THE APPLICATION OF E-COMMERCE AND WEB TECHNOLOGY IN AGRICULTURE[1]

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Abstract

The application of the latest information and telecommunication technologies is becoming inevitable in business development. Modern information technologies have been widely used in all stages of trading, from procuring, storing and handling goods, through selling and collection, to post-selling activities and costumer services, both in the wholesale and retail sector. Agriculture is an industry that, among others, has a large potential in the area of electronic commerce, and especially in the segment of web technology. In this paper we analysed several categories of web presentations – web sites that provide transaction cost savings, intermediaries on the electronic market, integrated services of electronic commerce and electronic commerce support service providers. We also systematised the benefits of using web technology. In the last section of this paper we gave the analysis of the current situation and potentials in the Republic of Serbia, giving an overview of introducing a new mobile phone technology for informing participants in the agricultural value chain.

Key words: *agriculture, electronic commerce, web technology, web presentation, web portal, mobile services*

Introduction

Modern business conditions, in all segments of the economy, are characterised by financial instability, market uncertainty and increased competition. In that environment, every company is trying to find sources

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of comparative advantage and to create added value. Greater competitiveness can be achieved by introducing quality systems and reengineering the business processes, with the inevitable application of technological innovation and information and communication technology (ICT). The application of the ICT has become inevitable to the extent that they make an integral segment of each company. Competitive business can no longer be imagined without the application of ICT. Companies have long been aware that successful business must rely on technology, which is one of the main sources of growth and development (Becchetti et.al. 2003; Keramati, 2007). As a result, this area attracts large investments, to the point that it is possible to study the impact of ICT investments on economic development of some countries (Vu, 2002).

The area with a significant potential for increasing the competitive advantage is also a global network – the Internet. The Internet can be characterised as an "information network" because it eliminates the distance and increases the possibilities of communication, both within and outside countries. Thus, the Internet has a direct and distinctive impact on business organisations. New organisational structures now also appear in the form of *dot.com*, transforming the existing market (Beurskens, 2003).

Agriculture is a specific economic sector, characterised by fragmented production with no substantial communication between farmers, processors and consumers. It is the application of communication models developed for using on the Internet that can bridge this gap.

This paper consists of four parts. The first part presents the concept of electronic commerce (*e*-commerce), its development and categories. The second part gives the overview of the benefits provided by the concept of *e*-commerce, while the third part describes in detail specific benefits of web technology. The third part is a central part of the paper and describes different forms and structures of web sites about agriculture: websites that provide transaction cost savings, intermediaries on the electronic market, integrated *e*-commerce services and *e*-commerce support service providers.

E-commerce

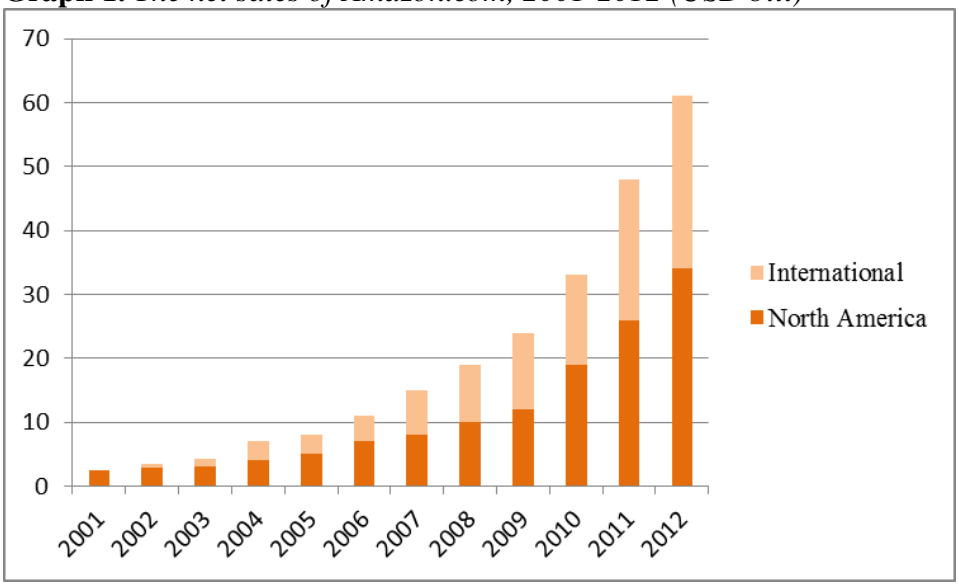
The systems of *e*–commerce and *e*-business have experienced explosive growth in recent years due to the development of Internet technologies, associated services and applied encryption mechanisms (protection). Modern information technologies have widely used in all stages of

