

# Exploring an integration of physical and virtual commerce

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**Abstract.** This paper presents the idea of an integration of physical and virtual commerce. The idea of joining physical and virtual commerce is new but steam from earlier works on how to bridge the gap between our physical world and the virtual world. We present some ideas and approaches about how to join the two worlds and conclude the paper by illustrating our vision.

**Keywords:** ubiquitous computing, physical/virtual, e-commerce

## 1 Introduction

In this paper we explore the idea of an integration of physical and virtual commerce. As we see it, retail customers today are clearly separated from Internet. Customers have to choose between shopping in a store created by computers, a virtual store, or in an ordinary traditional physical store. But maybe it could be possible to create a closer relation between the virtual store and the physical store? Is it possible to overcome the se separation and create a closer relation between the customer's activity in physical stores and actions in the virtual world? When we looked around, we didn't find any business, which have joined their physical and virtual commerce, in the way that we think it could be done. The idea about integrating the virtual world with our physical world is however not that new. This paper presents some ideas about integration of physical and the virtual worlds and concludes with an exploration about how these ideas can be applied to parts

of e-commerce. We will focus on retail business and not talk about e-commerce in general.

## 2 Retail business

E-commerce has gained tremendously in popularity in the last ten years. Small local stores as well as multinational companies have invested in IT. Internet has made it possible for a new type of commerce. Amazon.com are only one example of a company who's business model is build on peoples usage of Internet.

There are several reasons to why Internet is so interesting. That Internet alters the companies geographical dependencies and that the electronic marketplace makes it possible to connect with a large number of customers, is only two examples of what the technology has to offer (Lindh & Nyberg, 2000). Another possibility with having an online presence is that the company can have their products and services accessible twenty-four hours a day. To our experience most companies however separates their virtual presence from their physical presence. By this we mean that they haven't tried to merge the two worlds together, at least not to the extent that we think might be possible.

But why would anyone want to create a closer connection between their physical and their virtual store? We believe that there are many reasons for doing so. One argument is that certain commodities such as clothes and shoes have qualities that are hard to mediate to customers via a web page (Lindh & Nyberg, 2000). The technology lacks the possibility of providing the sensation of a cloths texture or facility for a customer to try out a pair of shoes. It's not hard to imagine why customers prefer to experience such qualities in the physical world, when these experiences cannot be replaced or substituted with technology. But does this mean that Internet is of less value to the shoe industry? We think that it would be interesting to explore if shoe retailers, could make use of Internet even the downsides of the technology. And if this is possible what does the system look like and how does it work? Being inspired by earlier work on integration of physical and virtual worlds, we want to explore the possibility of integrating physical and virtual commerce, or physical/virtual commerce.

## 3 Earlier work on integrating physical and virtual

The idea about incorporating the computers virtual worlds with our physical world isn't that new. We found some first ideas concerning this matter, in the works of Mark Weiser. In the 80s, Weiser gave birth to a new way of computing which he called calm computing, or ambiguity computing. Ubiquitous computing can roughly be described as the opposite to virtual reality. The ideal of ubiquitous computing is that the computers are invisible to the users and come automatically to assistance when needed. The users interaction with this system should be so natural and easy, that the user doesn't even have to think upon how to use the system. This kind of computing implies many technical

problems, which have to be solved. Such problems are for instance how communication between computers should be carried out. It is a hard task since there are so many different protocols and different types of computers. As with embodied systems this technology is supposed to operate in the background so that a user doesn't have to concentrate on the technology while using it. The ubiquitous computing also implies that the computers always should be there when you need them, and not the other way around. In ubiquitous computing, computers are not tied up to one object but they are everywhere, embedded in the natural environment. (Ubiquitous Computing, 2001)

We will now on short present some ideas, which we think would be rewarding when exploring a fusion of our world and the computers world. Some of the works that will be described here have close resemblance's. Each research field is however contributing interesting perspectives to the subject.

