented</li> </ul>
Value creation	The design of business processes, products or services is limited to the enterprise (or its partners)	<ul style="list-style-type: none"> <li>▪ Participatory and collaborative</li> <li>▪ Create revenue by using scarcity of attention</li> <li>▪ Seeking new business values</li> </ul>
Value chain	Limited actors	Large actor, where motivation of participating is rewarded
Customer connection/ Communication/ Conversation	<ul style="list-style-type: none"> <li>▪ Customers interact individually with e-commerce web sites and independently from other customers</li> <li>▪ No communication from customer to business or from customer to customer</li> </ul>	<ul style="list-style-type: none"> <li>▪ involves on-line communities that support social connection to enhance conversation between customers</li> <li>▪ Collaboration and participation</li> </ul>
System-interaction	<ul style="list-style-type: none"> <li>▪ One-way browsing, where information from customers is rarely (if ever) sent back to businesses or other customers</li> <li>▪ One-way creation of content (from business to consumer)</li> <li>▪ Push information to relatively passive audience</li> </ul>	<ul style="list-style-type: none"> <li>▪ Develops more social and interactive approaches that let customers express themselves and share their information with other customers as well as with business</li> <li>▪ Community creation of content</li> </ul>
Design	<ul style="list-style-type: none"> <li>▪ Presentation (views of the product/service characteristics)</li> <li>▪ Discovery mechanisms (e.g., search)</li> <li>▪ Navigation</li> </ul>	Web 2.0 is based on user-centered design, through interactive interface that enables identity, interactions and communities, i.e.: <ul style="list-style-type: none"> <li>▪ Recognizable actors</li> <li>▪ Conversation among actors</li> <li>▪ Participation of actors</li> <li>▪ Tag/ Rank/Rate/Review/Comment, etc.</li> </ul>
Platform	Web 1.0 (B2C), EDI or Web services (for B2B)	<ul style="list-style-type: none"> <li>▪ Web 2.0, Cloud Computing, SOA</li> <li>▪ Collaboration + Participation + Openness</li> </ul>
Legal issues	Emphasized within agreed upon policies	Need to be emphasized

### 3.2.4 Enabling Technologies

The most enabling technologies for social commerce are: Web 2.0, social media, Cloud Computing and SOA.

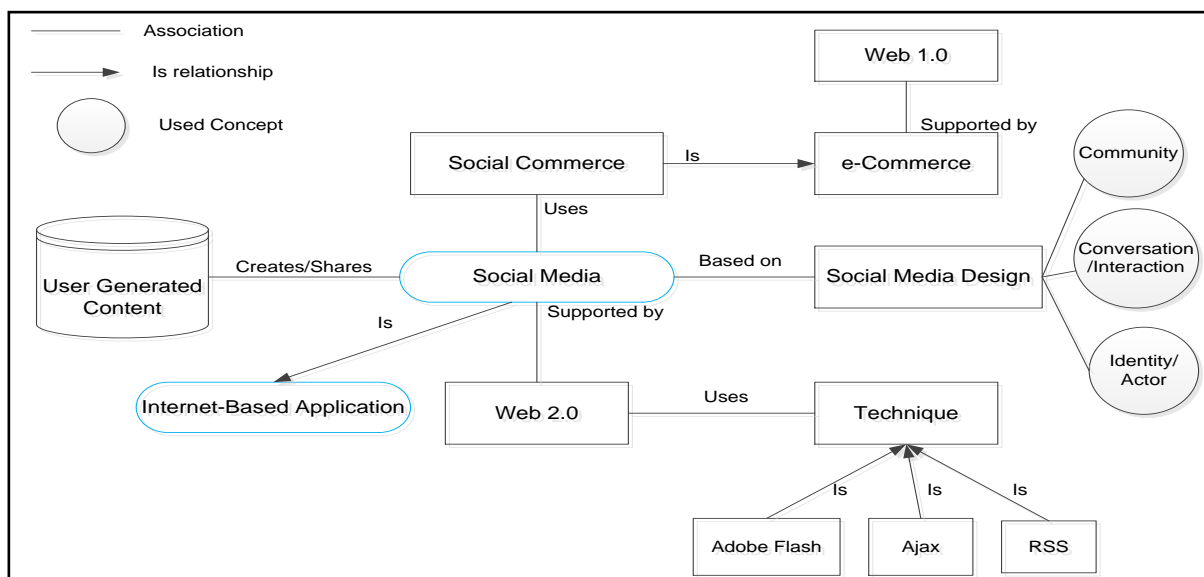


Figure 1: Concepts involved in social commerce

Social commerce extends commerce and e-commerce (supported by Web 1.0) by utilizing social media to create and share user generated content as shown in Figure 1. Social media are supported by Web 2.0, a platform that extends Web 1.0 by using techniques such as Adobe Flash, Ajax, or RSS. Social media applications are designed by using the principles of social media design, namely the three building blocks: Identity (or individual), Conversation (or interaction), and Community.

1. **Web 2.0:** Web 2.0 websites extends Web 1.0, but does not refer to any specific technical updates of the Web 1.0. It is a platform for exploiting collective knowledge. Within this platform, any actor (more specifically customer) has access to social knowledge generated by other actors, which supports them in better understanding the transactions, the products, or services, and making more informed and accurate decisions [37]. This constitutes one of the most important features in contrast to websites (where people are limited to the passive viewing of the content). Web 2.0 uses techniques Adobe Flash, Ajax and RSS to provide users with more interactive user-interface that enables Rank/Rate/Recommend/Review/Comment, we refer to as 4RC and the following relevant features referred to as SLATES.

- **Search:** finding information through keyword search
- **Links:** connect information together into a meaningful information by using the model of the Web
- **Authoring:** creating and updating in a collaborative (e.g., wikis), users may extend, undo and redo one other's work
- **Tags:** categorization of content by users adding tags, i.e., short description that facilitates searching
- **Extensions:** software such as Adobe Flash player, Microsoft Silverlight, ActiveX, QuickTime, Windows Media
- **Signals:** notification of users when content has changed by using syndication technology such as RSS

For instance, utilizing tagging elements of Web 2.0 produces new mechanisms of finding and locating information about products or services. By adding these new and innovative mechanisms, business can increase sales or interest in the products.

Web 2.0 is a platform that supports social media applications.

2. **Social Media:** In [37], the authors define social media as "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0; and that allow the creation and exchange of user-generated content." It is software that supports, extends, or derives added value from human social behavior, in social networking.

The added value is the most essential difference in comparison to conventional software applications [19]. It introduces substantial and pervasive changes to social interactions.

In the business context, the concept of social media is at the top of the agenda for many business executives today [37]. The user generated content, via the actor social interactions, is an emerging knowledge that is needed by the business, i.e., for their businesses processes, products or services.

Social media applications such as blogs, collaborative projects (e.g., Wikipedia), social networks (e.g., Facebook), content communities (e.g., YouTube), or virtual social worlds (e.g. Second Life) development is based on social design as shown in Figure 1.

3. **Social Design:** In business context, enterprises can design and use software in a way that facilitates the interactions among all actors of the value chain. Social Design aims to exploit these interactions to add value to community. The author in [29] states "great products and services depend on great experiences from their users, but it is not about what they do or how they do it, but rather why. That is, social design aims to explain the why behind great experiences." The author sees three core concepts, identity (individual actors), conversation (interactions), and community:

- C1. Identity (or individual) is the first concept in social design. It deals with identifying the actor so that he can be recognized. This is done through the design of a personal profile in particular contexts. A social commerce context may be business process, product/services, or customers.
- C2. Conversation (or interactions) is the second concept built on top of the first one, as interaction involves at least two actors. This concept is implemented by means that allow actors to act and interact in



bidirectional, synchronous or asynchronous communications, for a collaborative participation in a specific context. It needs an interface for content creation and sharing.

- C3. Community is the third concept. It deals with providing support for connecting groups of actors and enable them to collaboratively participate in supporting each other's decision making in a specific context (e.g., buying a product).