trading, from procuring, storing and handling goods through selling and payments to post-selling activities and costumer services, both in the wholesale and retail sector. According to the definition given by OECD (2001) 'An electronic transaction is the sale or purchase of goods or services conducted over computer-mediated networks (broad definition) or over the Internet (narrow definition)'. Of course, the payment and the ultimate delivery of the good or service may not necessarily be conducted on the Internet but also off-line. Telephone, facsimile or regular mail orders are not considered *e*-commerce. *E*-commerce is often regarded as online shopping. However, online shopping is a narrower term, because *e*-commerce implies 'any virtual electronic commerce and support to such business activities'.

Although such systems as EDI (Electronic Data Interchange) and EFT (Electronic Funds Transfer) have been used since the early '70s, the explosion of E-commerce took place in the early '90s, when the rapid diffusion of the Internet and the World Wide Web made the business management much cheaper and easier. The Internet is now considered a well-established channel for commercial transactions. It represents a global market with hundreds of millions of buyers and sellers, a place for all types of transactions, and any forms of business. *E*-commerce enables reducing transaction costs and saving time. In order to take advantage of all the benefits and opportunities it provides, companies (and individuals) have to be ready to accept and develop appropriate *e*–business strategies, thereby changing or abandoning their traditional business. *E*–business strategies must comply with the specific industry and have to be constantly innovated in order to create competitive advantages and new values. When it comes to agricultural products, the Internet could be an important market tool that would complement commercial activities. Large companies are usually the first ones to use new technologies and accept *e*-business philosophy, but this should not be an obstacle to small companies, since entry barriers are negligible (Baourakis, 2002).

The best illustration of *e*-commerce explosive growth is the example of one of probably the most famous companies that conducts its business on the Internet - Amazon.com. From 2001 to 2012 the company recorded remarkable growth in net sales. In those ten years, the sales grew from $2.5 billion to $61 billion, nearly half of which was conducted on the territory of the North America. Picture 1 shows the sales growth of Amazon.com.

Graph 1. *The net sales of Amazon.com, 2001-2012 (USD bill)*



Source: *Frederiksson (2013).*

Besides in the USA, the growth of E-commerce was also recorded in other countries. Thus, the E- commerce in China recorded the growth of 120% when compared to 2003, and in 2013 the Chinese market surpassed the US market. The market of South America also recorded a remarkable growth in the last decade, from $1.6 billion to today's $43 billion, whereas Brazil has the largest market share of nearly 60% (WTO, 2013).

Apart from all the opportunities and expansion, it is necessary to point out the fact that e-commerce is facing some very serious problems that slow down its development. These are problems related to product quality assessments when there is no direct insight, as it is in traditional trade. Ways of payments were an issue for a long time and they have been constantly improved, particularly in technologically developed countries. Goods and service delivery is a special challenge in case of limited understanding of legal issues that are the basis for safe *e*-commerce. International expansion of this type of trade is limited by the inconsistency of regulations, resources and capacities among countries as well as existing regional agreements.

E-commerce has found its way to agriculture. Since the Internet is becoming increasingly popular among people involved in different stages of agricultural production, we can expect further application of *e*-

commerce in this area. Ferentinos et al. (2006) have concluded that so far *e*-commerce has been implemented in agriculture within three categories: a) *e*–marketplaces, where buyers and sellers meet, expecting that they will manage to adjust their expectations, b) *e*-distribution sites, which complement or replace standard distribution channels and c) *e*-procurement sites, designed to provide their customers with aggregated online information helping them to depreciate prices (increase price transparency).

As in the case of other common business processes that benefit from the *e*-commerce, agriculture has some specific and additional benefits from this type of business. Bearing in mind that one of the key elements of successful business in agriculture is timely information (e.g. weather forecasts, market supply/demand, etc.), *e*-commerce introduces some significant changes and benefits.

