

Value Creation by leveraging interoperability between virtual and real-world business environments

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Abstract

Virtual Worlds are designed for sociability, environments where people have interaction with other people. Enterprises have already started exploring this new world as a way to provide a compelling new value proposition to their products and services. This paper makes a proposal for addressing the issue of interoperability between virtual and real-world business environments as a way to foster value creation opportunities as the virtual and real world interact with each other. To this end, the authors propose the Integration of 2nd Life object behaviour modelling within the actual Enterprise Engineering Life-Cycle in order to achieve a seamless enactment of both interoperable models in the virtual and real world. We believe therefore that our approach can bring value to most interaction types, especially in integration of the consumer in the value network and in strengthening the relationship between the consumer and the actual physical product. It is our believe that this will foster new opportunities for value creation, both in the interaction between the enterprises (including different segments of the network value chain) and in the interaction between these and actual the product or service consumer.

Keywords

Business Model, Second Life, Virtual World, Interoperability

1 Introduction

As new generations reach the professional working environments, they naturally bring in their own working and social practices. As many faculty lecturers must have witnessed, one is able to keep in touch with students that have concluded their graduation and post-graduation programs many years ago. Nicknames such as “John@Dubai” or “Sara-in-NY” or similar are very common and reflect not only mobility but also an ever increasing network of virtual on-line contacts. If this is true for informal networking contacts, the fact is that this is also becoming a pervasive practice within the enterprise’ working environment, sometimes under different platforms (e.g. SKYPE, ICQ, AIM, etc.) and nicknames.

With this in mind, we argue that Virtual Worlds open a whole new kind of environment for new value creation opportunities and new business models. In social networking platforms people usually interact, have global conversations, debates, exchange information and ideas, share knowledge and have community discussions. Building value on these interactions is very important for product/service improvement and for improving the relationship between enterprises and customers. In fact, these environments offer a set of opportunities for promoting and examining social interaction, technology development, information diffusion, business development and operations. Moreover, they provide a rich arena for customer and market research, and also for instant feedback [Ondrejka, 2004]. As an example we would highlight 2nd Life where businesses have found that Residents are fully engaged, but also that the virtual world and the lack of gesture cues reduce inhibitions about hierarchy and other social classifications and foster more effective feedback [Team Mascot’s Blog].

For the purpose of our research we focused on the 2nd Life Social Networking Platform because this is the only platform where users can actually model both the look-and-feel of their objects as well as their behaviour and interaction with other objects in the Virtual World. This feature is of utmost relevance if we have in mind the objectives of (Intra- and Inter-) Enterprise Integration. Integration consists of putting components together to form a synergistic whole, and the aim of enterprise integration is [Vernadat 1996] (i) to enable communication among enterprise functional entities, (ii) to provide interoperability of IT applications and (iii) to facilitate coordination of functional entities to execute business processes so that enterprise goals can be achieved. Moreover, things, to be integrated and coordinated have to be modelled.

In this context the paper presents a rationale for Value Creation by leveraging interoperability between virtual and real-world business environments. We start by introducing the 2nd life Social Networking Environment and a motivation of new business models. Follows the presentation of the integration rationale and conceptual approach. The paper concludes with the presentation of the enterprise engineering life-cycle and the description of how real and virtual worlds are integrated in a model-based approach.

2 2nd Life Social Interaction Environment

2.1 Second Life

2nd Life is an immersive, 3-D social interaction environment entirely created by its Residents, a Web 2.0 platform. Since opening to the public in 2003, it has grown explosively and today is inhabited by millions of Residents from around the globe. 2nd Life is not a game. There are games in 2nd Life, and some communities have created complex role-playing games; there are also games like Bingo. These games happen in the virtual world of 2nd Life [Second Life Official Site], [Ondrejka, 2004]. 2nd Life is a platform for sharing all kinds of information between people and companies, with the added advantage of being ‘immersive’, and, like the real world, in 3D. 2nd Life runs on a grid of computers with each one simulating approximately 16 acres of land and the airspace above that land, and is now 65,000 acres and growing [Second Life Official Site], [Ondrejka, 2004].

2nd Life is also used to publicly display of a work of art or other items of interest and to share information. 2nd Life has become a platform for collaboration and business that bypasses traditional geographic constraints, propelling the emergence of a new paradigm. 2nd Life demonstrates the power of using place geographic metaphors such as the notion of “place” leveraged by a communications platform, allowing distant participants to build on real world metaphors and habits to improve collaboration [Team Mascot Blog].

