The three-quarter moon:
A new model for E-Commerce adoption

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Abstract

One of economic development main drivers is technology. Technology adoption usually results in rapid economic growth, and rapid economic growth is usually accompanied by rapid structural change. It is now widely accepted by policy makers, enterprises and society at large that information and communications technologies (ICT) are at the centre of an economic and social transformation that is affecting all countries. E-Commerce and globalisation have combined to create a new economic and social landscape.

There are many drivers and barriers to E-Commerce. Most issues (Cost, infrastructure, time, information, legislation and regulation, etc) could be drivers or barriers. If a country has managed to achieve a cost reduction greater then the investment made in adopting the new technology then one could say that the cost factor is a driver rather than a barrier. The same philosophy could work with other aspects of E-Commerce drivers and barriers.

A new classification using drivers and barriers could be applied to countries and divide countries according to their technological advancement. The new classification groups countries into non-technologically advanced, less-technologically advanced and technologically advanced. This classification is driven by four main actors (Government, technologically advanced countries, companies and E-commerce users). The involvement of the fourth (E-Commerce users) actor is the result of the other three actors' actions on the economy. These three actors comprise the three quarter moon that encourages the fourth actor to complete the circle of adoption.

The circle of adoption includes three stages that, in order for E-commerce to be adopted, must be dealt with before, while and after adoption. The failure of adoption may be a result of a failure of one issue or a failure of number of issues together. Therefore the Internet involvement formula should help to indicate where the problem lies.

1. Introduction

E-Commerce forms part of a broader process of social change, characterised by the globalisation of markets, the shift towards an economy based on knowledge and information, and the growing dominance of technology in everyday life. This paper examines the drivers, benefits and barriers of E-Commerce to create a new model to help countries to adopt E-Commerce. If government, companies and technologically advanced countries (the three-quarter-moon) work together through set procedures to involve the fourth part (E-Commerce user) to complete the moon, then one could argue that the adoption of E-Commerce is successful. However, to allow a smooth transition to E-Commerce, investments are required in the social infrastructure and employees' skills to allow one to use the technology in a way that is compatible with the local circumstances, cultures and abilities of users in developing countries.

2. Drivers and barriers

It has been argued that the Internet has the ability to lower some of the entry barriers to global trading, e.g., geographical location and differing time zones. E-Commerce is expanding rapidly and has facilitated changes by significantly reducing the costs of outsourcing and co-operation with external entities. E-Commerce has helped to break down the natural monopoly characteristic of services such as telecommunications. E-Commerce is a key technology for speeding up the innovation process, reducing time scales, fostering greater networking in the economy and making possible faster diffusion of knowledge and ideas. E-Commerce has played an important role in making science more efficient and linking it more closely to business. Using the Internet to lower communication costs and reduce time-to-market for goods and services exports makes it a very valuable medium for firms engaged in international trade [1]. The ability of E-Commerce to deliver information of almost any sort in digital format at low cost offers significant efficiencies that firms can pass on to customers in the form of lower prices. It can also help manage supply chains for goods and services in cross-border trade, cutting overheads associated with marketing, transport and distribution. In agriculture, the Internet is providing better information about market prices and has fostered the emergence of new online commodity markets. In construction, it reduces the need for blueprints and allows seamless communications

between subcontractors. In manufacturing, it is generating new efficiencies by reducing procurement costs and improving supply chain management. Its role in the services sector is linked to qualitative aspects of products, such as convenience and customisation, thereby reducing costs and delays and increasing reliability [2][3][4][5][6][1][7].

Given that the underlying technology of the Internet is inherently global, accessible and based on open standards, E-Commerce applications are optimistically being promoted in the developing world as relatively cheap to set up and operate and flexible to configure [8][9]. Since Internet fixed and variable costs are lower and it is a more flexible and richer medium than electronic data interchange (EDI), it is claimed that E-Commerce provides developing country firms with new opportunities to compete globally as it reduces transaction costs and barriers to entry [10][11]. The "optimists" argue that the impact of reducing co-ordination costs will significantly influence global trading relationships [12] and encourage firms to find the best producers regardless of location [13][14].

One could argue that E-Commerce drivers are different from a country to another, Some drivers that seen in some developed country are not yet in many developing countries and in some cases theses drivers in a developed country could be a barrier in other country.