Benefits from the transition to electronic market

Potential advantages and benefits from the transition to electronic market (very often as an additional form of trade) are reflected primarily in reduction of costs, as well as in the fact that participants in the trade business are easier to find (their offer, price, ways of ordering, all contacts) and much easier and cheaper to contact. Bearing in mind the current situation on the electronic market and the Internet, we can conclude that the competition is getting fierce since all participants are equal on the network, at least when it comes to the way of accessing and using websites. All of the above causes a decline in direct costs, and modern computers and creating a website are so cheap nowadays that they do not represent a significant cost.

Training and learning costs practically no longer exist, since computer literacy is now seen as part of general education, starting at lower grades of primary school, if not earlier, and the Internet being used for a variety of purposes. On the other hand, a number of user-friendly applications are increasing, so users also find them easier to use.

There are two basic costs that users have to pay: the cost of internet connection and subscription fees. If we extend these costs, they would also include the purchase of a computer and the cost of training, but for the reasons mentioned in the previous paragraph, it is not necessary.

Possible benefits and income acquired when shifting to electronic market are not easily defined. It is necessary to compare the income before joining the electronic market with the current income, taking into account all other parameters that potentially could lead to change. Although they have been partially discussed, it is useful to make a brief summary of potential benefits (Petnek, 2009), such as:

- Using accurate and timely information, like information about goods, prices, etc.;
- Eliminating the distance between producers and consumers;
- A much more efficient procurement process through electronic ordering and online payments;
- Better information on supply and demand that results in forming more favourable prices;
- Excluding commercial agents that leads to cost reduction;
- Improving product quality;
- Reducing costs due to online marketing and online sales;
- Increased market availability of products.

Theoretically defined benefits of electronic markets are difficult to find objections on, but it is necessary to achieve those benefits through profits.

Advantages of using web technology

As we have already pointed out, the existence and the use of the Internet is essential for E-commerce. The Internet as a global network, however, implies the use of different services, the most popular of which is the World Wide Web, or just the Web. The Netcraft company research showed there were 919,533,715 registered websites in March 2014.

The Web is a way to access information through the Internet. It is a model for information exchange that uses the HTTP protocol as one of the languages used for data transfer within the network. Web services that use the HTTP protocol to exchange business logic use the Web to exchange and share information. In order to browse the web effectively, it is necessary to use search engines, such as Google Chrome, Internet Explorer, Mozilla Firefox and others. Without search engines it is not possible to access Web contents, which can vary from text, images and sounds, to videos.

The main advantages of using web technology in trading, regardless the kind of goods, are cost reduction and enabling a large number of users to

connect in different ways. Moreover, data presentation can be static or animated, searching for a specific product can include additional help functions, sound can be added, and credit card payments may be provided, while the encryption system increases the security of the overall system.

The analysis of existing web sites related to agriculture shows that all of them can be divided into four categories (Mueler, 2009):

- Websites that provide the transaction cost savings;
- Intermediaries on the electronic market
- Integrated *e*-commerce services;
- *E*-commerce support service providers.

This classification, however, should be considered as general, since hardly any website has an interest to cover a single aspect, i.e. their business includes all of the above mentioned aspects.

1. Websites that provide transaction cost savings

Transactions, in this context, include the flow of information, goods and money. Such transactions are significant different than conventional, since in traditional trade goods can be seen (touched), contracts between stakeholders (a quote, dispatch note, receipt, invoice) are in a form of a hard copy and payments are in cash or cashless.

When it comes to *e*-commerce, all information, money, and sometimes even goods must be transformed into a binary format and thus transported across the network at a high speed, with practically zero marginal cost.

The Internet can therefore reduce transaction costs by reducing trading costs or transfer fees, or both at the same time. Trading costs decrease since searching for necessary goods is free of charge, establishing communication with the seller/buyer via *e*-mail does not require additional costs and it is practically carried out without any delay or waiting, which is extremely important when stakeholders are geographically separated.