The digital 2nd Life world was designed to allow its residents enormous creative freedom and to be as broadly appealing as possible. 2nd Life mirrors the real world in many important aspects, such as in providing a place that feels familiar and comfortable, while granting its inhabitants and objects freedoms not possible in the real world [Chang 2006].

In the 2nd Life it’s possible to create anything with powerful, highly flexible building tools, using geometric primitives and a simple intuitive interface. One may do it live, in real-time, right in 2nd Life, or using separate tools or applications (Second Inventory, SL My Inventory Viewer) to import images and standard graphic files. Once something is ready, it is possible to sell it to other residents. Developing users can also backup all the objects they created and control the corresponding Intellectual Property Rights [Second Life Official Site].

The virtual world is supported by a bank of servers, each of which is responsible for managing objects, terrain, and avatars, and for ensuring that clients connected to the server are updated in a timely manner. Each server coordinates the interaction between avatars and in-world objects. Objects do not have an ability to react to inputs from avatars or other objects; they have to be scripted to come to life-Life [Second Life Official Site].

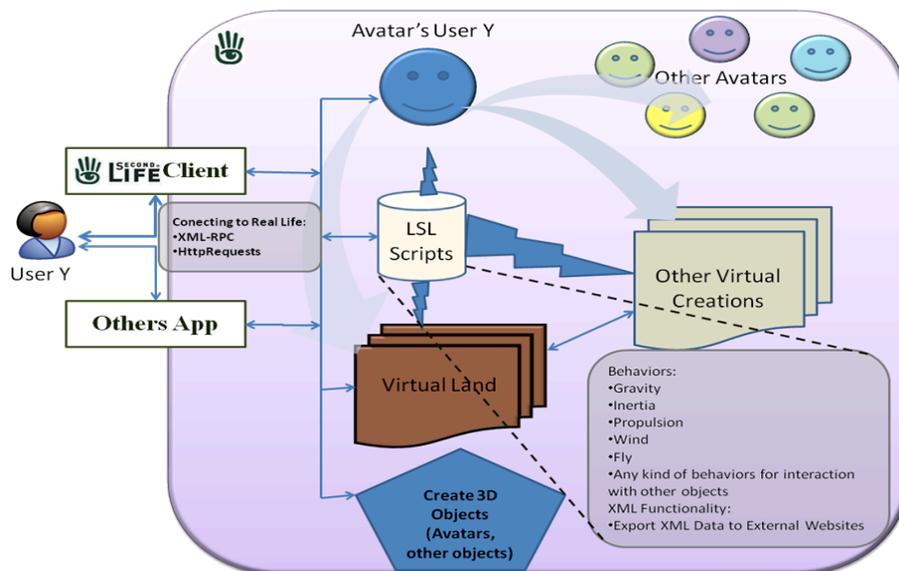


Figure 1: 2nd Life Objects and their interaction

LSL as the Linden Scripting Language (based on Java and C), is heavily based on "States" and "Events". A door can be "open" or "closed" and a light can be "on" or "off". A person can be "hyper", "calm", or "bored". Many real life objects have "states" and the same can be true for LSL programs. A script will have an idle state, the default state. An event can be thought of as a "Trigger". Events are not user defined in Second Life but rather predefined in LSL. Touch_start() is a event example that will trigger the code in it whenever the object running the script is touched.

Example of a script event:

```
Default
{
    touch_start(integer total_number)
    {
        llSay(0,"Hello World");
    }
}
```

The smallest LSL program must have one state, Default, with one event in it. Scripts can make an object move, listen, talk, operate as a vehicle or weapon, change color, size or shape. A script can make an object listen to your words as well as talk back to you, scripts even let objects talk to each other. Everything you can define in the edit window can be defined in a script. All interaction you see between objects or between avatars and objects is via scripts Life [Second Life Official Site].