There are a number of barriers to the adoption E-Commerce such as security, taxation or even in some circumstances, too much business for a company to cope with. The top ten barriers to E-Commerce in the United States, in declining order of importance, are security, trust and risk, lack of qualified personnel, lack of business models, Culture, user authentication and lack of public key infrastructure, organisation, fraud, slow navigation on the Internet, and legal issues [15]. In global E-Commerce, culture, organisation, B2B interfaces, international trade barriers, and lack of standards were placed at the top of barriers list [16]. Furthermore, one of the traditional barriers cited by many organisations to growth of *E-Commerce* is the relatively high telephone charge for Internet access the tariffs payable and cost of connection. Other cost such as hardware and web-design remain out of many people's ability to pay for the service. Also [17] that broad level support of the technology is lacking, both in the initiation of E-Commerce project and in the allocation of targeted budgets.

They are further barriers specifically related to developing countries. Accessing the Web is possible only when telephone lines and computers are available, but these technologies are still in very scarce supply in many countries. In addition to this

problem, Internet access is still very costly - both in absolute terms and relative to per-capita income in most developing countries. While computer prices have fallen dramatically over the last decade, they remain beyond the reach of most individual users and enterprises in developing countries [18]. Add to this the human capital cost of installing, operating, maintaining, training and support and the costs often become beyond the means of many enterprises in developing countries. Moreover, skilled personnel are often lacking, the transport facilities are poor, and secure payment facilities non-existent in many countries [19].

Users in developing countries are likely to be engaged in making improvements to their operations, often focusing on production management, financing and accounting, product development and marketing rather then paying attention to E-Commerce and E-Business strategies. Additionally, many Internet users in developing countries do not speak or write good English as well as displaying poor English on websites or in emails. Slow responses generally have the effect of pushing away potential customers [20].

3. The Three-quarter moon

From this examination of the drivers and barriers for E-Commerce, it appears that the main actors in E-Commerce development are government, technologically advanced countries, companies and E-Commerce users. Government helps to build the right foundation and infrastructure for E-commerce adoption. In economic theory, government always plays an important role what ever economic approach the country is adopting [21][22]. Government's role in economic development varies from one country to another. In a country such as Libya, there will be more government involvement then in any other capitalist countries. Therefore the Libyan government needs to establish an improved telecommunication infrastructure, establish a payment system, remove international barriers and build a postal services infrastructure.

However, in order to establish an E-Commerce environment in the country, the need to install and maintain advanced technology will be challenged. These new technologies will have to be provided by more advanced countries. Once the two parties (Government and technologically advanced partner countries) agree on the type of technology to be adopted, then the two parties can work closely together to provide the technology and train government employees to use and maintain the adopted technology. However, government need to bear in mind that technology is developing rapidly, therefore research and development and educational programmes are required in order to keep up to date.

The third main actor in E-Commerce development consists of companies (private or public) operating in the country. These companies clearly play an important role in increasing the number of E-

Commerce users by providing online services and lower prices. They also can provide services such as recruitment and leisure activities. Government and companies have to work closely together in order to achieve these objectives.

A fourth main actor is the E-Commerce user, without whom government and companies would gain no benefit from their investment in technology. E-Commerce users are the forth quarter of the moon and the involvement of these users is very much dependent on the actions of the other three actors. For example, attracting users to a company's website to buy products or use the company's services by offering better prices or giving awards via the web site. Another example is e-government services: if citizens realise the ease of use and the saving of time and money by using government services via the government websites.
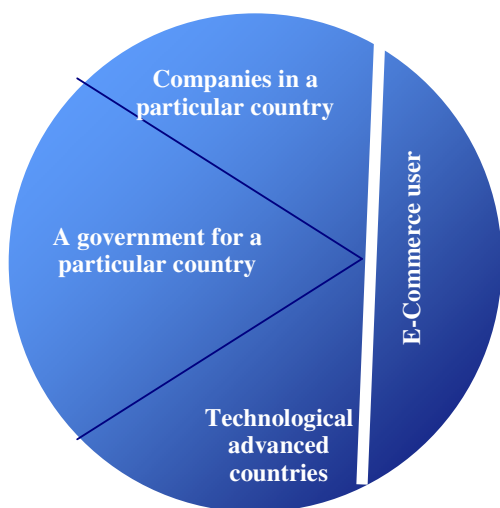