Image 1. *Home page of the web site "Agriculture"*

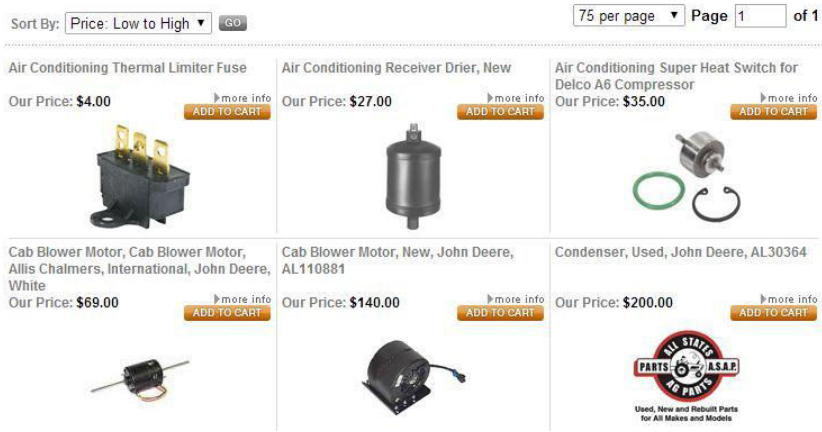
Source: *www.agriculture.com*

An example of this type of websites is certainly www.agriculture.com. On this website it is possible to find a number of information related to agriculture and farmers. The site has news feed, which covers the following categories: Crops, Livestock, Policy, Business and Technology. It also includes markets (Markets Analysis, One's World in Agriculture, Markets Newswire, Commodity Prices), with mandatory directories like Weather Reports, Forums, and finally News, Reviews, Classified and AG directories about products. A separate link is dedicated to successful farming. The presentation also offers the possibility of sending free newsletters.

2. Intermediaries on the electronic market

Having achieved cost reduction, due to application of the *e*-commerce, some of the activities previously carried out by companies can now be coordinated through the market. The reduction in transaction costs eliminates market mediators, but, on the other hand, it leads to the development of completely new and different intermediary activities on the market. This primarily refers to providers who classify supply/demand on the market, often specialised for a particular type of goods (grain, livestock, etc.); mediators that quickly link buyers and sellers; market space providers and auctioneers who make the negotiation on prices be public, in accordance with clearly defined rules.

Image 2. *Search result for tractor spare parts, John Deere, model no. 2250, air conditioning spare parts*



Source: *www.tractorpartsasap.com/John-Deere-2250-air-conditioning-parts-s/39070.htm*

An example of this kind of websites could certainly be www.tractorpartsasap.com. It is a website that offers spare parts for agricultural machinery, harvesters, tractors, etc. It is possible to find new, used or repaired parts, all in one place, with a complete specification, price and possibility to order right on the spot. Time saving is significant when using these types of sites.

3. Integrated *e*–commerce services

Some web sites are designed as agricultural portals, aimed to provide a wide range of information and play a mediating role. It is possible to set a broader picture, taking into account that users easily jump from one site to another if they are connected by hyperlinks. The various portals are thus linked to form a kind of web community.

Given the fact that most of agricultural products cannot be converted into a digital form, it is necessary to integrate with storages, transporters, and control and insurance bodies to achieve a full advantage of E-commerce.

An example of this type of website is the portal Farms.com. It is a comprehensive website that, among other information, provides detailed information on agricultural auctions that take place in the United States.

Image 3. *Example of searching agricultural auctions*

Source: *www.auctionhopper.com/cobrand/farms/location*

4. *E*-commerce support service providers

Participants in *e*-commerce expect from companies that opted for this type of business to have their own website. Often it is not profitable for farmers and people who run small business to invest in this kind of promotion since the costs of having a website are relatively high, since a modern website, besides advertising, also includes software tools for database searching, query systems, interactive work and a protection system of an entire website. Such participants are left to use services of internet providers specialised for agriculture.

E-commerce in agriculture on Serbian market

To develop *e*-commerce, certain conditions need to be achieved, above all, the diffusion of the network and a number and the structure of active users, as well as their geographical dispersion. If we analyse the situation in Serbia, we can come to a conclusion that the percentage of the population who use the internet has still been low, although constantly growing.

According to the Statistical Office of the Republic of Serbia (2013), 31.6% of households own a laptop, which is an increase of 10.2% when compared to 2012, and 16.1% when compared to 2011.

As for personal computers, 59.9% of households own a personal computer, which is an increase of 4.7% when compared to 2012 and 7.8% when compared to 2011.