Social design helps in developing social commerce in two different directions:

- Building the ESIM, supporting social commerce, on top of the existing social media applications by expanding them to the specifics and requirements of the enterprise. It is a kind of bottom-up approach, where the enterprise does not need to build a new social graph from scratch. For instance, building a social commerce based on Facebook
- Building the ESIM, supporting social commerce, from scratch. It is a kind of top-down approach, where the enterprise needs to start by specifying the requirements in terms of actors, interactions and communities within a context.

Regardless of the direction decided, social commerce applications store new data in the terabyte range on a daily basis (e.g., Amazon) and need many services (social commerce underlying business processes, and their integration, which requires infrastructure, platforms and applications). For instance, during seasonal, unexpected spikes, or exponential growth phase for a social networking Website, additional computational resources need to be allocated on the fly to handle the increased demand in mere minutes (instead of the many days it can take to procure the space and capital equipment needed to expand the computational resources in-house [1]. Similarly, in this environment, one only pays for what one needs, so increased resources can be obtained to handle spikes in load and then released once the spike has subsided [1]. Besides, with the emerging usage of Cloud Computing, this trend will not only continue, but accelerate over the coming years, as not only more and more data is generated, but also more and more data is permanently stored online, is linked to other data, and is aggregated in order to form new data [34].

**4. Cloud Computing:** Cloud computing brings a brand-new model of IT provisioning and delivery by offering benefits such as zero up-front investment, on-demand services, flexible and elastic capacity, and rapid service deployment [48]. It has the potential to reshape the landscape of the IT industry. Popular Cloud services such as Amazon EC2, Google Compute Engine, and Apple iCloud are now hosted on large-scale data centers and delivered to users through a variety of devices.

Cloud computing provides all of its resources as services as shown in Table 2. It uses well-established standards and best practices gained in the domain of SOA to allow global and easy access to cloud services in a standardized way. SOA is an architecture style that allows user break problems into services that can be integrated to provide a solution. One of the most important auxiliary services in SOA is the Enterprise Service Bus (ESB).

Table 2: Cloud computing layers

Layer	Content	Provision
Cloud Client	Web Browser, mobile applications, thin clients, or terminal	Client
Service	CRM, e-mail, communication, applications	Software as a Service (SaaS)
Platform	Processing, Web and Application Servers, Integrated Development Environment (e.g., .NET, or J2EE), Tools	Platform as a Service (PaaS)
Infrastructure	Virtual Machine, Storage, Load Balancer, Networks	Infrastructure as a Service (IaaS)

From a business perspective, Cloud computing allows enterprise to avoid up-front infrastructure costs, and focus on projects that differentiate their businesses instead of infrastructure. Cloud computing enables IT to more rapidly adjust resources to meet fluctuating and unpredictable business demand [11], [26].

However, realizing the full potential of Cloud services raises a number of significant challenges, which have not been fully recognized or addressed in the community such as reliability and secure high quality services, end user programming and personalization for cloud services. For example, after cloud services are delivered, how to enable end users to create on-demand situational applications, how to provide personalized services to specific users, to just name a few [70], which needs a strong business justification.

This work builds on the above-mentioned definitions of business model, enterprise architecture, social commerce, enabling technologies, and social design to provide a framework for social commerce-oriented business that guides the required ICT. The key entity of the framework is *Enterprise Social Interaction*, as this element has not yet been given the right place within business model and enterprise architecture. Indeed, [2] stated that the performance of an enterprise depends on how its parts interact, not on how they act taken separately. It follows that a fundamental

function of management is to manage: (i) the interactions of those units and individuals for whom they are responsible; (ii) the interactions of their units with other units within the organization; and (iii) the interactions of their units with other organizations or their units in each one's environment [2]. The effective management of the distributed processes and knowledge is essential to enhancing the electronic collaboration over the Internet [16].

Social Interactions constitute the glue of social commerce, and should be considered as a critical element in business modeling and map into a new dimension of the enterprise architecture.

### 3.3 The Framework Defined

The framework is an abstract model that captures the main entities of a social commerce-oriented business model environment, the relationships between the entities, and the constraints (if any). The proposed framework promotes Enterprise Social Interactions, where enterprise needs an interface that promotes openness, participation and collaboration with a knowledgeable environment (users) to capitalize on their involvement in the social media, specifically the emerging knowledge and intelligence generated from the user content.

The main entities are: (1) Knowledgeable Actor, (2) Enterprise Social Interactions, and (3) Business Processes (specifically the output in terms product/service) as context. Table 3 summarizes the entities, relationships, and the constraints.

The framework aims at guiding: (i) a social commerce model, and (ii) an enterprise technology architecture that enables social commerce.

Table 3: Entities of the framework, their relationships and constraints

Entities	Relationships	Constraints
<ul style="list-style-type: none"> <li>▪ Knowledgeable actors</li> <li>▪ Enterprise Social Interactions</li> <li>▪ Business Processes (Output)</li> </ul>	<ul style="list-style-type: none"> <li>▪ The knowledgeable actor Customer has demands expressed through social media</li> <li>▪ The knowledgeable actor Enterprise sets the context in terms of business processes specifically the output in terms product/services) and the governing policies</li> <li>▪ The knowledgeable actors: Functional areas, Employees, Partners, or Suppliers collaborate in setting the context and performing the activities of the business processes</li> <li>▪ The communities of knowledgeable actors surrounding the context in terms of business processes, products or services may influence the demands, which changes (directly or indirectly) the objectives, requiring reengineering, innovation, or improvement of business processes or its output</li> <li>▪ The communities of knowledgeable actors may affect the context while they act/interact</li> <li>▪ The communities of knowledgeable actors may transform the business processes while they act/ interact, by transforming the products or service being offered</li> </ul>	<ul style="list-style-type: none"> <li>▪ Allow creation of identity and share it through profiles, including their knowledge</li> <li>▪ Allow capitalization on knowledge generated from users' content.</li> <li>▪ Allow knowledgeable actor to feel familiar, relevant, and trusted</li> <li>▪ Allow knowledgeable actor to act/react within the context made up of thee business processes and its output (product or service)</li> <li>▪ Allow any knowledgeable actor to transform (directly or indirectly) the context, i.e. business processes , products, or services by using their knowledge and intelligence</li> <li>▪ Allow the context (business processes, products or services), to be shared and transformed by the knowledgeable actor</li> <li>▪ Business processes achieve objectives, i.e., generate (create) value (output) by transforming input through coordinated activities</li> <li>▪ The knowledgeable actor Customer consumes the value</li> <li>▪ Allow knowledgeable actor Enterprise to have a control on the context, i.e., business processes and its output</li> </ul>

#### 3.3.1 Knowledgeable Actor

A Knowledgeable actor may be a functional area (or business unit), an individual (e.g., customer, employee) or another business (e.g., partner, supplier, regulatory authority). Each knowledgeable actor has its own source of knowledge, including information and processes.

The enterprise knowledgeable actor is responsible for specific business functions and rules. These are implemented in the Enterprise Information System that also keeps track of the business structured data sources.

The knowledgeable actors interact with each other with respect to a value chain.

### 3.3.2 Enterprise Social Interactions

The concept of interactions has been given much importance in many disciplines [8], including management. Indeed, the performance of a system (e.g., enterprise as a system) depends on how its parts interact, not on how they act taken separately [2]. It follows that a fundamental function of management is to manage: (i) the interactions of those units and individuals for whom they are responsible; (ii) the interactions of their units with other units within the organization; (iii) the interactions of their units with other organizations or their units in each one's environment [2].

An interaction is an event that involves two actors that act in re-action to one other action. The actors in Enterprise Social Interactions are employees, customers, partners, suppliers, and even competitors. The ICT is enabling interactions and openness.

From the actor interactions (actions/reactions), one can get more knowledge than a simple summation of knowledge of the actors. This emerging knowledge is required for the social commerce, specifically in terms of business processes, products, services, and customer's profiles. Therefore, Enterprise needs to facilitate and capitalize on these diverse interactions.