2.2 New Business Models

A Business Model describes the whole process of value creation within an enterprise that leads to the delivery of a product and/or service to a customer. The emergence of the INTERNET as a new paradigm led to the development of new business models for the so-called new economy. These new business models emerged either as new models or as adaptation of existing real world models to the new media. This dynamic environment has fostered a new trend towards increasingly important role to be played in the value creation process by the actual *users of products and services*. In his book, "Democratizing Innovation", Eric Von Hippel states that [Hippel, 2005]: "*users of products and services—both firms and individual consumers—are increasingly able to innovate for themselves. User-centred innovation processes offer great advantages over the manufacturer-centric innovation development systems that have been the mainstay of commerce for hundreds of years. (...) The trend toward democratization of innovation applies to information products*

such as software and also to physical products.” In the event “A Whole New Ball Game – Marketing Successfully in the Web 2.0 World”, presented at an MIT Enterprise Forum Dinner Event (23/May/2007), this trend is further reinforced [Podcast1]: *Online marketing has transformed the way businesses and audiences interact. In the Web 2.0 world, audiences drive the discussion. They choose where, how, and even if they'll receive your marketing message.*

In the 2nd Life social interaction space, avatars (manifestation of a person in virtual world) provide a visual reference and allow residents to express themselves. Collaboration among avatars is encouraged by the availability of content tools in 2nd Life and its real-life nature: anyone nearby can see what you're doing and can participate. On their turn, enterprises extending their business to the 2nd Life Virtual World can improve internationalization, modernization of the brand, experimenting new job recruiting systems, exploiting the 3D capabilities in order to reduce new product development times and enhance the actual customer experience through his involvement in the process) [Cagnina, Poian, 2007]. Businesses can now explore new approaches to overcome the limits of the ubiquity of the brand, they can now focus on virtual community creation, and leverage on the creativity of consumers in the definition of the actual product, and of the actual buying experience. In this context, the physical product and the actual product buying experience in the virtual and physical shops are extensively discussed and tuned to the market expectations [Ahonen, Moore 2005].

