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AGENT-BASED E-COMMERCE AND ITS CONTRIBUTION TO ECONOMY

Abstract:

Today the importance of e-commerce increases in line with the rise in the number of internet users. The complexity and the excess of information in internet make the use of semantic web in e-commerce mandatory. In practice, semantic web uses agents for economic income. Agents are integrated into e-commerce systems such as B2C (Business to Consumer) and B2B (Business to Business). So, agents enable the exchange between customers and sellers and allow shopping transaction. Multi-agent systems are generally used in agent-based e-commerce systems. Negotiation and auction gained importance in these multi-agent systems. There are some differences between B2B and B2C agent systems. These differences can be exemplified by some systems such as MIT's KASBAH or E-bay's AuctionBot. With these systems, buyers can purchase with the minimum prices and sellers can reach more costumers without advertisement.
In this paper, the benefits and challenges of agent based e-commerce is investigated and the contribution of the use of agents in B2B (Business to Business) e-commerce systems to the economy is examined.

Keywords:

e-commerce, agent-based e-commerce systems, multi-agent systems, economic agents.

JEL Classification: O32, O39

INTRODUCTION

E-commerce is the most developed and the most used technology since the internet had provided internet entrepreneurships. Definition of the e-commerce is; "trade of goods and services".

In 2013, 2.8 billion of people use the internet which considered %38 percent of the World population, 7.1 billion [1]. The internet has been growing so fast that it's grown six fold in last ten years. Depending on the internet usage, e-commerce has grown as the same level of the internet. E-commerce provides rich product portfolio, detailed product info, comparing chance to product features and prices, low prices and competition. Those features is the key point of explaining how e-commerce has grown that fast. According to Goldman Sachs, the e-commerce's trading volume will be 1 trillion dollars in next 3 years which was 545 billion dollars at the end of 2012[1].

Agents help to make activities automatically and cheaper for all those above. Agents also contribute significantly the economies of countries which have a high internet usage.

SEMANTIC WEB

It's been getting harder to reach information since the internet and computers became popular. This provides more and more data is uploading the internet every day. Even the biggest search engines such as Google and Yahoo have hard times to find desired info. The reason is those information are saved by textual based, so people understand. Semantic Web is to make sense of the information and connect each data to another for computers to understand what it is [4].

Semantic web makes meaningful and semantically understandable the information on web so the agents can use the info as well. Semantic web is getting more effective with the Agents. Agents are smart software that responds when it's environmental changes [5].

INTELLIGENT SOFTWARE AGENTS

Software agents have artificial intelligence to determine environmental activities, reasoning, autonomy, and learning. It has abilities to have those cognitive adequacies [5].

Agents have computing abilities listed below [6];

- Reactivity; choose, understand and moving ability,
- Autonomy; Goal-Based, preventive and automatically start ability,
- Cooperative behavior; to communicate ability with other agents for reaching a common target.
- Info based communication ability; To communicate human based with other agents or people instead of symbol based protocols,
- Inference capacity; acting with AI specifications using just the pre-info of the main task.
- Continuity; The continuity of identity in the large time interval,
- Character; Features and character features can be clearly shown.
- Compatibility: Ability to learn and experience for self-development,
- Mobility: be able to now redirecting from one platform to another.

Agents contributed a lot economically and temporal level to the e-commerce and e-banking with indexing, filtering and render meaningful information on the internet.

MULTI - AGENT SYSTEMS

Multi Agent Systems (MAS) is defined to more than one agent which can't solve a problem alone or needs a lot to solve itself [7].

Dynamic collaborative multi-agent systems standards working groups; Foundation for Intelligent Physical Agents (FIPA), the Object Management Group (OMG), the Knowledge-able Agent-oriented System (chaos), and the General Magic group [8].

FIPA is the one of the most used standard that gets agents to communicate in highest efficiency level. FIPA is a well-known group that prepared a report about a standard multi-agent systems communicate with internet users and e-commerce. The report that mentioned before calls "FIPA STANDARDS" [9].

E-COMMERCE

Reflection of the process of digitization in the world economy has increased the importance of electronic commerce. E-commerce provides consumers with a rich product portfolio, comprehensive product information, product features and the possibility to compare prices, low prices and convenience were important factors in the development of electronic commerce. E-commerce has different kind of models such as B2C (Business to Consumer), C2C (Consumer to Consumer), B2B (Business to Business), B2G (Business to Government) and C2G (Consumer to Government). In this paper, we focused on the most commonly used ones; B2B and B2C. B2C businesses that provide products or services directly to the consumer is referred to as a model [1].

B2C products or services based on the type of financial risk or inventory risk varies. B2C formats in the world; operating in the Amazon (USA), Flipkart (India), Yoox (Italy), Hailo (UK) in different areas, such as business-to-consumer companies provide services [1]. In the model of business to business (B2B) transactions amounts per capita when compared to other models due to the large volume reached more. B2C e-commerce market in 2013, 252 billion dollars in the United States B2B, this figure is more than twice as high and 559 billion dollars [1]. The best example for B2B is China according to Alibaba.(Alibaba,Chement) [1].