The main aims of the Enterprise Social Interactions in social commerce are:

- Collaboratively improvement and innovation of the business processes and their outputs that are products or services
- Create trustful communities around a context
- Help actors involved in making decision
- Trigger new customers needs
- High visibility of the enterprise
- High reachability
- Better satisfaction of all involved knowledgeable actors, specifically communities of consumers

The communities of actors are formed by interactions within contexts. With respect to social commerce, these contexts are the business processes and their outputs (products or the services) and the customers.

### 3.3.3 Business Processes

There are many definitions of business processes from different perspectives [12], [43]. From innovation perspective, Davenport defines a business process as "a structured, measured set of activities designed to produce a specific output for a particular customer or market." [23] From reengineering perspective, [33] built on Davenport's definition to define a business process as "a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer." From management perspective, where organizational and technical resources are used for effective execution, [67] defines a business process as "a set of activities that are performed in coordination in an organizational and technical environment."

This work builds on the management-oriented definitions of business processes, where the focus is on their reengineering, improvement, or innovation to make them responsive to the changes, where existing business processes are no longer effective [44]. In addition, it considers an Enterprise Social Interaction perspective of a business model to define a business process as a dynamic flow of interactions among knowledgeable actors, aiming at serving the value chain, including all the involved knowledgeable actors.

That is, a business process is a flexible composition process that requires well-specified, dynamic, cost-effective, timely Enterprise Social Interactions.

Business processes have objectives and are governed by policies, where inputs are transformed into outputs through actions/reactions (activities) performed by resources (e.g., knowledgeable actors such as customers, enterprise, partners, and suppliers). The enterprise knowledgeable actor defines and controls the business process objectives, yet the value chain communities (e.g., customers and competitors) mostly influence these objectives while interacting. Enterprise and government (e.g., regulatory authorities) define policies. That is, one can view a business process as a set of dynamically interconnected knowledgeable actors through Enterprise Social Interactions.

The relationships describe how knowledgeable actors use Enterprise Social Interactions to collaborate on business processes, products or services. Whereas, the constraints describe what each of the type of knowledgeable actors can do.

While this work presents a framework that guides business models for social commerce, it is limited to the conceptualization of the central and critical element of the framework that are the Enterprise Social Interactions, as they constitute the glue of social commerce.

## 4 Conceptualization of Enterprise Social Interactions for Social Commerce

The concept of interaction has been used by several disciplines such as linguistics, work organization, distributed agents, software engineering, knowledge management, and Web component [8]. A business perspective, specifically social commerce perspective adapted from the above disciplines considers Enterprise Social Interactions, as a set of action-reactions of causal, reciprocal knowledgeable actors synchronously or asynchronously sharing social media related to business processes, products or services, in different situations. That is, Enterprise Social Interactions constitute the main building blocks of social commerce that facilitate the interfacing of the enterprise with its environment and employees as well [6].

The conceptualization of the Enterprise Social Interactions perspective, of a business modeling, is an approach to specify the requirements and the design of a solution to interface the enterprise with its environment. This interface promotes the openness, participation and collaboration required for social commerce. It aims at providing different levels of abstraction from both business and ICT perspectives, with regard to their alignment. It concerns with: (1) the purpose of the Enterprise Social Interactions for social commerce, (2) the challenges facing Enterprise Social Interactions, (3) the specification and modeling of the Enterprise Social Interactions, (4) the social commerce interface through the ESIM, an artifact that implements the requirements as a collaborative platform, and (5) the realization of the ESIM with ICT, namely Web 2.0 technologies and Cloud Computing with respect to an architectural style that is SOA.

### 4.1 Enterprise Social Interaction Purposes for Social Commerce

Enterprise Social Interactions aim to:

- Make the enterprise transparent and expose its values and policies, i.e., make the enterprise visible to all actors as they are more knowledgeable, demanding, and connected
- Collaboratively improve and innovate the business processes and their outputs that are products or services
- Create and reach trustful communities around the business processes and their outputs that are products or services, and cultivate relationships
- Trigger customers needs and attract new customers
- Help all the involved actors in making decision by using the knowledge that emerges from interactions
- Help in changing the enterprise organization to get employees efficiently involved and participative in social commerce
- Change the role of the knowledge managers in order to consider the different sources of knowledge, specifically the emerging knowledge from interactions and to prepare for social commerce
- Allow Information Technology people to work closely with knowledge managers and actors

### 4.2 Enterprise Social Interaction Challenges

Fostering Enterprise Social Interactions is not without having challenges. These are:

- Proficiency and context: this considers: (i) the nature of actors and usability with varying levels of comfort with social media applications and tools, especially when users have varying degrees of comfort and familiarity with the tools and practices of social media, (ii) uncertainty on the purpose of Enterprise Social Interactions, (iii) competitor implementation of Enterprise Social Interactions. It is worth noting the proficiency and context may be a barrier to social commerce

- ICT governance and policies: this includes security, privacy, visibility, and custody and storage of content, including the governance of the required social media applications and the Cloud computing services
- ICT manageability: this includes integration, extensibility, interoperability, standardization, and customization. Enterprise Social Interactions add new layers of complexity to the existing content management, security, performance, interoperability, and participant support

### 4.3 Specification and Modeling of the Enterprise Social Interactions

Enterprise Social Interactions entail that knowledgeable actors realize the model of activities (protocol), as shown in Figure 2, assuming that knowledgeable actors can discover and select each other. While re-acting, any connected knowledgeable actor may: (i) generate a response to the requester, (ii) generate a request to other knowledgeable actors, or (iii) change the state of a shared representation, i.e., social content, where the content is related to business processes, products or services, and knowledgeable actor's profiles.

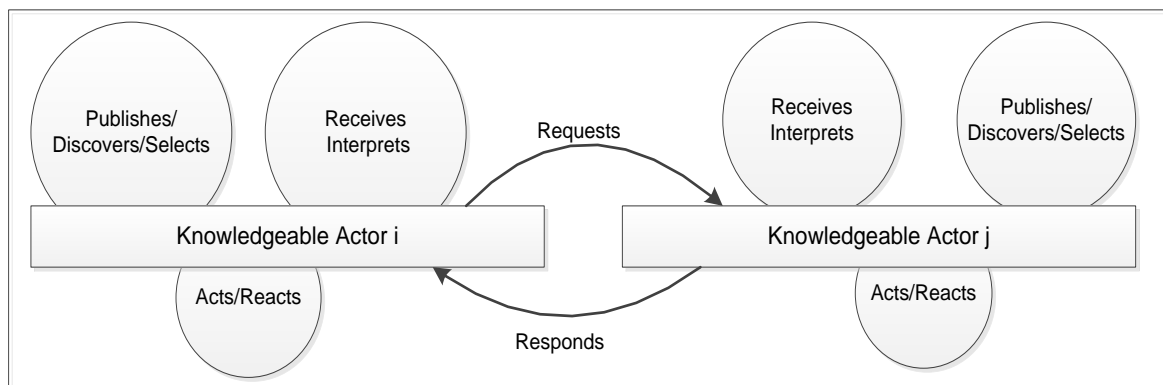


Figure 2: Enterprise social interactions activities

Besides, Enterprise Social Interactions have different situations that concern with various answers to the question *why and how do knowledgeable actors interact?* With respect to social commerce, different types of knowledgeable actors interact to dynamically collaborate in order to create value.

Therefore, the modeling of the Enterprise Social Interactions is based on the principles of separations of concerns, abstraction, and specialization. The insulation of activities and the specialized reusable high-level Enterprise Interactions patterns assist in deciding the enabling technologies to realize different types of Enterprise Social Interactions.

#### 4.3.1 Insulation of Enterprise Social Interaction Activities

The insulation concerns with the separation of the core business activities from the social and communication activities as shown in Table 4. Core business activities are business functions and rules. Most of the business functions access structured data by using the well-known Create/Retrieve/Update/Delete operations. The Enterprise Social Interactions deal with social media. Social interactions are the well-known Search/Link/Author/Tag/Extend/Signal (SLATES) actions and Rank/Rate/Recommend/Review/Comment actions. Communication activities are common infrastructure services.

This insulation aims mainly at: (i) making the enterprise core business activities independent from the social and connecting technologies in order to leverage them and avoid affecting the core business activities whenever a connecting technology is upgraded, and (ii) lightening the workload of the knowledgeable actors.