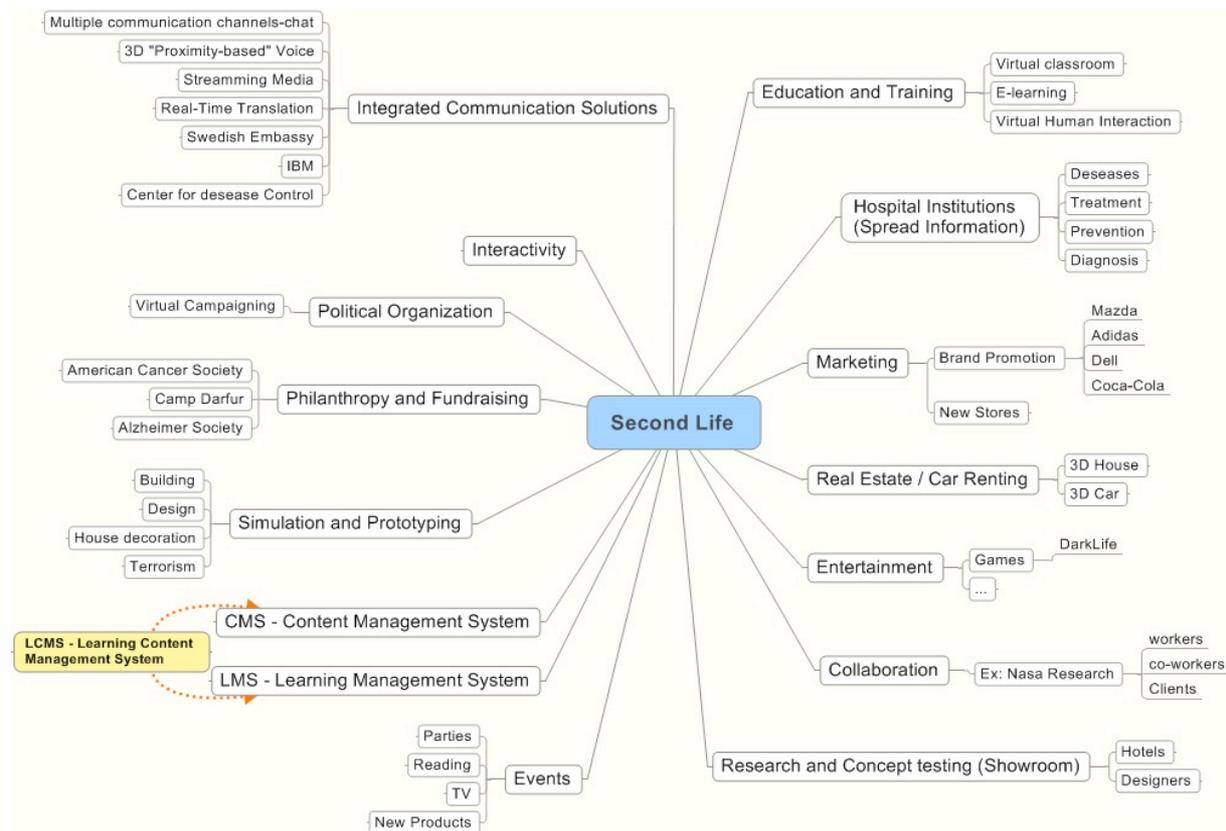


Figure 2: 2nd Life Mindmap

The Mindmap illustrates areas where 2nd Life has been growing and developing and these range from collaboration to Philanthropy and Fundraising [Mennecke, et al. 2007]. More examples are available at the 2nd Life website [Site 2nd Life]: *A virtual world can give the experience of a product that can't be appreciated even with a lengthy explanation, video or animation. Receive product feedback from customers around the world without leaving the office. Meet with global partners at virtual headquarters. Discover a new world of online fundraising capabilities. Build an island where customers and clients can test out new designs and concepts. Build community around branding. Say good-bye to conference calls and say hello*

to real-time 3-D collaboration. The 2nd Life Grid allows for projects as limitless as the imagination.

3 Value Creation

3.1 Introduction

Tools and theoretical frameworks such as the value chain [Porter 1985], filled the need of understanding an industrial context. The idea of the value chain is based on the process view of organizations, the idea of seeing a manufacturing (or service) organization as a system, made up of subsystems each with inputs, transformation processes and outputs. Inputs, transformation processes, and outputs involve the acquisition and consumption of resources—money, labour, materials, equipment, buildings, land, administration and management. How value chain activities are carried out determines costs and affects profits [Porter 1985]. Porter breaks the value chain (VC) model into two distinctive types these being primary and support activities. The model suggests, that no matter how many operational units that are involved in the process of generating customer value; these primary activities can be conceptualised into five generic stages [Porter 1985]. The five primary stages are inbound logistics, operations, outbound logistics, marketing and sales, and service. These primary stages are supported by the firm’s infrastructure, human resource management, technology development, and purchasing and procurement. The stages within the VC should not be seen in isolation but looked at in a wider context and include the interactions between stages not just within the processes. The relationship between sales, operations and procurement for instance can determine how much stock is to be carried and therefore reflected in cost of inventory held [Porter 1985].

An evolution of this concept is illustrated below, the so-called value network, described as “any web of relationships that generate tangible and intangible value through complex dynamic exchanges between two or more individuals, groups or organizations” [Allee 2002].

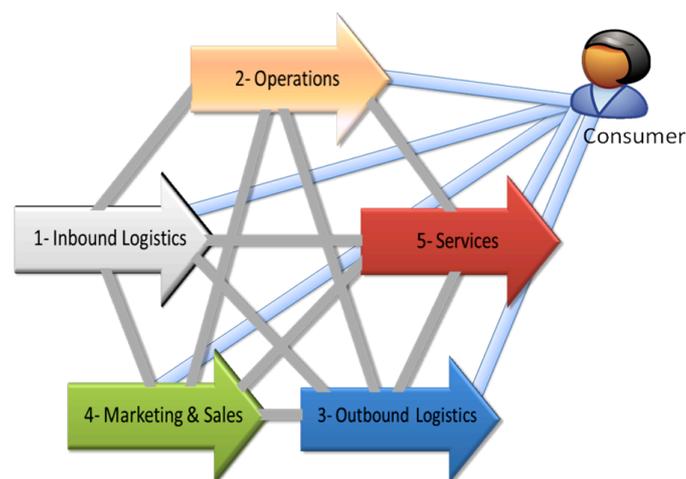


Figure 3: Value Networks with consumer

The explicit consumer inclusion is of particular relevance. On one hand, through the new Social Networking platforms the consumer/end-user is now able to play an active role in the value creation process while interacting with any node of the enterprise or enterprise-network Value Chain. On the other, the consumer needs a compelling value proposition not only to buy products and services but also to actually interact in the value creation process with the business entity.

3.2 The Conceptual Approach

2nd Life grid is a platform that enables the creation of public or secure private space using the leading 3D online virtual world technology. The existence of this private and secure space is very valuable. There are nevertheless other issues to be tackled such as mutual trust for

supporting business interaction. Relevant work on this issue was developed under the B-MAN project where the so-called “Mutual Trust Business Integrator” was developed (Hugo Ferreira 2003). The MTBI aided companies in selecting the right partner for the task at hand by maintaining and analysing a history of past contracts and was able to go much further than traditional security in B2B processes, as it provided a contract-based measurement of trust. Sophisticated mechanisms exist to overcome these issues and more will emerge in the future and the concepts developed in this paper should build on them as infrastructural.

