A TECHNOLOGICAL STEP IN HISTORY EDUCATION MATERIAL: NFC

TARİH EĞİTİM MATERYALİNDE TEKNOLOJİK BİR ADIM: NFC*

Etkinlik Makalesi

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Özet

İnsanoğlu var olduğu günden beri sürekli bir değişim ve gelişme arayışı içerisinde olmuştur. İlkel tarım aletlerinden sanayi devrimine kadar bu gelişme isteği yadsınamaz boyuttadır. Sanayi devrimiyle birlikte ise gelişim hız kazanmış özellikle 20. yüzyılın ikinci yarısında ilk kişisel bilgisayarların ve internetin hayatımıza girmesiyle beraber gelişimin hızı sınırları zorlamaya başlamıştır. Dördüncü sanayi devrimi kavramının hayatımıza girdiği ve nesnelerin internetinden bahsetmekte olduğumuz şu günlerde akıllı cihazların ve sensor teknolojilerin de tanıtılmasıyla beraber gelişimin hızı baş döndürücü bir hal almıştır. Hayatımızın hemen her alanda bu gelişim ve değişim sürecinin sonuçlarını görebiliriz. Ne var ki çok az sayıda da olsa bazı alanlar değişime karşı direnç göstermişlerdir. Bunlardan birisi olan eğitim alanında da gelişim ve değişimin hızı nispeten yavaş olmuştur. Sonuç olarak dünyanın birçok yerinde yüzyıl öncesinde olduğu gibi eğitim ve öğretim yapılmaktadır. Tıpkı yüzyıl önceki sınıflarda olduğu gibi öğrenciler sınıflarda arka arkaya dizilerek pasif ve bilgiyi sadece alan rollerini devam ettirirken öğretmenler de sınıftaki otorite olma rollerini sürdürmekte ve hala bilgiyi sağlayan tek kaynak olmayı seçmektedirler. Bu bağlamda okullarımızda yürütülmekte olan tarih dersleri de maalesef bir istisna oluşturmamaktadır. Genç nesillerin eğitiminde son derece önemli bir yere sahip olan tarih derslerinde kullanılan kitap, harita, poster veya tarih cetvelleri gibi materyaller günümüz teknolojisini yakalamakta yeterince başarılı olamamışlardır. 21. yüzyıl öğrenci profili düşünüldüğünde bu materyallerin öğrencilerin ihtiyaçlarını ve beklentilerini karşılamakta yetersiz kaldığını söylemek yanlış olmayacaktır. Bu açıdan bakıldığında, hayatımıza son yıllarda girmiş olan Yakın Alan İletişim Teknolojisinin – Near Field Communication (NFC) tarih eğitiminde kullanılmakta olan materyallerin modernize edilmesinde dikkate değer bir potansiyeli olduğu söylenebilir. Kısa mesafeden temassız iletişimi ve bilgi paylaşımını olanaklı kılan bu teknoloji sayesinde tarih eğitimi materyalleri etkileşimli hale getirilip daha verimli bir şekilde kullanılabilir. Liselerde uygulanması planlanan daha geniş kapsamlı çalışmanın ilk adımı olan bu çalışma kapsamında, okullarda kullanılmakta olan poster ve haritaların NFC teknolojisi kullanılarak etkileşimle hale getirilmesinin yolları araştırılmış ve örnek posterler hazırlanmıştır.

Anahtar Kelimeler: Yakın alan iletişim teknolojisi, tarih eğitimi, tarih eğitim materyalleri, NFC, akıllı posterler

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Abstract

Since the existence of first humans, human beings have been in search for continuous development and improvement. This development which accelerated especially after the industrial revolution gained momentum after the introduction of first personal computers and internet in the second half of the 20th century. Nowadays in which the fourth industrial revolution is on its way and the internet of things has entered our lives, it can be said that the developments in smart devices and sensor technologies increased this momentum to incredibly fast levels. Although we feel the effects of these developments and changes in every field of our lives, resistance in some areas like education can be observed. In that, today the teaching and learning processes are being carried out in a way which had been done hundred years ago and in which students play the information receiver role by sitting behind each other in rows and teachers has information provider role. Besides, although information technologies have entered into classrooms in recent years, traditional education materials still exist. In this vein, it can be said that history education is not an exception and materials such as books, maps, posters and chronological charts which are used in history education have failed to keep up with technological developments enough. When 21st century student profile is considered, these materials may fall short in meeting students' needs and expectations. Accordingly, it can be argued that Near Field Communication (NFC) technology may have a great potential and may be used to modernize the materials which are used in history education. Due to this technology which enables contactless data transfer in short distances, the history lesson materials can be turn into interactive ones and can be used in more effective ways. In this study, which has been planned as the first step of a broader study which will be carried out within a high school, the possible ways of turning history lesson materials into interactive ones by using NFC technology are investigated and sample applications are carried out.