In fact, each type of activities has its specific enabling technologies. Core business activities are implemented in their respective Enterprise Information Systems or knowledge base. The communication activities are supported by communication platform such as SOA Enterprise Service Bus. The interactions activities need a social media platform such as Web 2.0 or ultimately Enterprise 2.0 as shown in Table 4. Social media applications will generate huge amount of data, which may call for Cloud Computing terms of Infrastructure as a Service (IaaS), Platform as a Service (PaaS), or Software as a Service (SaaS).



Table 4: Specification of the three types of activities and their required and enabling technologies

Activity Type	Refinement	Required Technologies	Web 2.0, Cloud Computing and SOA
Business Activities: Business Functions and Rules	Business Logic: activities representing the business functions implemented within the different application servers	Back-end application servers and DBMS server	Existing applications as SaaS Partners' services such as SaaS
	Business data: activities dealing with structured content such as databases are known as Create/Retrieve/Update/Delete operations		Presenting SQL statements as SaaS
	Business Rule: activity dealing with knowledge base		Presenting business rules as SaaS
	Orchestrating the flow of business processes Choreography of business processes		BPEL as SaaS WS-CDL
Enterprise Social Interaction activities: Social Activities	<ul style="list-style-type: none"> <li>▪ Search/Link/Author/Tag/Extend/Signal (SLATES) operations defined in section 3.2.4</li> <li>▪ Rank/Rate/Recommend/Review/Comment (4RC) actions</li> </ul>	Social Media Platform	Web 2.0 enabling SLATES and 4RC operations 4RC as SaaS
Communication Activities	<ul style="list-style-type: none"> <li>▪ Publish content to be discovered</li> <li>▪ Discover knowledgeable actors</li> <li>▪ Select a knowledgeable actor among many similar ones</li> <li>▪ Resolve dependencies by selecting and integrating a new knowledgeable actor when the exiting one fails</li> <li>▪ Transmission/Reception activities</li> <li>▪ Coding/encoding activities in order to interpret and understand the request/response</li> <li>▪ Encrypt/decrypt secure exchanged message</li> </ul>	SOA: ESB + Cloud Computing services	PaaS, IaaS, SOA ESB or Cloud Computing ESB as Service SOAP proxy WS* technologies, namely WS security standard

### 4.3.2 Enterprise Social Interactions Patterns

Different types of knowledgeable actors such as enterprise (or its functional areas), employees, partners, customers, suppliers, and regulation authorities, are involved in Enterprise Social Interactions in different situations. These situations evolve into different communities of knowledgeable actors with respect to certain context. Each community concerns with a certain type of business processes (e.g., primary business processes, cross-organizational business processes, or supporting business processes), products or services. Therefore, a categorization, with respect to the situations in which knowledgeable actors interact, would reduce their complexity and facilitate their implementation by using different social media and technologies, as not all communities of knowledgeable actors interact similarly. That is a categorization of formed, controlled communities around specific context and objectives would constitute reusable high-level Enterprise Social Interactions patterns as shown in Figure 3. When refined and implemented with different social media and technologies, these patterns solve the problem of interfacing the enterprise to its environment. This is critical to social commerce, where decision-makers (or stakeholders) need to give it much attention. Indeed, nowadays, enterprise transformation is happening more at the enterprise environment than inside enterprise (Damaskopoulos, 2005), which applies specifically to social commerce transformation. This categorization would help in smoothly realizing the interfacing with different types of social media and technologies that can build on top of each other.

With respect to a social commerce-oriented business model, we distinguish internal and external Enterprise Social Interactions as shown in Figure 3. The former allows communities of internal knowledgeable actors such as Enterprise-Employee (E2E), whereas the latter involve all kinds of knowledgeable actors, namely Enterprise-Consumer (B2C), Enterprise-Enterprise as Customer (B2B1), Enterprise-Suppliers (B2B2) Enterprise-Partner (B2B3), and Enterprise-Administration (E2A) interactions. These high-level Enterprise Interactions patterns can be refined and implemented with different infrastructures, platforms, and services. For instance, any type of B2B requires IaaS, PaaS and SaaS for dynamic relationships.

Moreover social commerce is not possible if B2B integration (with suppliers, partners, or service providers) is not working properly. Indeed, as a layer on top of existing e-commerce, social commerce is depending on the effectiveness of B2B (namely B2B2 and B2B3), which, in its turn, is depending on the effectiveness of internal integration; and all of them are depending on services, mostly public or private Cloud services that are composed with respect to SOA.

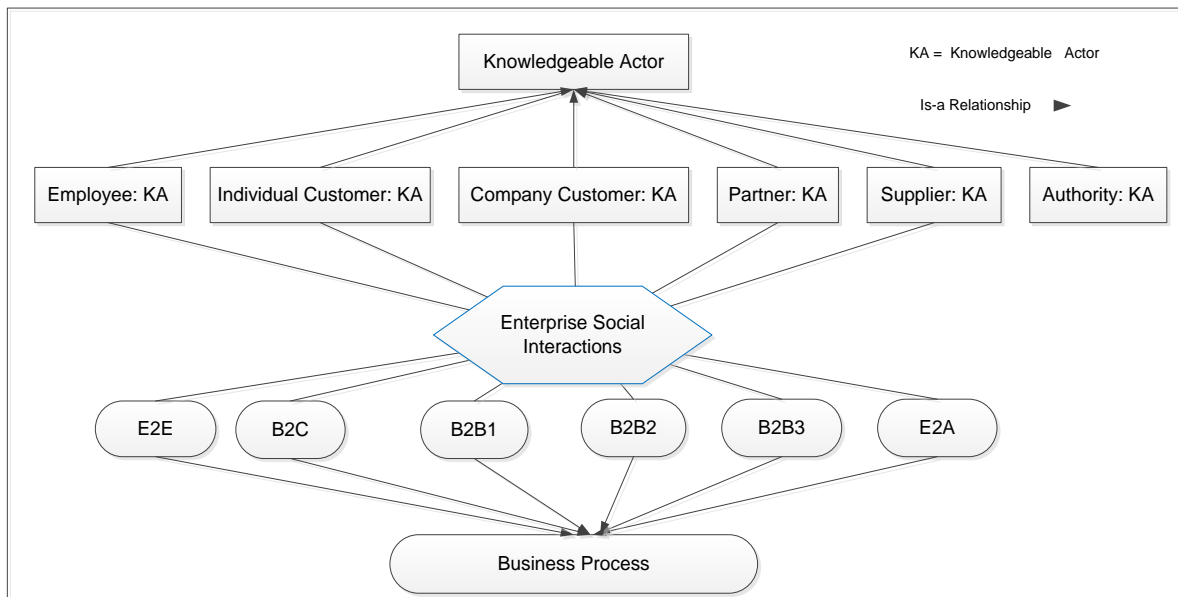


Figure 3: Categorization of business processes with respect to knowledgeable actors

The specification, model of activities, categorization and patterns of Enterprise Social Interactions allow:

- A separation of concerns, i.e., the connecting and social activities are handled by a specific manager, whereas the knowledge actors are responsible for providing core business activities and knowledge
- Well-specified interfaces for the knowledge actors independently of any technology implementation of the content, i.e., the separation of concerns simplifies the specification of such interface definitions
- An effective loose coupling of the heterogeneous business functions, i.e., the business activities and content (insulated and independent from their implementations) are described in a standard extensible markup language that can be understood by any knowledge actor implementation (e.g., XML, OWL).
- On-demand composition (or reengineering) of the business processes. Planning of the control flow, discovering, and selecting knowledgeable actors (e.g., partners, suppliers).
- Management of the orchestration and choreography of social commerce business processes
- Fine/coarse-granularity i.e., the categorization of the Enterprise Social Interactions, described above, allows first an implementation of the business core activities and the structured data as fine-grained services [9].

These activities would be better interfaced through an ESIM that provides a uniform interface to all the knowledgeable actors.