Fig 1. The four E-Commerce actors

These four actors have different roles to play to complete the adoption of E-Commerce in a country. Even though the E-Commerce users are the result of other actors' actions, they still have a role to play in E-Commerce adoption such as culture and religion. If an E-Commerce service in a country conflicts with the culture or religion of that country then E-Commerce adoption may be prejudiced and a bad image of the technology created which will be difficult to overcome. Therefore all four actors have roles to play in the adoption of E-Commerce. This theory suggests that in order for E-Commerce to work smoothly within a country's economy three adoption processes have to be adopted -before, while and after.

The adoption of E-commerce in a country should go through three stages or 'an adoption life cycle'. The three stages should involve all four actors.

3. 1 Before E-Commerce adoption

Before E-Commerce is adopted by a country the following issues should be addressed:

- **Telecommunications infrastructure**: an infrastructure should be built for providing citizens with telephone lines and Internet connection. Digital technology could be used to provide landlines and/or wireless technology especially for rural areas.
- **Postal Infrastructure**: in order for non-electronic products to be delivered to consumers who may have bought them from the Internet, a postal and transportation services infrastructure must be established. This development could be carried out by government or by private delivery services. In either case the government has to think carefully about the way to develop postal services especially for countries such as Libya where there is no Post Code or delivery address.
- **Payment System**: this is an essential part of the infrastructure for economic activities and E-Commerce. The payment system must be established and put in place before E-Commerce adoption to enable users to transfer, receive and pay money without the need to visit a bank. Other related payment system issues such as Point of Sales and ATM machines have to be considered.
- **Legislation and regulation**: regulation should control and manage the way that electronic transactions and activities are carried out in the economic of a country. E-Commerce legislation needs to consider globalisation and the involvement of other countries as well as all economic activities in the country. Removal of import and export barriers is vital to the success of E-Commerce. For example the Libyan government restricts the purchase of products from Israel and even from companies having business activities in Israel. Such restrictions limit the ability of E-Commerce activities to expand.
- **Education and labour training**: Education and training could be delivered in the country by companies from technological advanced countries or by sending citizens to these technological advanced countries. This will enable the country to keep up to date with technologies and the best ways using that technology. Additionally, research and development on the E-Commerce and related subjects should take place before, while and after the adoption, which will help the country to find the best possible way of adopting new technology and keep the development of the economy sustainable.

- **E-Government strategies**: E-Government strategies are additional factor that has to be thought of carefully before the adoption of E-Commerce. E-Government will be one of the main drivers of E-Commerce and will encourage users and other to participate in using the internet.
- **Low cost hardware and software**: This needs to be provided to users before the adoption in order for people to get used to using computers and understand the nature of computer software. Even though hardware and software costs have fallen dramatically over the years, the prices are still out of the rich of many people in developing countries. Therefore government, companies and other technologically advanced countries have to find ways of providing hardware and software. An example of this is the One Laptop Per Child (OLPC) supported by the United Nation to provide cheap laptops to children in developing countries.
- **International trade**: the infrastructure of International trade has to be established that would include many of the above mentioned factors, in order to enable seller and buyers to trade fairly and without any restrictions.
- **Removing barriers for foreign investment**: E-Commerce adoption will bring more new businesses; create new strategies and platforms to do business. Many international companies will have to have branches, representatives, resellers, and after sell supports for their customers. These international companies will help developing the economy of a country. In order for these investors to enter the country, they would have to make sure that there are no barriers to export or import from that particular country, as well as other issues such as taxation, regulation and skilled employees.
- **Establishing E-Commerce department**: One of the main issues of E-Commerce adoption is creating a responsible committee or a department responsible for E-Commerce activities and regulation. This department or committee could be representative of different ministries and departments of a government, or a new department which will work closely with all ministries in that government. It has been argued in Libya that the main issue effecting E-Commerce adoption in the country is a lack of a responsible government department.
- **Lowering Taxation**: lowering taxation on imported and exported products and services would solve the problem of double charged taxation between countries

and encourage E-Commerce users and others which will benefit the government by increasing the activities relating top E-Commerce. Removing taxation barrier will encourage many investors to trade in that particular country which will help in reducing the unemployment and create new business opportunities.