Key words: Near field communication technology, teaching history, history teaching materials, NFC, smart posters

INTRODUCTION

When humans left the hunter-gatherer life style and settled down, they understood that it was necessary to improve their equipment and technology as well. The process which started with the development of primitive plough has gained velocity in time and still continues to gain more. Since the early times human beings have been in search of better standards. As a result, the transition from agricultural society to industrial society took place. Together with the industrial revolution, the need for educated work force emerged and to compensate the educational needs schools were established. This incited willingness to develop and the need for change. Although the speed of development accelerated with industrial revolution, the invention of computers and internet in the second half of the 20th century enabled the speed of development increased at a dizzying rate. Afterwards, personal computers have become accessible economically at the end of 1990s, the effects of computer technologies started to be observed in almost every fields. With the invention of mobile devices, sensors and smart applications and the development of software, it has become possible to control all kinds of devices and processes in almost all aspects of our lives. However, in few sectors one of which is the education sector and which have resisted change and development, traditional methods still perpetuate.

Today although a few technological education materials have been embedded into education processes, we still continue to educate our children in the same way as we did hundred years ago. Yet, it is generally accepted that the traditional way of instruction decreases the efficiency of system, kills the creativity of our children and ends the interaction among individuals.

Even though the history will not change in the future, it is evident that the way of providing history education which have not been benefitted from the educational technologies in desired level should change. The materials which are being utilized within history education which is highly important in terms of educating our future generations fall short in meeting today's children's needs and arouse their interests. The material support in history education is highly important. The technology should be exploited to embody the abstract events and to be adopted by students. This not only provides opportunities for students but also for teachers. Besides, it can be possible to strengthen the relationship between students and teachers

and improve motivation in classrooms. In this respect, latest technological developments which have become available to us recently have potential to break the chains that restrain education. Undoubtedly, mobile devices undertake significant roles in this process. In addition, the developments in senor technologies enables the use of mobile devices in a more efficient way. It can be said that one of the promising technologies in this field is Near Field Communication Technology (NFC).

In scope of this study, the possible ways of using NFC technology in the development of history education materials which are thought to be inefficient because of being inactive are sought. Especially, it is aimed to allow students to access more interesting and efficient contents by using their smart phones or tablets. In addition, it is aimed to provide a technological infrastructure for posters which are being utilized in history instruction. As secondary objectives, turning school environments into smart environments and increasing the awareness about NFC technology are aimed. In this vein, first the related literature on mobile learning and NFC technology is investigated below and then instructions for sample materials are provided.

Mobile Learning (mLearning)

The term mLearning is getting researchers' attention more and more. Among these Sharples, Taylor, Josie and Vavoula (2007) state that mobile and context-aware technologies provide the opportunity to learn by exploring the world and enable continuous communication. As to the definition of what mobile learning is some researchers have tried to define it, for example, Kukulska-Hulme and Shield (2007), by focusing on the time and setting and mobility of devices, define mobile learning as "… learning mediated via handheld devices and available anytime, anywhere. Such learning may be formal or informal" (p.3). In another definition of mobile learning, Sharples, Taylor and Vavoula (2007) not only emphasize portable technology but also the mobility of people and knowledge. According to them, mobile learning is "the process of coming to know through conversations across multiple contexts amongst people and personal interaction technologies" (p.4). As can be understood from these definitions, mLearning enables students not to be restricted by space (classroom) and time (class time) and to have access to educational materials in other contexts. In other words, allows individualized education which is independent of time and location.

At this stage, it may be necessary to state what constitutes mobile devices. Traxler (2010) points out they are "smart-phones, game consoles, digital cameras, media players, netbooks, in-car sat-nav, and handheld computers" (p.3). So it can be said that today most devices can be counted as mobile.