#### 4.4 Social Commerce Interface through Enterprise Social Interaction Manager (ESIM)

The ESIM is a key component of the enterprise architecture that supports social commerce. It enables social commerce by enabling social media related to Enterprise Social Interactions. It is a collaborative and social platform extending the capabilities of social media by implementing the activities detailed in Table 4. Figure 4 shows that the ESIM provides different knowledgeable actors with a uniform interface to:

- Use social media
- Access the structured content and user generated content related to business processes, products/ services, or customers

- Manage user generated content, collaborative knowledge base, profiles, and communities
- Capitalize on the knowledge that emerges from Enterprise Social Interactions
- Use common commerce services such as digital payment, or digital signature
- Connect to enterprise resource managers and to social media applications
- Planning and managing the business processes in terms of a flow of knowledgeable actors
- Composing the business process of different types

It is worth noting that the design of the interface for social commerce differs from the e-commerce (B2C). The latter focuses on the products/services and their features (e.g., laptops and their relationships), the presentation (e.g., the different views of forms, and cards), the way information is discovered (e.g., search, navigation). The former (ESIM for social commerce) focuses on the individuals, interactions and communities, the SLATES operations, 4RC actions, users' profiles and community, and the user generated content.

#### 4.5 Realization of ESIM with Web 2.0, Cloud Computing and SOA

Although the existing social media applications are very useful, they may not be the right implementation to fulfill the Enterprise Social Interactions requirements, due to their drawbacks (e.g., lack of editorial control, quality, credibility, content analysis and management). Moreover, the aim of existing social media applications is not for e-commerce.

However, social design helps in realizing the ESIM, for social commerce, with two main different options:

1. A bottom-up approach that consists in building the ESIM on top of existing social media applications by expanding them to the specifics and requirements of the enterprise. This will not require the enterprise to develop a new ESIM, including social graph from scratch.
2. A top-down approach that consists in building the ESIM from scratch. In this case, the enterprise needs to start by specifying the requirements in terms of actors, interactions and communities within a context.

Therefore, to provide knowledgeable actors with a standard uniform interface that integrates business, social, and communication activities, Cloud Computing (private or public) would better serve, due namely to the aforementioned advantages. That is, the ESIM activities, depicted in Table 4 would be better implemented by using service standards. This requires reasoning in terms of Cloud services in an architectural style that is SOA (including ESB, one of its tooling auxiliary services), as shown in Figure 4, to provide:

1. ESIM uniformed interface as a set of standardized services contracts, including the social media application operations
2. Business, interaction, and communication activities as services, specifically SaaS
3. All the resources as services (SaaS)
4. The platform (to develop and run the underlying social media, databases, and knowledge base) as services (PaaS)
5. The supporting infrastructure as services (IaaS)

Indeed,

- The existing business activities can be readily presented as SaaS. Any local business activity such as business logic, business rule, or a data CRUD operation on a database can be readily interfaced and implemented as a fine-grained SaaS [10].
- The agreed-upon, running business processes can be wrapped and interfaced as coarse-grained services provided that they are well-specified in terms of: (i) flow of explicit, semantically, interfaced business functions, (ii) commonly understandable input/output messages, and (iii) pre-conditions and post-conditions
- The SLATES operations can be readily specified in terms: Operation name (e.g., search), input (e.g., text), output (e.g., URL to content), pre-condition (e.g., content exists), and post-condition (e.g., content displayed) then implemented and interface as web services

- The 4RC facilities can be provided as web services
- The development of these activities and resources can be done by using PaaS

This results in a collaborative architecture that integrates social media applications and services of different types in SOA-compliant architecture to support social commerce applications.

#### 4.6 Enterprise Architecture Supporting Social Commerce

Social commerce emphasizes interactions beyond simple communications or transactions. The implementation of the functionality of the ESIM with Cloud computing supporting social media applications will enable the categories of the business interactions including B2C, B2B (B2B1, B2B2, and B2B3), E2A, and EAI (EAI1, EAI2, and EAI3) as detailed in Appendix A. Each category is a specific instantiation of the ESIM with respect to their situations as shown in Figure 4.

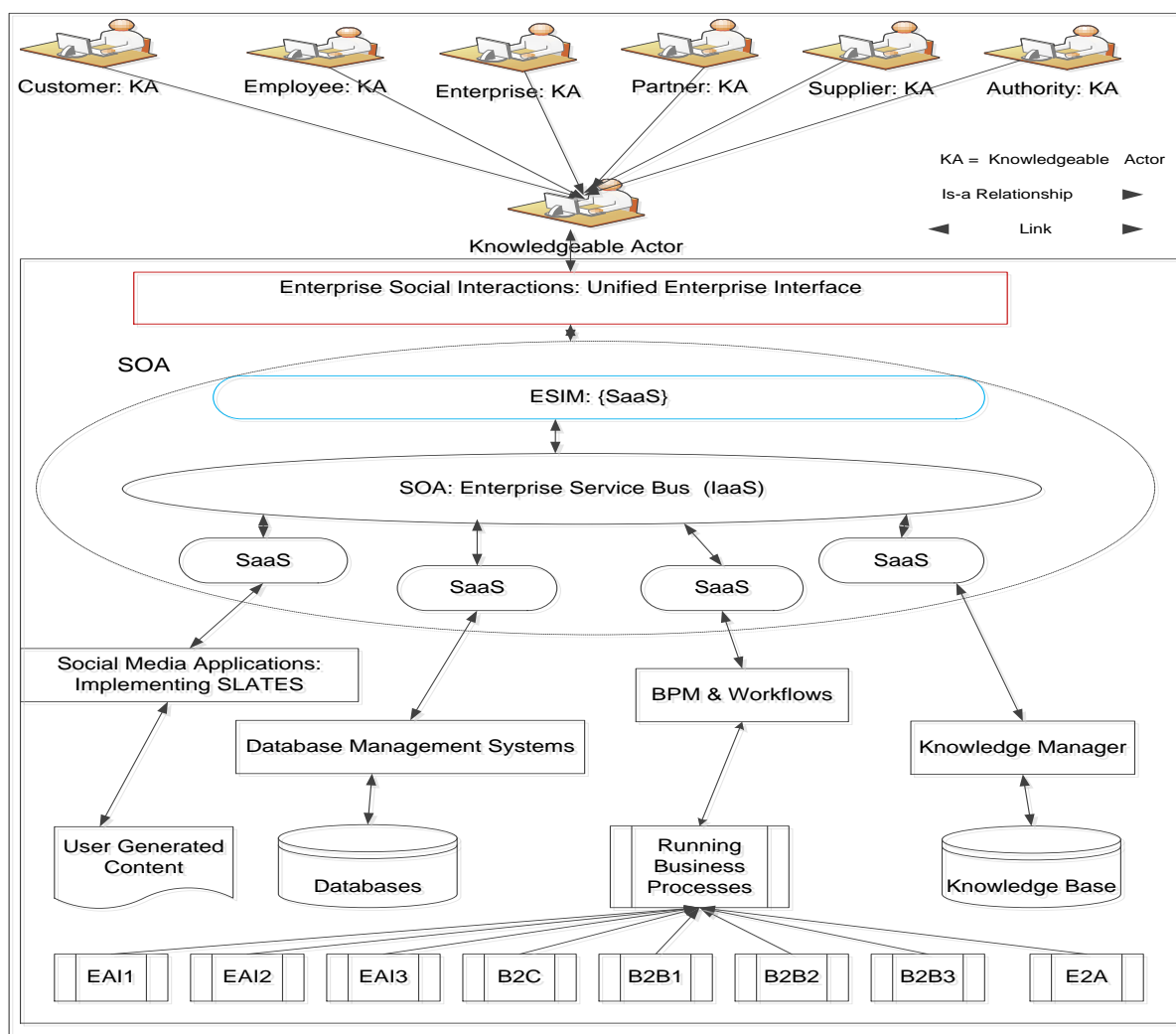


Figure 4: Architecture of social commerce, where the ESIM is implemented with services in a SOA style

#### 4.7 Running Example: ESIM B2B Underling Social Commerce

This example shows how the ESIM works to enable B2B, as critical e-commerce underlying and backing social commerce

##### 4.7.1 Application Requirements

A company YNB has an e-commerce application to sell online laptops. The current Web site allows consumers to select a laptop, view the characteristics, including the price and the selling condition, the basket to add items, and the payment. YNB is willing to add a configurator that allows consumers to participate in the configuration of the

laptops they buy. It needs to build a private social media application to promote social interactions focusing on the context of laptops to enable, in a first phase, a collaborative configuration of the laptops. Later on, YNB is willing to make the business process (activities from the *order* to the *delivery*) visible to its employees, partners, suppliers, and even consumers for recommendation about innovation and improvement.