- **Culture, religion and Values**: These have to be thought through carefully before adopting E-Commerce. A country has to make sure that E-Commerce will not conflict with a country's culture and values. E-Commerce actors (government and companies) have to be very careful not to challenge the religion or the culture of a particular country. As an example, selling pornography magazines or Alcohol in Muslim countries will drive many shopper away of that particular business. Even more, a picture of that particular business could be applied to E-Commerce as whole which will effect users' incentive to use the Internet for shopping in the future.

Table 1illustrate the above discussed issues and links them to the responsible actor. For example legalisation and regulations are the responsibility of government, companies and technologically advanced countries in order to be adopted in the economy.

Table 1: Before adoption

Before adoption	Governments	companies	Technological	E-commerce user
Telecommunication infrastructure	Y			
Postal infrastructure	Y			
Payment system	Y			
Legislation and regulations	Y	Y	Y	
Education and labour training	Y	Y		
E-Government strategy	Y			
Low cost hardware and software	Y	Y	Y	
International trade	Y		Y	
Removing barriers for foreign investments	Y			
Establish an E-commerce department	Y			
lowering taxations	Y			
Culture, religion and values	Y	Y		Y

3.2 While adoption

Once the 'before adoption' issues are completed and dealt with, one could argue that the fundamental infrastructure for E-commerce is ready. The completion will be different from country to country depending on the size of the investment and the willingness of actors to improve and establish services. However, countries do not have to wait for full completion of all infrastructure projects. Once a payment system, legislation and regulation are established, and access to the Internet is provided to citizens, government should start stage two of the adoption and should think carefully of the following issues that will develop through the adoption of E-Commerce. This could be summarised as:

- **The needs of using local language in websites**: many users in developing countries do not speak foreign language. If a website is in English then that would limit the involvement of users in the country which will result in poor adoption. Local language will encourage people to use the Internet and create self confidence. People are likely to feel that their language, culture and traditions remain safe and are not adversely influenced.

- **Accept credit cards and international payment**: Services providers and consumers would need to be able to pay for international services and products over the internet. Such a payment system is likely to be provided by an international services provider. This would risk reducing local income to government and local providers.

- **Transaction security**: security is one of the main challenges with E-Commerce, many user do not feel confident that their information would remain safe over the internet. Therefore government, companies and technological advanced countries would need to work hard to secure transaction between sellers and buyers by providing secure platforms and convince users to trust service providers.

- **Encouraging expatriate workers to return from overseas**: adoption of E-Commerce would need more than establishing infrastructure and putting securing and payment system in place. It needs new skilled employees and expertise to help manage and design strategies for E-activities. Training and education of employees overseas or in-house would help but not fulfil the needs of experience. Therefore attracting expatriate to return from overseas and work in the country would result in improving the services. If a country fails to attract their expatriate worker to return, they could full this gap by employing experience and skilled workers from other countries who are cheaper or in similar culture, traditions and values.

- **New strategies**: E-Commerce is a new way of doing business; it is not just having a website for business. New strategies have to be developed and put in place at all organisational levels. Many businesses especially in developing countries would face a challenge of preparing the new strategies, therefore the government of a country and other business should help by providing the services of designing E-Commerce strategies. Most traditional businesses especially in developing countries should ensure that E-Commerce works smoothly with their traditional activities.

- **Change business culture**: government and companies may have to change business culture, E-Commerce has its own organisational culture, a culture that deals with the skills of computers and quick response to emails and customers' enquiries. Change in the strategies of management, marketing, promotion, accounting and finance has to take place.

- **Culture, religion and value**: Culture will be affected over the years from the adoption of E-Commerce. Technology adoption usually combines with culture change. The government E-Commerce department will have to monitor closely the changing culture and address the changes needed in management and strategies to fit with the new culture.

- **Training and Education**: Government and companies should work in developing ideas and training employees in using technologies as well as encouraging research and development to keep up to date.

Table 2 illustrate the while adoption issues and explain which actor is responsible for each issue.