ROLE OF INTELLIGENT AGENTS IN E-COMMERCE

The main objective of agents used in software development, factors within the plan to move, to act autonomously, listen to their environment and fulfill the user's goal is to inform. It's the flexibility of the agents that any changes in the environment, makes change in the plans of the agents. Factors in electronic commerce can easily be done using the following procedure:

- The buyer's option to find the closest matching: For example the buyer wants to go İstanbul to Exeter next Tuesday and he has a budget limit that max. 250 euro. After being informed, Agent defines the related markets and time. Agent filters the options and receives the best offers.

- Multiple e-market behavior; For example, a buyer decide to buy a computer. There are two specifications for this product sale. It should be strong computer and it should deliver in a week. Software agent tries to find those computers in the market. When agent defines the e-markets which are suitable for the demand, it lists the best to worst. This definition is based on the agents specialties such as, one agent could list it with the price another can list it based on the arrival time. The agent also bargains with some of producers. After negotiation, Agent lists the result to the buyer. Then buyer picks the suitable offer.

- Coalition: a bakery agent wants to sell 600 per day cakes to a supermarket needs. But the bakery can only produce 400 daily. Therefore the agent communicates with the other bakery agents to fulfill the request. So the agent bargain and buy 200 from another agent.

The first two scenario is based the B2C (Business the Consumer) and the third one is B2B (Business to Business). Those three examples shows not just agents behaviors, it also shows how the agents communicate each other [10].

B2C AND B2B E-COMMERCE

B2B is known as electronic commerce market between companies. Those companies are done the purchase/ sales transactions over the internet. B2B e-commerce systems contribute to the economy sector is rapidly evolving with software agents day by day. B2B provides power for organizations in their sectors. It's because B2B's own specifications such as; providing new export markets and trying to get costumers in the domestic markets especially in the crisis environments [11].

E-commerce provides companies directly sale their products to consumers through the internet. Nowadays the biggest B2B example is amazon.com according the sales volume. The Amazon Company has big sales rates to consumers all around the world which inspired the companies which want to join e-commerce world [12].

B2C systems rapidly developing with each passing year due to agents, B2C e-commerce revenue reached up to $ 3.9 billion in the United States.

The Change of B2C E-commerce Sales Worldwide According to Years					
	2012	**2013**	**2014**	**2015**	**2016**
Asia-Pasific	$301.2	$383.9	$525.2	$681.2	$855.7
North America	$379.8	$431.0	$482.6	$538.3	$597.9
Western Europe	$277.5	$312.0	$347.4	$382.7	$414.2
Central & Eastern Europe	$41.5	$49.5	$58.0	$64.4	$68.9
Latin America	$37.6	$48.1	$57.7	$64.9	$70.6
Middle East & Africa	$20.6	$27.0	$33.8	$39.6	$45.5
Worlwide	$1,058.2	$1,251.4	$1,504.6	$1,771.0	$2,052.7

Figure 1

As shown in Figure 1, according to year of sales of the B2C e-commerce has increased from 2012 to 2016 consistently [16].

B2C SOFTWARE AGENT EXAMPLES

Kasbah: It is a web-based multi agent system developed by MIT. It provides that users can perform their duties to create agents. When agent is created, it is handled criteria such as the best price, the worst price, time and negotiations. With this criterion, consumers provided by server do negotiations and when conditions determined by user are provided, shopping process occurs. [12].

Ebay is an auction -supported system. In this site, it has two suggestion tool including Feednack Profile and Personal Shopper. Feedback Profile gives feedback that updates the seller and buyer which interact with each other. Buyers can see profile of seller and percentage of votes in the last seven days, the last month, even throughout a year. According to the interests of the consumers processing of information fulfilled via e mail in the Personal Shopping. Users are informed according to budget and looked for criteria.

THE DIFFERENCES BETWEEN B2B AND B2C

- B2C would appeal to individual customers.
- B2B is exchange between companies.
- Negotiation and integration in both systems are applied in different ways.
- There is a chance of negotiation in B2B. But B2C works just the defined circumstances.

Agents and Its Roles in B2B

- *Partnership formation*; artificial initiatives and product chain management.
- *Broker:* Restore and transaction information, negotiation, user profiles, notifications, cooperate with other brokers.
- *Negotiation:* Auction and Deal.

Agents and Its Roles in B2C

- *Requirements Identification:* Amazon (Delivers) and Fastparts (Auto Watch)
- *Product Brokering:* Feature-based, collaborative and constraint-based filtering
- *Union of Buyer Formation*: Gross book sales.
- *Merchant Brokering: Price comparison and multi-feature comparison, The Bargain Finder.*
- *Auction:* Negotiation and multiple auctions. Such as; Ebay, AuctionBot.