Some differences can be seen when compared the presence of computers in urban and rural parts of Serbia: 66.3% vs. 50.9%. Since 2012, this gap has been reduced. The growth rate of computer presence in urban and rural parts of Serbia supports this fact. In urban parts, it amounts to 3.3%, while the growth rate in rural parts amounts to 7%, when compared to 2012.

The computer presence in households varies depending on the territory: it is 67.1% in Belgrade, 64% in Vojvodina and 55.1% in Central Serbia.

In the Republic of Serbia, 55.8% of households own an internet connection, which accounted for an increase of 8.3% when compared to 2012, and 14.6% when compared to 2011. Internet connection is mostly present in Belgrade and it amounts to 65.8%. In Vojvodina it amounts to 58.3%, and in Central Serbia 49%.

The situation is the business sector is much better. In the Republic of Serbia, 99.6% of companies have an internet connection, which is 1.9% more than in 2012 and 2.4% more than in 2011.

An unavoidable gadget that has to be mentioned here is the mobile phone. The research has shown that 87% of the population uses the mobile phone, and in 2012 it was 85.8%. When compared to 2012, a number of people who use the mobile phone have increased by more than 30,000.

Bearing in mind the above mentioned data, we can conclude that there is a good basis for introducing *e*-commerce in agriculture, although households have not been following enough modern electronic trends. Nevertheless, one cannot forget the fact that the percentage of the population who use the Internet to receive information about goods and services is considerably high (60.8%), while the percentage of the population who use web portals to buy and sell goods and services amounts to 29.3%, which implies highly pronounced growth of this sector.

Development of .rs domain web portals

In the area of web portals particularly, as a way of *e*-commerce on the national market, we need to mention the web portal www.agroponuda.com, the first B2C[4] internet project for promoting the agricultural products from Serbia, funded by the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia (MAFWM) with the help of USAID. It was designed to develop the trade of products between Serbian farmers and interested buyers who look for quality Serbian products.

The supply data are entered by agricultural extension agents who receive them directly from farmers, which ease and speed up the process of product placement and keep costs on minimum. Besides this portal, we can also mention the first internet market of agricultural products - www.agrora.com, which enables people to use it in six languages.

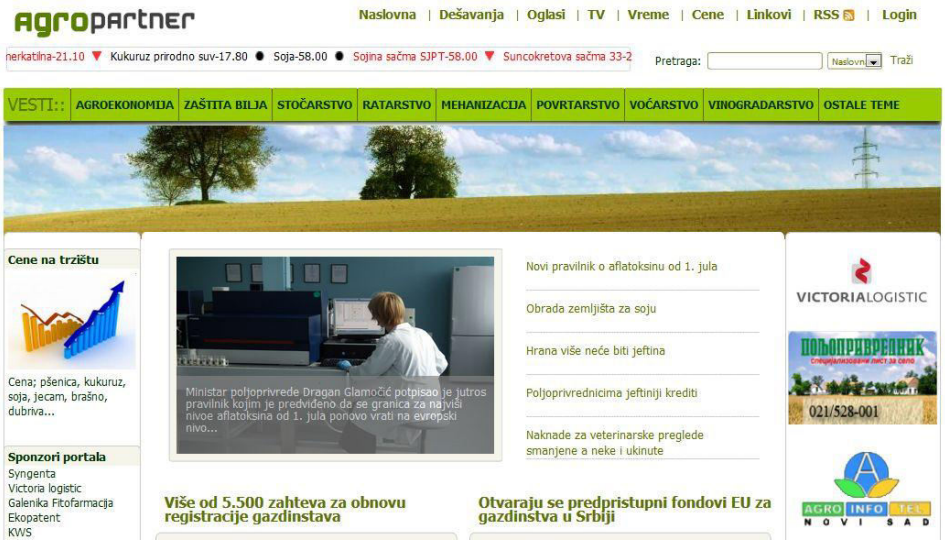
A portal also funded by MAFWM is the "Marketing Information System of the Republic of Serbia – STIPS" (www.stips.minpolj.gov.rs). This portal is the result of the project initiated by MAFWM with the help of the United States Embassy in Belgrade and USAID. It is a project that still provides users with information on the prices from green markets in Serbia, i.e. from locations taken in the sample.