Table 2: While adoption

While adoption	governments	companies	Technological advanced	E-commerce user
The use of local languages in website	Y	Y		
Accept credit card and international payments	Y		Y	
Transaction security	Y	Y	Y	

Encouraging expatriate workers to return from overseas	Y	Y		
New strategies for government and businesses	Y	Y		
Change business culture	Y	Y		
Security	Y	Y	Y	
Culture, religion and value	Y	Y		Y
Training and education	Y	Y	Y	

3.3 After adoption

Once E-Commerce is in place, government, businesses and users are involved in E-Commerce activities. The four E-Commerce adoption actors have to pay attention to other factors that will arise after the adoption of E-Commerce. These factors need to be checked and monitored carefully and could be summarised as:

- **Security**: As mentioned above security always a challenge to Internet and E-Commerce. Government, businesses and technologically advanced countries must to work closely to overcome threat to securities that created from the use of E-Commerce in a country.
- **Monitoring and updating**: monitoring and updating is different from one actor to another. For example, government has to monitor the use of the Internet, generate statistics of the use of E-Commerce and activities, and provide these data to researchers and companies enabling them to redesign and restructure their business activities. Additionally, government needs to update infrastructure, strategies and other related issues according to new challenges and changes in technologies. Companies should monitor their business activities, website visitors and their interest and new technology and development to understand the user's behaviour and be technologically up to date. Thus companies need to update their website with information to keep customers coming back and using the services. Furthermore, technologically advanced countries could help a country to monitor the use of the bought or licensed technology and advice on ways to maximise the use of that technology as well as helping the country being up to date.
- **Online promotion**: companies have to pay attention to online promotions and marketing issues to attract customers to their websites. These customers could be from the same country or from any other part of world.
- **Customer satisfaction and customer trust**: government and companies should satisfy their customers with the services provided. This will generate more use of the service and help in promoting E-Commerce services to other citizens. Additionally, satisfied customers will trust the service provider which will create a special relationship between the provider and the consumer. Thus this relationship will result in more involvement in E-activities.
- **Culture, religion and value** (see section 3.2)
- **Training and education**: (see section 3.2)

Table 3: After adoption

After adoption	Governments	Companies	Technological advanced	E-commerce user
Security	X	X	X	
Monitoring and updating	X	X	X	
Online promotions		X		
Customer satisfactions and customer trust	X	X		
Culture, tradition and value	X	X	X	X
Training and education	X	X	X	X

These three stages of adoption illustrated in the figure below differ from country to country. The adoption will depend on the size of investment a country is willing to invest in the technology as well as the stage of development for infrastructure. The quicker the country act to deal with adoption stages, the faster the adoption of E-Commerce will be and the faster the economy will develop. Many developing countries especially in Africa will face some difficulties in adopting the technology and preparing the infrastructure. This may be due to a gap of investment which could be filled by a foreign direct investment or first aid from developed countries. Another solution could be encouraging private companies to make part of the investment.
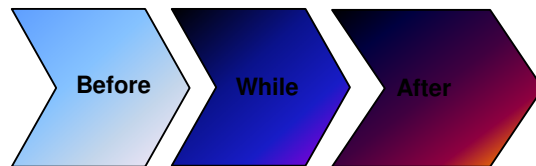

Fig 2.Adoption stages

The three stages of adoption (Before, while and after) are driving by the four E-Commerce adoption actors (Government, Technologically advanced countries, companies, and E-Commerce users). The adoption actors and phases together are completing the digital economic activities in a country and create the complete moon. Each of the four actors has a different role to play. However, the important of an actor is different from one country to another. A

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government in a developing country plays an important role as it controls most of the organisation, banks and services providers. For example in Libya, Internet providers, banks and postal services are run by the government which will limit the effect of companies in the market. Thus government could be counted as the main actor for most developing countries. In other countries such as the USA, that have adopted capitalism and encourage free market and privatisations, companies would play an important part where government are monitoring the adoption and controlling the move of the economy. Additionally, for developed countries such as USA, the role of technologically advanced countries is limited, the reason is that USA is a already a technologically advanced country. However, USA still needs the involvement of other advanced countries because of advancing technology

The result of the three actors' activities (Government, technologically advanced countries and companies) affect the involvement of E-Commerce users and complete the moon circle. For example if government manages to encourage users to use E-government service by providing most services online or reducing cost of services charge online rather then traditional way, then one could argue that users could be positively influenced to engage in E-Commerce activities. The three-quarter moon model describes the whole adoption of E-Commerce in a country. It is called a three quarter moon model to ilstrate the way that the three main actors (Government, technologically advanced countries and companies) encourage the fourth player (E-Commerce user) to get involved and complete the adoption.