Historical Development of mLearning

The historical development of mLearning begins with the introduction of first mobile phone which was DynaTAC 8000X developed by Motorola in 1973. According to Crompton (2014) in whose work the historical development of mLearning is well documented, in 70s, technology and telecommunications were merged. Although technology was not so important in those years the term 'Discovery Learning' was developed in 1970s. Then, first handheld computers were introduced in 1980s. In this period, students were able to interact with computers in their learning processes by means of Computer-Assisted Instruction (CAI). Since students were involved in learning it can be said that educational circles embraced more constructivist point of view in this period. Then, the first web browser was introduced in 1990s. In schools, it was possible to find multimedia computers and PalmPilots a form of personal digital assistants were the first devices used for educational purposes. Moreover, by means of World Wide Web, socio-constructivist learning gained importance in this period and the demand for mobility of devices increased. From 2000s to present it is seen that mobile phones have become smaller and more affordable and they have begun to have the capabilities of microcomputers. Static internet has changed to the dynamic and this resulted in the development of Web 2.0 tools and virtual learning environments. Internet has become wider and more accessible and people get accustomed to the use of smart phones. Tablets which offer more screen size were also introduced in this period.

Using Mobile Devices for Educational Purposes

As can be understood, the development of mobile devices has affected the understanding of education. Together with each technological development the educational understanding has become more interactive and gained a more socio-constructivist characteristic. Thus, for students both hands on and collaborative learning has become possible.

In this respect, it can be said that using mobile devices for educational purposes has some potential benefits. Kukulska-Hulme (2005) and Crompton (2014) point out that with these devices students now can decide when, what, where, how fast to learn and also, more personalized and student-centered education is possible. Besides, for Ferran-Ferrer et. al (2014) it is easier, faster and cheaper to develop and find mobile devices and tools designed specifically for learning.

Surely mLearning and using mobile devices for educational purposes have some potential drawbacks as well. Several researchers such as Brown, Hruska, Johnson and Poltrack (2014), Waard (2014), Parsons (2014), Ting (2012) and Traxler (2010) have criticize mLearning. Besides minor drawbacks of mLearning such as being disruptor and inappropriate usage, Traxler (2010) also mentions about drawbacks in infrastructures, procurement and sustainability issues; ethical aspects; ensuring equality of opportunity, inclusion and access; and quality assurance and staff training (pp. 11-12).

NFC Technology

When compared to other technologies, since it is relatively newer technology, which was jointly developed by Philips and Sony in 2002 for contactless communication, there are fewer number of studies in literature related to Near Filed Communication. Some of the studies on NFC are: Choo, Cheong and Lee, 2014; Özdenizci, Alsadi, Ok and Coşkun, 2013; Ok, Aydın, Coşkun and Özdenizci, 2011; and Ok, Coşkun Aydın and Özdenizci, 2010.

While defining what NFC is, researchers used similar expressions. In one of these, Choo, Cheong and Lee (2014) state that "NFC is a short range and robust high frequency wireless communication technology which enables the exchange of data between devices" (p. 739). According to Ok et al., (2011) there should be two devices for NFC communication, one indicator which is active and responsible to start the communication and a target device which responses the indicator's request. When indicator gets close to the target device (less than four cm) it generates 13.56 MHz magnetic field and powers the target device. Özdenizci et. al., (2013) say that it can be used as a trigger to access a space by interacting with a smart object and allows more personalized control of a number of devices in that space.

NFC Modes

It has three operation modes in which NFC mobile interacts with a smart object like NFC tag, NFC reader and NFC mobile. Coşkun, Özdenizci and Ok (2013) argues that each mode employs different communication interfaces. In reader/writer mode mobile user make use of the data stored in NFC tag and take appropriate actions. In peer-to-peer mode two NFC devices establish a bidirectional communication to exchange information. In card-emulation mode NFC device acts as smart card.