THE OPPORTUNITIES AND CHALLENGES OF AGENT BASED E-COMMERCE

Opportunities

- Agent-based e-commerce information relating to areas of interest to the users automatically presented to users via the Internet in accordance with the price they want more efficient and gives the opportunity to shop [14].
- Agent technology in terms of both technology and privacy policies are appropriate to the development. In terms of Security is not a problem yet [14].

- According to a survey conducted by IDC (http://www.idc.com) global software agents on the market from 1997 through 1999 to $ 51.5 million from $ 7.2 million, an increase was observed terrific. In 2004, this figure amounted to $ 873.2 million. Exceeding the trillion by 2014 this figure in electronic commerce intelligent agents that contribute to the economy shows how [15].

Challenges

- Agents communicate to each other, people and it's their environments. This requires improving their communication languages. In this case XML (eXtensible Markup Language) is suggested. In terms of users' interests on the meaning have some problems to solve in XML [15].
- Agent-based metaphor of the factors in e-commerce opportunities are offered by the individual. Electronic commerce offers the same resolution and settings for each user instead of agent-based offers great opportunities to individual users. That kind of personalizing represents by agents which acts like the user. But the agents which act like user cannot be distinguished as always. Therefore, these agents are still need to be improved [15].
- Software agents are not developed for communicate each other. So there still understand problems between the agents [15].
- Agents don't have any problem about the safety issues. But the issue of users rely on agents should be investigated. It's still a discussion that agents suggest price and product quality may not qualify as users want. [15].

CONCLUSION

Software agents have important roles in information security since the security is the indispensable part of online transactions. With the development of semantic web, software agents which act like user have increased revenue of e-commerce. Sending e mail transactions according to user's interest, product price according to the budget of users and suitable product presentation are done through software agents. These transactions are important online trading. Besides opportunities, software agents have challenges that are investigated in terms of security.

In future studies, researchers should investigate about the differences of economic revenue between agent based e-commerce and non agent based e-commerce.

REFERENCES

[1] TÜSİAD, Dijital Pazarın Odak Noktası E-ticaret, Dünyada Türkiyenin yeri, mevcu durum ve geleceğe yönelik adımlar, Haziran 2014

[2] Robert H. Gutmann,Alexandros G. Moukas,Pattie Maes,Agents As Mediators İn Electronic Commerce,Electronic Markets,Vol.8,No:1,Pp. 22-27 January 1998

[3] S. Abu-Draz And E.Shakshuki, "Agent-Based Online Trading System, " Advances İn Artifical Intelligence,Proceedings Of 16th Conference Of Canadian Society For Computational Studies Of Intelligence,Canada,2003.

[4] Börteçin Ege,Hacettepe Üniversitesi, Mühendislik Fakültesi, Bilgisayar Mühendisliği Bölümü, "Yeni bilgi modelleme ve programlama felsefesiyle Semantik Web"

[5] M. Wooldridge. An Introduction to MultiAgent Systems. John Wiley & Sons Ltd, 2002, paperback, 366 pages.

[6] Hermans, B. (1996). Intelligent Software Agents on the Internet: An inventory of currently offered functionality in the information society and a prediction of (near-) future developments. Thesis, Tilburg University, Tilburg,The Netherlands.

[7] Aleksander , Matjaz Gams, Intelligent Agents In E - Commerce, Josef Stefan Institute, Department Of Intelligent Systems, Jamova 39,1000 Ljubliana

[8] Multi-Agent Systems for E-CommerceT.V. Solodukha, O.A. Sosnovskiy, B. A. Zhelezko

[9] Ayşegül Alaybeyoğlu, Rıza Cenk Erdur, "Yazılım Etmenleri: Açık, Dinamik ve Heterojen Ortamlarda Yazılım Geliştirme İçin Bir Teknoloji", Akademik Bilişim 2006, Denizli, s. 468-471.

[10] On Agent Mediated Electronic Commerce Minghua He,Nicholas R. Jennings, And Ho-Fung Leung IEEE Vol.15 No.4. July/August 2003

[11] N. Sarısakal, A.Aydın, "E-ticaretin Yeni Yüzü", Havacılık ve Uzay teknolojileri Dergisi, Temmuz 2003

[12] E-COMMERCE AGENTS AND ONLINE NEGOTIATION PROCESS Amged Fathey Modern Academy in Mfaadi, Maadi, Cairo, Egypt, Ramadan Moawad , Computer Engineering and Computer Science Department, Arab Academyfor Science & Technology

[13] L. Palopoli, D. Rosaci, D. Ursino, "Agnet Roles in B2C E Commerce", AI Communications ISSN 0921-7126, IOS Press

[14] J. Joul, Agent-Based Electronic Commerce:Opportunities and Challenges, IEEE 5th International Symposium,2001

[15] M.He, R.Jennings, H.Leung, "On Agent-Mediated Electronic Commerce", IEEE Transactions on Knowledge and Data Engineering, Vol. 15, No. 4, July/August 2003

[16] http://www.emarketer.com/Article/Global-B2C-Ecommerce-Sales-Hit-15-Trillion-This-Year-Driven-by-Growth-Emerging-Markets/1010575