Within 2nd Life enterprises can create their own space for internal communication and collaboration and also to promote the community engagement. Enterprises and consumers can use the 2nd Life grid to have virtual meetings, construct product simulation, support employee training and many other things [Second Life GRID]. 2nd Life is a specific instance of a virtual world, a space that looks a lot like the real world, where one can do almost everything (including flying).

Figure 4 illustrates the two worlds as well as the representation of each player in both worlds. Outward looking at the consumer, enterprise 1 (producer and supplier to enterprise 2) can observe and interact with all other entities present in the virtual world, by observation and measuring their tastes, habits, places you visit, contacts, friends, family and community [Podcast 1]. The Social Media consequently used to create connections between enterprises and between enterprises and consumers. Consumer ideas, criticisms and comments can be a real added value for enterprise products and services [Seth, Zhang, 2008]. Moreover, these “conversations” are good to obtain publicity and awareness, to get feedback from different customer experiences, to share contents and comments, to create new audience and to develop better products with a compelling value proposition to the consumer [Podcast 1].

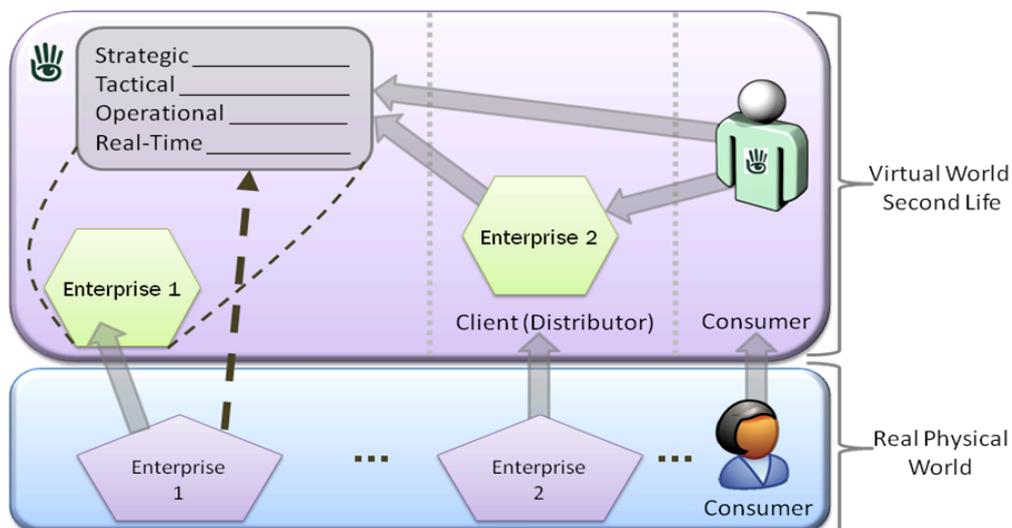


Figure 4: Interaction Virtual World with Real World

This new interaction fosters the value flow from supplier to consumer and vice versa. This is not always the case, as the flow of value (cash and information) from the consumer seldom reaches the actual production enterprise. This flow of information is very important both from inventory management and from product development. This flow and the actual interaction can therefore influence the enterprise behaviour at all levels, from Strategic to Tactical level, Operational and Real-Time level.

With our proposal of seamless integration between real and virtual worlds we aim at opening new opportunities as we leverage interoperability between virtual and real-world business environments by outlining a life-cycle architecture capable of handling such challenge in a comprehensive way.

4 Integrating 2nd Life in the Enterprise Engineering Life-Cycle

The picture below builds on the well-known and widely accepted framework for enterprise integration, where models set the reference for interoperability and for business activity orchestration, as well as for the enterprise engineering life-cycle [GERAM 1999]. On the right hand side of the picture we have the enterprise engineering environment and life-cycle phases. The emphasis on the modelling and on the enterprise particular model enactment is central to the outlined concept. Upon completion of the enterprise particular model, the enterprise model is released for execution over the so-called model execution services. As illustrated, and upon each model release, the engineering environment releases two models: (i) a model for enterprise functional entity configuration (such as an ERP System, a Workflow Management System, or a human resource, etc.); (ii) and another model, a 2nd Life script, that mirrors that same application desired behaviour and interfaces in the 2nd Life virtual world (released to the 2nd Life environment). On top of the expected interoperability between applications within the real world and within 2nd Life, this joint modelling should further ensure interoperability between corresponding real entities and virtual objects (avatars).