### 3.2 Context-awareness

Beigl et al believe that computers could be integrated in our daily life to a greater extent then today. One way of doing this could be by attaching small computers, to ordinary daily life objects. This would enable the computers to receive datum about the objects environment. After processing the datum, information about the objects location could be calculated and one could now say that the object is aware of its location. (Beigl et al, 1999)

Context-awareness is however more then just the location of an object. Marmasse describes context-awareness as the computers ability to sense it's environment and act upon this information. Such information could regard for example the identity of an user, location, time or temperature. Of the aspects mentioned by Marmasse mentions, location is one of the most commonly used in context-awareness research. A reason for this is might be that it is a relatively simple feature to measure. (Berqvist et al, 1999)

#### Location awareness

There are at least two approaches that one could take, when dealing with location awareness. First we have the idea about an absolute position for objects in the world. This can be carried out by technologies such as global positioning system (GPS). Another approach is to think upon objects as having a relative position to other objects, as for an example: The computer is at home, standing on the floor next to the aquarium. The location of the computer is not decided by a coordinate but on it's relative position to the home and the aquarium. (Berqvist et al, 1999)

We have found an example of relative positing in the works of Dahlberg and Sanneblad. They have invented proximity-based notification (PBN). Picture yourself a computer equipped with sensors. The area nearby the computer is the proximity. When a person carrying a transmitter enters the proximity, the computer detects and identifies the person. This is an example of PBN. Dahlberg and Sanneblad claim that computers using PBN could support human communication. As in the example above, the computer might for instance display a reminder on the computer, when is detects a person entering the

proximity. The computer owner has written the reminder at an earlier time, and is now activated by the presence of the predefined identity. The reminder could for an example contain information about an important issue, that is to be discussed with the detected person. (Dahlberg & Sanneblad, 2000)

### 3.3 Wearable computing and embodied systems

According to Fällman an embodied system is a system that should follow the user, rather than the other way around. Fällman describes three principals that constitute the difference between embodied computing and other computing. To begin with, the embodied computer should be able to be triggered by information steaming from the environment and respond accordingly to the input. The second principle is that the computer should be able to communicate with computers in the close surroundings. Finally exchange of information between the systems must be secure. Even though Fällman doesn't mention it as a principal, it is stressed that it is important ant that the user doesn't have to focus on the usage of the embodied system. Instead situation should cause computing to take place. Some expectations on embodied systems are for instance that daily life actions are carried out more easily. Activities such as money transactions could be carried out electronically, without the user having to search for a wallet, cards or other devices. The transaction should simply be sensed by and carried out by the embodied computer, triggered by the given situation. (Fällman, 1999)

### 3.4 Physical/virtual

Pederson defines the physical world as everything that is taking place except on your computer screen. The virtual world is the environment that makes the user dependent of computer power. Pederson argues that the physical world offers important advantages that is hard or simply can't be substitute in the virtual world. Since the computers also have a great deal to offer Pederson reasons that a closer relation between computers and the physical world would be most beneficial. (Pederson, 1999)

Most times we have to separate between our actions in the physical world and in the virtual world. After performing certain tasks, the user has to make adjustments to either the physical world or to the virtual world. This must be done in order to ensure that the two worlds have corresponding information. Physical/virtual computing is the idea about building a bridge between our physical world and the virtual world. When using a physical/virtual system, the computer detects changes in the physical world. This triggers the computer to take appropriate actions so that information integrity is ensured. Likewise it would beneficial if changes made to the virtual world, were reflected to the physical world. So instead of the user having to synchronize the physical and virtual world manually, the computer should do this automatically. Pederson describes this separation between the two worlds, as a gap. (Pederson, 2000)

## 4 Our idea: an integration of physical and virtual commerce

In this paper we have presented different perspectives on the integration of physical and virtual worlds. None of the articles that we refer to in this paper investigate however the possibility of merging physical and virtual commerce. We haven't found any other article where this is done either. But what happens when we think about commerce in this way? What new possibility arises when we merge physical and virtual commerce? Since we haven't conducted any experiments or found any articles about this, we can do nothing more than speculate. But when we think about the ideas that we have described in this paper and taking in consideration the technologies that BLUETOOTH (The Official Bluetooth SIG Website, 2001) will enable, we think that this is very exiting area of research.