The three players should pay attention to culture, religion and value, and training and education over all the adoption stages. The conflict of E-Commerce with the country's culture or religion may drive users away of using the technology. Therefore companies and government should monitor culture and religion over all adoption stages. Further, culture would be affected by E-Commerce activities, so companies and government should work closely to monitor the change in the country's culture and meet the new needs or help restoring some of the culture aspects that may have been affected by E-Commerce.

Additionally, training and education is the responsibility of government, companies, and technologically advanced countries. People in a country should be encouraged to be trained and educated and to carry out research and
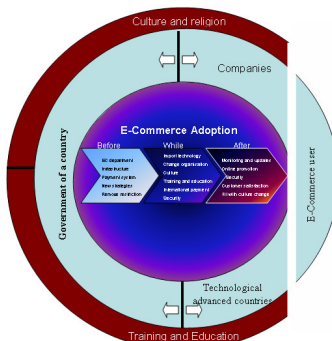
development to meet the rapid development in the world and keep the economic growth of the country sustainable.
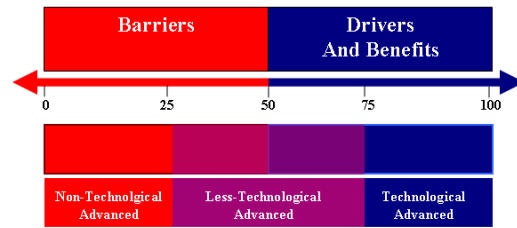
Fig 3. The three-quarter moon model

Fig 4. E-Commerce adoption measure model

3.4 Deploying the three quarter moon model

The question that arises here is how a country can know the level of development needed and where is the starting point for adoption. The Internet involvement formula is the place to start.

$$\text{Internet involvement} = \frac{\text{Number of Internet users in the country}}{\text{Country's Population} - \text{Number of under 5's}}$$

If the result placed a country in the non-technologically advanced classification then the country will have to start at the before adoption stage. This means that a country has no infrastructure to support E-Commerce, or there are some complications for different infrastructures to work together and with other issues such as regulation, payment, etc. Therefore these countries have to re-exam all 'Before adoption' aspects and adopt the new strategies for E-Commerce activities.

If the result of Internet involvement formula places a country in a less-technologically advanced, then the country could start the adoption from 'While adoption' stage. This means that a government has managed to establish the basic infrastructure for E-Commerce which has resulted in a reasonable involvement of Internet users. The government should pay attention to International payment and other aspect mentioned in the 'while adoption' stage to keep user involvement and attract new users to electronic activities.

And finally, if the formula resulted in placing a country in a technologically advanced countries

classification, then the country has managed to establish all the necessary aspect for E-Commerce use, and therefore the country should work carefully with the after adoption stage, satisfying customers as well as other issues such as privacy, intellectual property etc.

3.5 Conclusion

There are many drivers and barriers to E-Commerce. However, most of these issues (Cost, infrastructure, time, information, legislation and regulation, etc) could be drivers or barriers. If a country has managed to achieve the cost reduction greater then the investment made in adopting the new technology then one could say that the cost factor is a driver rather than a barrier. The same philosophy could work with other aspects of E-Commerce drivers and barriers.

However, the classification of drivers and barriers could be applied as a classification for countries and divide countries according to their technologically advancement. This classification of drivers and barrier is driven by four main actors (Government, technologically advanced, companies and E-commerce users). The involvement of the fourth actor is the result of the other three actors' actions on the economy. These three actors are the three quarter moon that encourages the fourth actor to complete the circle of adoption.

The circle of adoption includes three stages that, in order for E-commerce to be adopted, most be dealt with before, while and after. Failure of the adoption may be a result of a failure of one issue or a failure of number of issues together. Therefore the Internet involvement formula should help to indicate where the problem lies.

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