*Requirement 1:* Allow YNB to manage created/shared user generated content that enables proactive characteristics of the laptops, and community of consumers, their configurations, preferences, reviews, ratings and referrals. In this case, the knowledgeable actors are the enterprise and the consumers, and to a less extent the partners and suppliers.

*Requirement 2:* Assist YNB in mining the content related to the Enterprise Social Interactions around the laptops, stored as generated content from a social media application, for decision-making about the company transformation.

YNB web site (Web 1.0 platform), as it is currently set, cannot satisfy these collaborative requirements. Indeed, the existing social media applications were not destined to social commerce. Therefore, YNB needs to think about developing or outsourcing an ESIM for the given requirements.

First, the ESIM assists the enterprise, partners, and suppliers knowledgeable actors in:

- Providing the first configuration
- Displaying the characteristics of the laptop configuration along with other characteristics from the structured content (e.g., product database)
- Controlling the configuration

Then, it enables the consumers to use social media to:

- Interact on the configurations to manage the laptop configurations by using collaborative tools
- Simulate the use of the laptops
- Manage their profiles
- Provide ranking, rating, recommendation, reviews, and comments. It is expected that by combining rating, ranking and recommendation with comments and feedbacks, the ESIM user will gain insight from customer like him. Indeed, the impact of *like me* is more and more increasing among users.

Finally, it allows:

- An agreed-upon configuration that will be assembled
- Commercial transaction management

#### 4.7.2 ESIM Enabler of the Underlying B2B: Functional Architecture

This social commerce application built on top of traditional e-commerce would be effective if the following underlying B2B (integration with suppliers, partners, and service providers) is properly functioning. Figure 5 is an instantiation of Figure 4 that illustrates the required B2B (with suppliers) process *Purchase*, YNB should implement. It is composed of some business functions: *Quotation*, *Order* and *Tracking*, *Perfect delivery*, *Billing*, and *Payment*. These business functions are actually implemented in the knowledgeable actors YNB and supplier Information Systems, which are likely running on heterogeneous platforms. This B2B is supported by the ESIM as follows:

First, the ESIM:

- Allows the user to interact on the configurations by using a collaborative tool (wiki) + a virtual social world of type Second Life to see how the laptop works in simulation
- Manages the laptop configurations by using a collaborative tool such as wikis, which would result in overall view of the laptops that is accepted by a majority of users
- Manages the user profiles
- Provides mechanisms to ranking, rating, recommendation, reviews, and comments



Then, it:

- Provides a private social media application of type collaborative project (wiki in this case) to assist YNB and the partners and suppliers knowledgeable actors to collaboratively plan the *Purchase* business process in terms of control flow of business functions implemented within different knowledgeable actors (e.g., *Quote, Order, Track, Perfect delivery, Bill, and Pay*)
- Registers the agreed-upon planned business process *Purchase* in the business process repository for reuse

Finally, it:

- Assists YNB in enacting the business process
- Assists YNB in executing the business function *Purchase*
- Keeps track of the enactment and execution

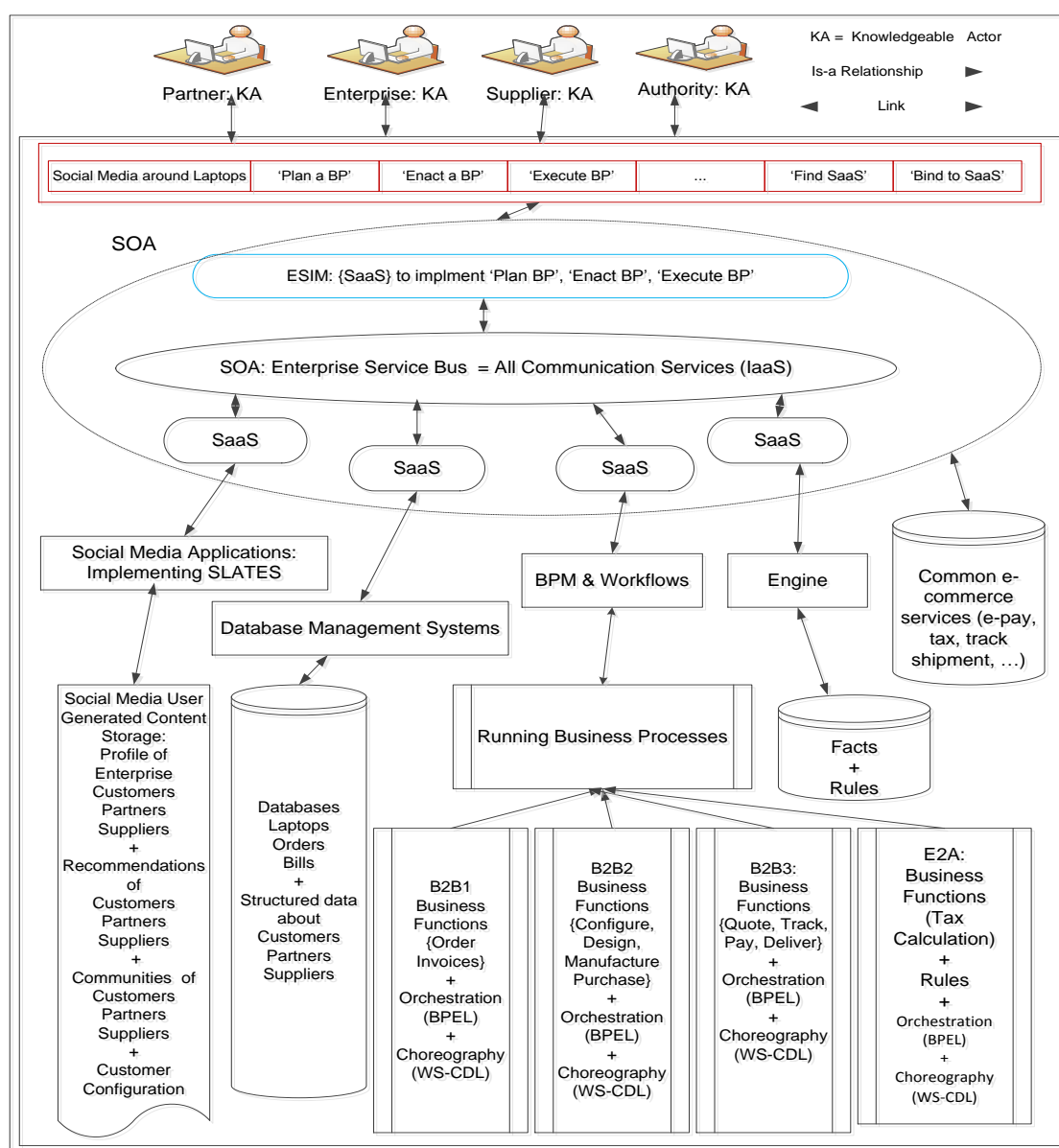


Figure 5: Example of a B2B Enabled by ESIM as a Set of SaaS

These applications need to be developed; and require a platform and an infrastructure.

### 4.7.3 Realization of the ESIM: System Requirements

System requirements include all the applications, the platform, and the infrastructure. YBN has many options, including in-sourcing, out-sourcing, or a mixture of services depending on many scenarios with respect to a business case.