## 5 Expected advantages of integrating physical and virtual commerce

As it is now we know to little about this area, in order to say anything about how a successful system should be build. Probably there are many ways of merging physical and virtual commerce. We guess that the business, customers and the products are example of such features that needs to be taken under consideration when building the systems.

So, what is there to gain with integrating physical and virtual commerce? Well as stated before we can say nothing for sure but we have some ideas on what expectations we can have. We will now illustrate our vision of how an integration of physical and virtual commerce might look like.

### 5.2 Contribution to physical commerce

Imagine yourself stepping into a retail shop for shoes. You have been there before and are already registered to their physical/virtual integrated IT system. You know that your visit here will not be in vain since you logged on to their web site, had a look at the assortment last night and had a pair of shoes put away. A salesperson notices you and come to assist you. At the same moment you entered the store your phone began communicating with the stores computer system, so the salesperson already knows about the shoes you had put away. You decide to buy the shoes and payment is made automatically, by simply pressing a button on your mobile phone.

The situation above is an illustration of how a system that integrates physical and virtual commerce could be implemented. When we have speculated about how this system could be designed, we have come to the conclusion that not only money transactions should be in focus. As illustrated in the example above we think that it could

be useful if also the computers were able to communicate personal preferences. But how would this be possible? In the example above we describe how the customer step into the store and the customer's mobile phone connects to the store's computers. The connection is preferable wireless and is established automatically. When the mobile phone is connected the customer's unique identification number is transferred and now the computers can access the customer profile. Maybe this could be a solution?

One of the key features in the illustration is how little attention the customer is giving the mobile phone. One click is all it takes in order to close the deal. We believe that it is very important that the technology is as simple to use, as it is possible to make. Therefore our idea is that the mobile phone should be aware of its presence in the store and configure itself so that the proper user interface is loaded. It is this that makes the one click to buy possible and the user doesn't have to navigate through different menus at all. We imagine that it would be a great thing if there were a standard for this type of user interaction, so that one key on the mobile phone is dedicated for this kind of operations. It would be a kind of confirm-button for the physical/virtual systems, as we have the enter button on the computer keyboards.

### 5.3 Contribution to virtual commerce

We suggest that the electronic interaction the customer has with the business, shouldn't be seen only as virtual interaction. We think that it could be beneficial to both customers and businesses if actions can be related to the physical world as well. In the example with the customer in the shoe store, we described how the customer first used the website to browse through the collection of shoes. Those shoes that seemed the most interesting, were put away. So actions that before had to be done physically, could now be done virtually. This might seem as a little bit farfetched, but our notion is not to provide a system design but merely to suggest what these ideas might take us.

As portrayed in the illustration, we don't see interaction with the virtual world as something that is performed just at home, when you're sitting by the computer. We also think that virtual interaction is when the customer uses the mobile phone or when the phone communicates automatically with the system in the store. Even though the customer doesn't have to intervene in this process, we think that the sharing of profiles and other integrity related information is a part of the person's virtual existence.

## 6 Summary and future work

In this paper we have presented and explored the idea about an integration of physical and virtual commerce. As we see it customers generally have to choose between either visiting physical stores or surf to their website. Could it not be possible to somehow merge those two worlds or at least bring them closer together? We have described some earlier works that have been done on integration of physical and virtual worlds and we believe that it would be possible to apply some of these ideas on retail businesses. We

believe that a merging of the two worlds could be very fruitful for both businesses and customers. We have however not found any business that has already done this, at least not to any greater extent.

We have yet much more to learn about physical and virtual commerce and will continue by developing ideas about how an integration could be done. As a starting-point we would like to explore supportive technologies that can co-exist or be integrated with other technologies. So our next step is to create a prototype of the system that we described in our vision of the shoes store. Later on we will investigate other possibilities that this type of commerce enables.

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