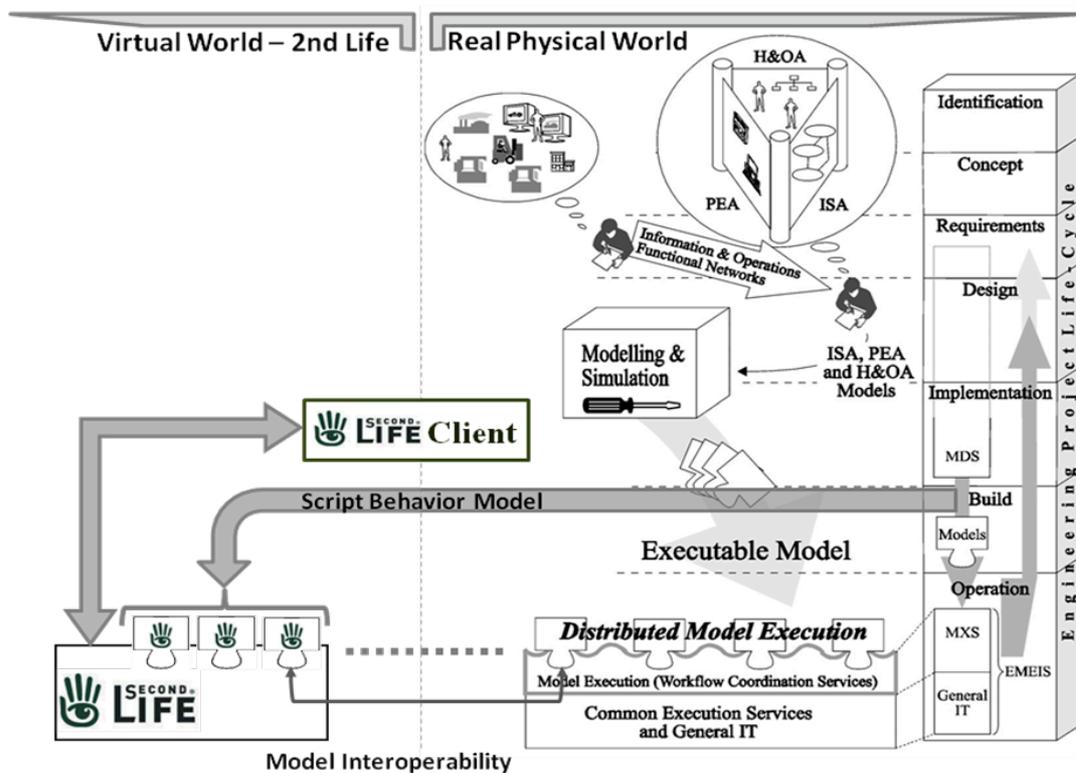


Figure 5: Enterprise engineering life cycle (Pinto Ferreira 1999) and 2nd Life Integration

5 Conclusions

This paper illustrated an approach to promote the embedding of interoperability between virtual and real-world business environments within a comprehensive enterprise engineering life-cycle. The authors used the 2nd Life Virtual World environment as an example to illustrate how to achieve this objective. The option to use the 2nd Life virtual environment was also justified by the need to have a model-based approach to the enterprise engineering and integration in the virtual world.

By leveraging the interoperability between virtual and real-world business environments we ensure that enterprise functional entities (people, machines, application software, etc.) have, if required, an avatar in the virtual world. By making this explicit in the enterprise engineering life-cycle, we promote the engineering of new virtual objects and interfaces, able to adequately

handle: intra-enterprise functional entity interaction; inter-enterprise interaction; and interaction between the enterprises (including different segments of the network value chain) and between these and the product/service consumer/end-user.

The business value of this integration lies in the fact itself that the presented approach promotes the explicit virtualization of all enterprise activities, paving the way to a comprehensive strategy for embedding the consumer/end-user in relevant enterprise operations. As an example, we would highlight activities fostering the so-called user-centred innovation processes.

We believe therefore that our approach can bring value to most interaction types, especially in integration of the consumer in the value chain and in strengthening the relationship between the consumer and the actual physical product.

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