The different options are:

- Option 1. Building social media applications on top of existing e-commerce (B2C), which assumes that YBN has a working e-commerce applications
- Option 2. Building social commerce on top of existing social media applications such as Facebook,
- Option 3. Building social commerce from scratch

This depends on the challenges of YBN such as are time to market, agility, flexibility, and cost to face:

1. The additional computational resources need to be allocated on the fly to handle the increased demand
2. Huge generated data
3. More data, permanently stored, linked to other data, and is aggregated in order to form new data

Then, these requirements can be fitted by services. In this case, YNB has decided to build social commerce and the underlying B2B (integration with suppliers, partners and service providers) from scratch, where ESIM functionalities are realized by Cloud computing is a solution. Table 5 shows what can be provided as services for the running example.

Table 5: Cloud computing layers for the running example

Layer	Components of the social commerce architecture	Content
Cloud Client	<ul style="list-style-type: none"> <li>▪ ESIM as a thin client</li> </ul>	<ul style="list-style-type: none"> <li>▪ ESIM application as a thin client</li> </ul>
SaaS	<ul style="list-style-type: none"> <li>▪ Different applications that ESIM can present as shown in Figure 5</li> </ul>	<ul style="list-style-type: none"> <li>▪ Social media application, including all the SLATES operations in addition to rank/rate/review/comment activities</li> <li>▪ E-commerce standard services (e.g., tax payer, track shipment)</li> <li>▪ Customer Relationship Management</li> <li>▪ Enterprise Resource Planning supporting the different business processes</li> <li>▪ Business Process Manager</li> <li>▪ Knowledge Manager</li> <li>▪ Business Intelligence</li> </ul>
PaaS	<ul style="list-style-type: none"> <li>▪ Database Server</li> <li>▪ Web Server</li> <li>▪ Application Server</li> <li>▪ Integrated Development Environment</li> <li>▪ Tooling</li> </ul>	<ul style="list-style-type: none"> <li>▪ Database Management Systems (e.g. Oracle, DB2 or SQLserver)</li> <li>▪ Web server and Application Servers (IIS or Apache)</li> <li>▪ Integrated Development Environment (e.g., .NET visual Studio, or J2EE Oracle Jdeveloper/Websphere)</li> <li>▪ SOA tooling</li> <li>▪ Business process management tools</li> </ul>
IaaS	<ul style="list-style-type: none"> <li>▪ Communication</li> <li>▪ Storage</li> </ul>	<ul style="list-style-type: none"> <li>▪ SOA ESB</li> <li>▪ Storage</li> <li>▪ Load Balancer, Networks</li> </ul>

## 5 Guidance to Deploy Enterprise Technology Architecture for Social Commerce

The ESIM, as a key component of the enterprise architecture geared towards social commerce, will certainly add value to the enterprise architecture. Yet, the deployment of such architecture is still hindered by some methodological and technical issues. Methodological issues deal with frameworks and methods (including design processes, representation techniques and tools). While technical issues are, for instance, related to security, availability, transaction, synchronization, and performance. This section presents guidance towards a method to deploy the architecture depicted in Figure 4 (instantiated in Figure 5) towards a combination of Web 2.0, Cloud Computing and SOA to enable and even drive social commerce. The guidelines are presented from business perspective to IT perspective.

### 5.1 Required Business Perspective for ESIM

First, ESIM needs to be aligned with business, which requires its visioning within a business or enterprise architecture at different levels of abstraction, in order to make clear (and distinguish) business orientation from technology orientation. Each abstract level has its own semantics and communication artifacts, as it concerns with specific stakeholders. Unfortunately, current approaches for deploying both social commerce and its underlying e-commerce with Web 2.0 are more ICT-related than business-oriented. Focusing on ICT rather than the business itself will not allow an abstraction and a robust specification of the requirements of ESIM for each category of social commerce with respect to business specifics. Indeed, an ICT perspective often gets analysts confused, as technologies are not mature enough and rapidly evolving. Therefore, it is very hard and time-consuming to build consistent SOA starting from the lowest abstract level, a technology-oriented level, where the varied and redundant components have complex semantics [7]. Certainly, these components will be leveraged, interfaced, and (re)used but after having specified the requirements and designed the architecture.

Unlike the ICT perspective, a business perspective allows answering critical questions related to the product or service, the organization (value chain), business events, business processes, business objects, business functions, business interactions, and the relationships between them. That is, the focus must be on the specification of these building blocks, at a very high abstraction level, independently of their implementing technology [15], [50]

Business or enterprise architecture can play a mediating role between policy and strategy and enterprise technology architecture. This would allow a better alignment of ICT on business [13]-[14], [30], [63].

### 5.2 Guidelines to Deploy Social Commerce Architecture Based on the ESIM

Deploying social commerce technology architecture like the one depicted in Figure 4 (instantiated in Figure 5) is a huge challenging project. Moreover, there is a lack of consistent methods (including a process with steps, models and tools) to deploy such architecture. In such situations, analysts must prioritize the deployment. Therefore, starting from internal, incremental to external integration is necessary. One cannot efficiently use the features of technologies such as Web 2.0 or SOA services (e.g., SaaS, ESB) for building a new layer without the underlying layers working properly. Indeed, social commerce cannot work if B2B2 and B2B3 (integration with suppliers, partners and service providers) is not functioning correctly. Similarly, these B2B cannot work without having efficient EAI integration. Therefore, a general approach would concern with:

#### *Level 0: ESIM Client*

This level concerns with Web browsers, mobile applications, thin clients, and terminals used to access the services provided by the ESIM.

#### *Level 1: Social Commerce Applications*

This level concerns with:

- Step 1:* Deciding the type of the social commerce applications involved in business processes.
- Step 2:* Instantiating the ESIM to specify its functionality for each category of social commerce applications. The ESIM presents an interface for each category of social commerce application.
- Step 3:* Designing the social media application(s)

#### *Level 2: ESIM Underlying Integration*

This level concerns with:

*Step 1:* Categorizing the situations of Enterprise Social Interactions into:

- Internal Enterprise Social Interactions (EAI1, EAI2, and EAI3)
- External Enterprise Social Interactions (B2C, B2B1, B2B2, and B2B3)

*Step 2:* Specifying the Enterprise Social Interactions in terms:

- Activities, intensity, and volume
- Connected knowledgeable actors, exchanged messages, shared representation, space, time, dynamics, intensity, and situations (e.g., EAI1, EAI2, EAI3, B2C, B2B, B2B2, and B2B3)

*Step 3:* Specifying the interface of each type of ESIM

*Step 4:* Analyzing the different scenarios and deciding how to use Cloud computing to implement the instance of the ESIM. That is, in-sourcing or out-sourcing?

#### *Level 3: Services*

This level concerns with deciding the required services:

- Structured content (e.g., databases) in term of schema, i.e., accessible structured content, namely the pieces of data (a database may play the role of a shared representation)
- Internal knowledgeable actors such as business units. There is a relationship between internal knowledgeable actor and structured content (e.g., databases). Well-specified databases may lead to a specification of almost all the knowledgeable actors, and vice versa.
- Social media, i.e., shared representation of the content , including profiles, communities
- Business process, i.e., the initial structure of each business process in terms of control flow and data flow

#### *Level 4: Platforms*

This level concerns with the platform that develops and runs the services. It deals with integrated development environment (e.g., from either .NET such as Visual Studio, or J2EE such as Websphere or JDeveloper) databases systems, business process management tools, and application and web servers.

#### *Level 5: Infrastructures*

This level concerns with the required storage, load balancing, and networks such as ESB.

## 6 Conclusion

This work has first provided a definition of social commerce as doing commerce in a collaborative and participative way, by using social media through an enterprise interactive interface that enables social interactions.

Next it assumed that social commerce is enabled by Web 2.0 and Cloud computing within an architectural style that is SOA.