The Advantages and Disadvantages of NFC technology

NFC technology has some advantages. First of all, according to Özdenizci et. al., (2013) as a result of the developments in NFC technology, mobile phones have undergone some changes and are now safer, more convenient, speedier and more fashionable. That is, the transformation of mobile devices into smart devices has enabled them to become popular and they have become accessible by many people all around the world. This means that today it is much easier to design educational materials utilizing these kind of smart materials than ever before. Also, Ok et. al., (2010) state that turning mobile devices into information storages and being able to use them as NFC readers simultaneously is one of the advantages of NFC technology. Before the widespread usage of the smart devices and NFC, people needed to use separate devices for each different task for each step in the educational material design processes. This resulted in a turmoil for both the

designer and the user, which in turn decreased the engagement rates and finally failure. However, after these technologies have become extensive, the ability to complete all the processes by using one device has created a great advantage. Another benefit of these technologies can bring about is that it is possible to use available technological infrastructures which will decrease to required investment considerably. Besides, to be able to use the existing RFID infrastructure, its simplicity of use, which does not require any knowledge about the technology, and the security it provides are among the main advantages of NFC technology. Even the basic user who may have problems while carrying out simple procedures can easily use the NFC integrated systems. However, NFC technology is not free from some drawbacks. According to Coşkun et al. (2013) the problems of NFC can be grouped as technological and operational problems and managerial and strategic problems (p. 2278). Even if the NFC technology itself has become widespread recently, not all the smart device manufacturers use it. This may lead some problems in terms of enabling all students have access to the developed educational materials. In addition, developers may need to integrate more than one technology into one piece of material according to the different technologies of different devices. Consequently, this may create a fuzziness while using the material.

Sample Applications

Since NFC technology started, several applications have been developed. These are classified by Coşkun et al. (2007) as healthcare applications, smart environment applications, data exchange and sharing applications, mobile payment, ticketing and loyalty applications, entertainment applications, social network applications, educational service applications, location-based applications and workforce and retail management applications (p. 2280-2283).

Choo, Cheong and Lee (2014) conducted a study called I²Navi using NFC stickers and smartphones. With NFC-enabled smartphones they designed a navigation system in a faculty. They put NFC tags on posters in various places inside the building. These tags provided reference coordinates which users can use on a floor plan of the building on their smart phones. Besides, Miraz et. al., (2009) mentions about possible use of NFC applications in teaching scenarios in their study. In addition, at Cordoba University they tested attending control (p.7). Coşkun et al., (2010) tested the usability of NFC in a student council voting and compared NFC voting to web-based voting and found out that NFC increases the potential of the usability of system.

Other Technologies

There are other technologies which are similar to NFC and which form basis for NFC technology. Barcode, QR code or RFID techologies which we come across in all pats of our lives have some potentials in educational fields as well. Barcode technology is a kind of information coding technology and it requires an optic reader to be able to reach the coded information. Barcodes can be seen everywhere and for everyhting. Although it can be very easy to produce barcodes, only limited amount of data can be coded into them (Kato ve Tan, 2005) and it is difficult and costly to establish the infrastructure. Theresore, there are problems with using this technology for educational purposes.

On the other hand, QR codes which were used in the production phase in automotive sector first and entered in our country with its use in pharmacy sector are another possible technology to be used in educational environments. From prescriptions to identity cards, and from tickets to TV programes or product flyers or library application, QR codes are used in various fileds. They are cost effective and can be used with almost all kinds of mobile devices. So, it can be said that they are a little bit more advantageous than barcodes. However, they can only be used once and need to be reprinted when new data need to be coded which cause some problems in terms of educational settings (Kato ve Tan, 2005).

Their use in edcational setting are rather in the form of supplementary materials which aim at increasing the efficiency of printed materials (Özdemir: 2010). When considered in this way, QR code technology is advantageous not only being cheap but its potentials. RFID techologies which we utilize in many parts of our lives and contitutes the basis of NFC technology can be used for educational purposes in many ways.

RFID technology is the general name for the technologies which are used to identify things or human by using radio frequencies. This technology which has existed since 1970s is a technology which uses antenna, microchip and reader device and which requires infrastructure investment. Although it is becoming more advantageous in terms of investment cost in these days, its beign easily damaged, affected by environmental factors a lot, and having secutiry gaps result in difficulties while utilizing it. Generally, in the identity cards that are used in bussiness and whi,ch have key function, the RFID technology is being used (http://www.sembolbarkod.net/rfid-nedir/19.08.2016).