Agricultural extension agents are also responsible for this information they collect on markets located on the territory covered by the agricultural extension office they work for. On the portal there are prices of fruit and vegetables, live animals, grains, milk and dairy products, eggs, poultry and inputs (pesticides, fertilisers and seed). National reports and bulletins are generated based on price movements on markets on chosen locations.

A portal completely dedicated to agriculture is www.agropartner.rs. It is a comprehensive portal that offers various pieces of information (news, contacts, address books, forum, marketing, credits). A portal similar to this is www.mojafarma.rs.

[4] B2C – Business To Consumer

Image 4. *View of the "Agropartner" web presentation*



Source: *www.agropartner.rs*

On the portal www.produktnaberza.co.rs users can follow price movements of all products offered on the commodity market (wheat, soybean, soybean meal, etc.). Although this web presentation is not interactive, it provides much information very useful to farmers. "Produktna berza" works as a company for product mediations and informing. The company was organized as a non-public, one-member limited state-owned company. The issue related to the active participation of individual farmers (natural persons) in the commodity market was solved in 2003, when a company called "Agrar produkt" was founded, now located in the premises of its founder - "Produktna berza". The main reason for founding "Agrar produkt" was to have a link between individual farmers and the commodity market, which has been succeeded. "Agrar produkt" is now a representative of individual farmers for selling agricultural products via "Produktna berza", practically operating as a broker. "Agrar produkt" does not gain profits through the price difference between offered and final prices. It is financed exclusively through the broker's commission that amounts to 1% of the final transaction. Therefore, the above mentioned limiting factor of being legal entity to be allowed to trade was skipped, enabling individual farmers to sell their products for the prices that are on the commodity market. Finally, we have also to mention a portal for selling and purchasing farm machinery and its components - www.poljomasine.net.

Development of mobile ICT in agriculture

As it can be seen from the section dedicated to *e*-commerce in Serbian agriculture, the use of mobile phones is on a very high level.

One of the available services that are being more and more initiated is, primarily, sending information via SMS (*Short Message Service*) – mobile phone messages. "Produktna berza" uses this service to provide market information on the prices of agricultural products formed just after transaction on the commodity market finishes.

Some useful information that could be received via SMS may also be pieces of advice, contributing to a decrease in uncontrolled use of plant protection products as well as to a reduction of costs of production.

The European Union finances a project called "The Agriculture Forecast-Reporting System in the Cross-Border Region" that is being implemented within the second call for the Cross-Border Programme Serbia - Bosnia and Herzegovina. The project is being implemented by the Agricultural Extension Office of Užice in cooperation with the Federal Office for Agriculture from Sarajevo.

The project has resulted in twenty agro-meteorological stations set on the territory of eight local governments. Moreover, software has been developed for processing data and sending them to farmers via SMS, with crop protection recommendations.

The project "The Agriculture Forecast-Reporting System in the Cross-Border Region" has been one of the seven projects from whole Europe awarded the "Sail of Papenburg". This award has been given since 2002 for a special contribution to cross-border cooperation, and this year it has also been focused on a special contribution to the area of agriculture. The EU recognised the value of this project that has set an innovative approach never seen before in Serbia or Bosnia and Herzegovina, and significantly contributed to agricultural development. The Agricultural Extension Office of Užice is the first Serbian institution that received such award. Farmers should start receiving first text messages with recommendations on crop protection at the beginning of next vegetation period, i.e. in March 2014. This service will be free of charge for farmers.

Conclusion

The topic that refers to *e*-commerce in agriculture is very wide and it needs some analyses from the aspect of companies, small entrepreneurs and individuals who entering this segment of trade. Then, it is necessary to identify direct benefits from using new technologies that reflect in higher profits of participants.

The aim of this paper is to indicate the importance of this topic and to generally identify key points of *e*-commerce, and especially of web technology with their application in agriculture, practically introducing the reader with the problem.

New internet-based technologies make a significant difference in the way of connecting people, sharing information, negotiating prices and payments, etc. In next couple of years, it is expected to have an expansion of *online* trading, new providers and better integration of food producers.

The Republic of Serbia has made significant steps in this sector. However, people need more time to accept *e*-commerce as a standard way of trading, especially when it comes to farms.

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