Then, a framework for social commerce-oriented business modeling has been proposed. It aims at guiding an enterprise technology architecture that enables and drives social commerce. The key, central entity of this framework, Enterprise Social Interactions, have been conceptualized in terms of (i) model of activities, where interaction activities have been insulated from business and communication activities, as these activities have separate concerns, and (ii) interactions patterns that would be further refined and reused. This conceptualization has resulted in a specification of a uniform enterprise interface that promotes openness, collaboration and participation, which enables the required knowledge emergence and intelligence for the value (co-) creation. The interface is realized by a dedicated component of the enterprise technology architecture, referred to as ESIM. The functionalities of the ESIM are implemented by exiting (or to develop) social media applications supported by Web 2.0 platform and Cloud Computing with respect to an architectural style that is SOA. This way, the ESIM can realize the social commerce and any of the categories of e-commerce that supports and backs social commerce. A running example of social commerce showed how the ESIM enables: (i) the configuration of a product by using the Enterprise Social Interactions that involve consumers and their communities, and (ii) the underlying layer that is B2B e-commerce integration with suppliers, partners and service providers).

Finally, it has resulted in a practical guidance for developing social commerce with Web 2.0, Cloud computing and SOA, where the social commerce interface behaves as a Cloud client.

This new framework for social commerce-oriented business model guides the enabling integrated enterprise architecture geared towards interfacing enterprise with its environment, namely customers, partners, and suppliers, and its employees, is a paramount importance to enterprise willing to develop social commerce by the enabling ICT, namely Web 2.0, Cloud computing and SOA.

While this work presents a framework that guides business models for social commerce, it is limited to the conceptualization of the central and critical element of the framework, Enterprise Social Interactions, as they constitute the glue of social commerce, and the architecture and design of their supporting artifact that is ESIM. It does not really present a complete social commerce business model. In addition, the realization of the ESIM has been limited to the use of Cloud computing and Web 2.0 as a platform for social media. The other options to Cloud computing have not been discussed in this work.

This work has open issues related to the critical role and place of Enterprise Social Interactions within a business modeling for social commerce. It can further be developed in many directions such as: (i) adopting the exiting business models such as e<sup>3</sup>-value, STOF, or Canvas to integrate Enterprise Social Interactions in order to adapt them to social commerce; (ii) building new social-commerce business model; (iii) integration of social commerce into any of the well-known enterprise architecture models such as Zachman's model, TOGAF or Archimate; (iv) developing methods for designing and adapting social commerce platforms; (v) different scenarios and alternatives to realizing social commerce with Cloud computing; (vi) comparing different options of adopting social commerce: such as building social media applications on top of existing e-commerce (B2C) if any, building social commerce on top of existing social media applications, or building social commerce from scratch; (vii) comparison of social commerce in small and medium enterprises and big enterprises; and (viii) social commerce in the context of the enterprises running B2B integration with customers.

## Websites List

Site 1: Business Models on the Web

<http://digitalenterprise.org/models/models.html>

Site 2: Archimate (OpenGroup)

<https://www2.opengroup.org/ogsys/ServePublicationGraphic?publicationid=12480>

Site 3: TOGA TOGAF version 9.1, The Enterprise Edition

<http://www.opengroup.org/togaf/>

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## Appendix A: Cloud Services Enabling Enterprise Social Interactions for each Category of E-commerce

Business Processes	Sub Type	Actors	Value added by ESIM and enabling technologies	Enabler
Social B2C		<ul style="list-style-type: none"> <li>▪ Enterprise</li> <li>▪ Employee</li> <li>▪ Customer</li> </ul>	<ul style="list-style-type: none"> <li>▪ Group buying/Co-browsing/rating, ranking, reviewing and commenting/Customer testimony/personnel recommendations and referrals, forum and communities, source crowding/Attracting visitors/Social ads/Search and track facilities/Product/service evaluation/Cataloging</li> <li>▪ Search/Link/Author/Tag/Extend/Signal</li> <li>▪ Rank/Rate/Recommend/Review/Comment</li> <li>▪ Business functions involved in B2C such as <i>placement, payment, shipment, tracking, and returns</i> are better interfaced, as services accessible through different means, i.e. office devices, PDA, mobile devices, and browsers</li> <li>▪ Dynamic binding facility, which allows business applications or services to bind to services at run-time</li> <li>▪ Facilities assist in the inspection and selection of cost-effective services and connection</li> <li>▪ Use of external as well as internal CRM applications accessible from anywhere through Internet</li> </ul>	<ul style="list-style-type: none"> <li>▪ ESIM uniform interface implemented as extended Social Media</li> <li>▪ Enterprise Web 2.0 via ESIM</li> <li>▪ Functionalities provided as SaaS</li> <li>▪ Accessibility through PDA, office devices, and mobile devices in addition to Web browsers</li> <li>▪ CRM provided as SaaS via ESIM</li> <li>▪ Services are provided by a private or public Cloud computing</li> </ul>
Supporting Cross-organizational business processes (B2B)	B2B1 + B2B2 + B2B3	<ul style="list-style-type: none"> <li>▪ Enterprise as seller</li> <li>▪ Enterprise as buyer</li> <li>▪ Suppliers</li> <li>▪ Partners</li> </ul>	<ul style="list-style-type: none"> <li>▪ Business process management exposed as services, is accessible over the Intranet and Extranet for any partner willing to compose or to reengineer a business process</li> <li>▪ ESIM allows flexible or agreed-upon business processes</li> <li>▪ Dynamic knowledgeable actors are autonomous in their interactions by dynamically discovering and selecting their partner knowledgeable actor through the ESIM</li> <li>▪ Dynamic binding facility allows applications or services to bind to services at run-time via the ESIM</li> <li>▪ ESIM allows inspection and selection of efficient services and cost-effective connections</li> <li>▪ Free message format using XML. Messages format not fixed and standardized. They are open messages</li> <li>▪ Services can live with the already integrated applications with a distributed computing middleware (e.g., CORBA)</li> <li>▪ More importantly, all types of knowledgeable actors are provided with a uniform interface to participate in the management of such business processes. ESIM enables knowledgeable actor customer, partner, supplier, and even employee to get the right picture about the running business processes, the products and the services provided by the enterprise. Reversely, the knowledgeable Actor enterprise can capture knowledgeable actor knowledge to better manage its assets, satisfy and reach more customers.</li> <li>▪ EDI/VAN is no longer required, which facilitates the entry into B2B to SMEs</li> </ul>	<ul style="list-style-type: none"> <li>▪ ESIM functionality, and required platform and infrastructure provided by private or public Cloud services</li> </ul>

<i>Appendix A: continuation</i>				
	E2A	<ul style="list-style-type: none"> <li>▪ Enterprise Authority</li> </ul>	<ul style="list-style-type: none"> <li>▪ ESIM allows enterprise to interact with regulatory authorities</li> <li>▪ Exchanging content about policies through SaaS</li> <li>▪ Paying tax using SaaS</li> <li>▪ Getting updated through Web 2.0 platform</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enterprise Web 2.0 via ESIM</li> <li>▪ Functionalities provided as Seas</li> </ul>
Supporting internal knowledge	E2E	<ul style="list-style-type: none"> <li>▪ Enterprise Employee</li> </ul>	<ul style="list-style-type: none"> <li>▪ ESIM allows enterprise to interact with its employees and to capitalize on their knowledge</li> <li>▪ ESIM allows employees to form a community</li> <li>▪ ESIM allows employees to participate to the management of the Business Processes</li> <li>▪ ESIM allows employees to participate to the elaboration of products and services</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enterprise Web 2.0 via ESIM</li> </ul>
	EAI1	<ul style="list-style-type: none"> <li>▪ Knowledgeable actors in different functional areas</li> </ul>	<ul style="list-style-type: none"> <li>▪ ESIM facilitates the internal integration</li> </ul>	<ul style="list-style-type: none"> <li>▪ ESIM functionality, and required platform and infrastructure provided by private or public Cloud services</li> </ul>
	EAI2	<ul style="list-style-type: none"> <li>▪ Knowledgeable actors in same functional areas</li> </ul>	<ul style="list-style-type: none"> <li>▪ ESIM allows employees in the same functional areas to share knowledge</li> </ul>	<ul style="list-style-type: none"> <li>▪ Web 2.0</li> </ul>
	EAI3	<ul style="list-style-type: none"> <li>▪ Knowledgeable actors and content</li> </ul>	<ul style="list-style-type: none"> <li>▪ ESIM allows content to react to the changes</li> </ul>	<ul style="list-style-type: none"> <li>▪ Web 2.0</li> </ul>