To sum up, to be able to use mobile devices for educational purposes and to able to offer mLearning which enables anytime anywhere learning will be significant parts of teaching and learning processes of the future. Moreover, since NFC technology is versatile and has many advantages to be used in educational environments, it is evident that it will have a significant role in the education of future.

History Education in Highschool Classrooms

History is not a satisfiying science in many respects. It consists of unreliable, variable and incompatible parts. Yet, since it is the best in reflecting human, it is an inseparable part of our educational system. Because, it is required to be able understand ourselves and to understand what is happening around us. Also, it can help people find answers for the questions which ask what will happen in the future. Of course, past does not change. But our intentions in terms of perceiving the the past, accepting and canalizing it are continuously changing. Each generation reinvestigates the past according to its interests and worries as far as its abilities and and strenghts allow (Özbaran, 1995, p. 28).

History education has a significant role in bringing up developed individuals in terms of cognitive, personal and social aspects. Shaughnensy ve Haladyna (1985) who condut a study on students' attitutes related to social sciences, state that most of the studetns in all levels find the classes little interesting and unrelated to their personal lives and characteristics. As a result, it is stated that the content should be contextualised in control of the teaher. In history education teacher has a great role and the course book in the mostly used material. It is found out that new materilas hardly employed and an education based instruction and repitition is accepted. In addition in the current understanding of history education, it is important to acquire certain information and students study not for learning but for good grades. Besides, it is stated that the topic are not dealt in accordance with the aims (Paykoç, 1995: 331). It is also stated that the course books used in history classes have some problems in the way the content is delivered (Kabapınar, 1995: 217). As a result, some pedagogical problems arouse which causes students follow only the cronological aspects of the events (Sakaoğlu, 1995: 141-142).

History education has an abstract and verbal characteritics. This causes the biggest diffculty as well. However, 75% of the information we get is processed visually whereas 13% verbally, 6% tactile, 3% olfactory, and 3% by tasting (Küçükahmet: 1995, 23). Edgar Dale designs The Generative Theory of Multimedia Learning with his "Life Cone" (Dale, 1969: 108). Accordingly, only when students actively take part in the laerning activities, the learning can be optimised. Nevertheless, since it is almost impossible to optimise the learning outcomes in history education with available teaching materials, there is a need to develop new ones. In the past, materiawhich could provoke students' imagination were fruwuently used. According to Şimşek (2003) some these can be:

- Radio and voice recordings,
- Visual symbols,
- Films and televison materials,
- Presentation and gamification (Drama),
- Exhibitions and excursions to museums (p. 113-114)

However, form time to time there have been problems with the avaibilty of these materilas. Moreover, it is necessary to utilize materials appropriate to students' ages which causes extra problems in terms of the adaptation of available ones. Besides, because of the cost, some materials could not be developed. Developing technologies enables teachers and students develop their own materials. In this respect mobile

technologies can have facilitative roles. Also, they can enable equality of opportunity for all students. NFC technology can be seen as a part of mobile technologies and has some potentials in educational fields. It can help to embody the historical content and facilitate the process. Because NFC has the advantage of easy sability and is accessible for everybody.

NFC Capable History Teaching Materials

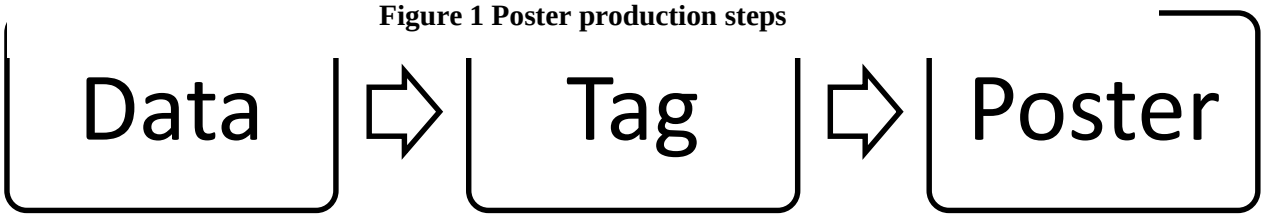
In scope of this study, it was aimed to produce educational materials. Thus, in the first phase, the history teaching materials, posters and maps, which were being used in high schools were investigated. As a result, the posters of Fatih Sultan Mehmet and Kaşgarlı Mahmud (Mahmud ibn Hussayn ibn Muhammed al-Kashgari) together with the map of 14th century Anatolian Principals were chosen to produce NFC capable smart materials.

As the second phase, a content analysis was conducted to determine the appropriate data which would be embedded into the NFC tags. In terms of writing the appropriate data onto the tags, there were several ways to be used in this phase. Depending on the type of application designers could choose one of the two options to embed the data. At this stage the critical factor which needs to be taken into consideration was whether the teachers or researcher wanted to collect the user data. Because if there was no need to store user information, the data can be written on the tags via free mobile applications that can be found in the market easily. When the user activates the tags by using his/her mobile device, the data can be read on the screen. Alternatively, addresses of the related web sites can be embedded into the tags. When activated, the tag diverts students to the desired web-site.

In addition to the above ways of data writing, there are other different methods to embed the data into the tags. However, these are more complicated and requires expertise. For example, an application can be written for this purpose. When user reach the data via this application, data related to user preferences can be collected and stored. As another method, a new web-page can be designed and the content can be uploaded to this page. By using the smart devices users can be diverted to the page. Again in this method the data related to user preferences can be accumulated and stored.

In this current study, embedding the address of an accessible web-page into the tags was chosen as the data writing method. In this way, it was aimed to reduce the costs and increase the usability of the system so that teachers or other possible users of the system who had limited knowledge about the use of smart devices and NFC technology could use the system easily.
In figure 1, the poster production steps are given. In this respect, the link of a video in which Kaşgarlı Mahmud is told and which can be accessed through Turkish Language Institute web page (http://www.tdk.gov.tr/?option=com_dlt&view=dlt&kategori1=videoın) was embedded into the Type 2

Figure 1 Poster production steps



NFC tags by using NFC-Pro application which can be downloaded from Google Play Store for free. Then, the poster of Kaşgarlı Mahmud which were used in a passive way in school environments were taken and the tags were stuck on them in an invisible way. In addition, an informative sign was added to the front side of the poster to indicate that it was an NFC capable smart poster.

Figure 2 NFC capable Kaşgarlı Mahmud poster and informative sign

A similar procedure was carried out for Fatih Sultan Mehmet poster. What was different from the previous poster was that this time a link for the written text was used instead of video. The link for the text (see appendix 1) diverted users to the web page of Turkish History Institute (http://www.ttk.gov.tr/index.php?Page=Sayfa&No=116).

Figure 3 NFC capable Fatih Sultan Mehmet poster and informative sign

Finally, a map which represents the borders of the 14th century Anatolian Principals and which is frequently used in history lessons was chosen. Different from the other posters, separate Type 2 NFC types were stuck to the back side of the poster for each principal. The data related to each principal were accessed through the data base of Turkish National Ministry of Education which is called EBA (http://www.eba.gov.tr). The related links were embedded into tags and users were directed to the related information. For example, a tag including the link for a video which shows the political situation in Anatolia in 14th century was placed behind the title section of the map whereas another tag diverting the users to the page in EBA which included information about Karamanoğlu Principal. For each principal the data was provided in different forms such as lectures, presentations, pictures, texts or videos so that users could reach the data via different channels.

Figure 4 NFC capable 14th century Anatolian principals map and informative sign

All in all, by means of these smart posters it was aimed at making history education materials, which are used in an ineffective way, more interactive. In scope of this experimental study in which students will take part in voluntarily, a questionnaire which will provide data about students' mobile device usage and knowledge and a semi-structured interview which will be carried out with both students and the teachers are going to be conducted. This way it is aimed at collecting data about the usability of the system and whether the system will have an effect on students' academic achievements.

CONCLUSION

Education needs to have an evolving structure. Current educational models need to change according to the present conditions. In addition, the educational materials which have crucial roles in this process need to be redesigned to be able to meet contemporary requirements. In this vein, Mobile technology comes forward as an inseparable part of our daily life because of its potential in educational environments. Recent technological developments one of which is NFC technology facilitate the integration of mobile technology into education context. In current study, history education materials are tried to be improved with a new point of view and by using new technological developments. In this way it is aimed to create a new perspective in terms of classic history education materials. By means of NFC technology, it is possible to provide static information in more interactive ways.

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