THE INTERNATIONAL MARITIME TRANSPORT & LOGISTICS CONFERENCE
(MARLOG 4)
A SUSTAINABLE DEVELOPMENT PERSPECTIVE FOR MEGA PROJECTS
29- 31 MARCH 2015

CLOUD COMMUNITY IN E-CLUSTERS: TOWARDS SUSTAINABLE LOGISTICS CLUSTERS

M.A.DIWAN

Projects Manager, Integrated Solutions For Ports (ISFP)
23H Dr. Yehia Mashad St. Smouha, Alexandria, Egypt, maha_diwan@hotmail.com

ABSTRACT: The formation of business clusters have long been recognized as having a positive impact on organizational competitiveness. However, there hasn't been enough focus in research literature on logistics clusters. On the other hand, the major advances in information and communication technology are changing the way of doing business. The information wave is giving new dimensions and new scopes for excellence. This paper sheds the light on how using the cloud can have positive impact on the competitiveness and sustainability of logistics clusters. It starts by highlighting logistics clusters. It then moves to introducing e-clusters and their development. It shows important aspects of their formation and their potential for long term sustainability. The paper then proposes how cloud computing can be useful in optimizing logistics e-clusters processes. It also shows how this can have a positive impact on logistics clusters sustainability.

Keywords: cloud computing, logistics, supply chain, shipping, logistics chains

INTRODUCTION

In today's highly competitive economy business clusters play an important role in the economic sustainability and competitiveness of its players. Many industries benefit through clustering. There are several areas where we can realize the user of industrial and business clusters. Meanwhile, the logistics industry role in global and national economy is increasing. The demand for logistics services together with the ever increasing customer expectations are putting pressure on logistics industry players to seek new innovative ways to provide logistics services. On one hand, such innovative ways are needed to meet the market demand and to satisfy the ever increasing customer needs and expectations. On the other hand, there is always a need to maintain and increase the profitability and sustainability of logistics service providers and companies within the logistics industry.

Technological advancements are providing new frontiers for business excellence. Modern communication technologies are cutting short distances and enabling various companies to collaborate together as if they are collocated. Cloud computing is also providing new means of using ICT without incurring upfront costs. It enables sharing and collaboration in a way that never existed before.

Knowledge sharing and management together with the various advanced ways of doing

business nowadays makes it necessary to depend on more flexible platforms.

INDUSTRIAL CLUSTERS

Industrial clusters have long been recognized in economic literature for their positive impact on organizational competitiveness. According to literature the main the main driver was colocation. In 1920, the British economist Alfred Marshal commented on the "positive externalities of co-location" in his book "Principles of Economics"[1]. Almost 80 years later, Michael Porter of the Harvard Business School highlighted the major advantages of industrial clustering regarding increased productivity, increased pace of innovation and a high rate of new business formation[2]. .Industrial and business clusters have been used in several industries. We can find this clear in Silicon Valley and also in Hollywood. Actually there has been a historical trend to use clusters. This can be found clear in the ancient Roman artistic clusters.

So the question that pops up here is why use clusters? The answers are clear. Clusters enable more trust among its players [3]. It also enables tacit knowledge exchange among its partners leading to a better service. Another reason is the collaboration among various players within cluster. Research and education also can benefit by working on research using real data. Also forming a cluster attracts a large number of suppliers thus forming a large supply base[3].

LOGISTICS CLUSTERS

A very special type of clusters is the logistics clusters. Although logistics clusters share the advantages of other types of clusters, yet it is very unique in its way of doing business. Such clusters are the ones recognized with high logistic activities. There is shortage in academic literature in this area.

Logistics clusters usually grow around transportation hubs. Multimodal transport is a very important component within logistics clusters activities.

Logistics clusters have many benefits and advantages. They can be categorized as follows:

OPERATIONAL ADVANTAGES

Logistics clusters participants can benefit from the economies of scope, economies of scale, economies of density and economies of frequency. This can be done through consolidating logistics demand and better coordination of logistics activities. As the cluster grows it attracts more participants and the loop goes on. Also cluster participants can enjoy resource sharing.

VALUE-ADDED ACTIVITIES

Logistics clusters formation gives way for introducing new value-adding activities that add to the economic gain from cluster formation.

ECONOMIC IMPACT

Logistics clusters provide new jobs thus adding value to the economy. It also acts as an economic improvement catalyst attracting new businesses and new players. Logistics clusters are one of the most powerful mega projects nowadays that can boost the economy.

There are many examples of logistics clusters all over the world. Boile et al (2009) review 55 "freight villages," 18 intermodal industrial parks and five industrial parks in Europe, North America and Asia[4].

Table (1) Boyle et al List of Reviewed Logistics Clusters

EUROPE	
Denmark	Denmarks Transport Center, Hoeje-Taastrup Transport Center, Nordic Transport Center, Skandinavisk Transport Center, Taulov Transport Center
France	Rungis-Sogaris
Germany	GVZ-Dresden, GVZ-Bremen NW, GVZ Weil am Rhein, GVZ Nuremberg, GVZ Frankfurt/Oder (ettc), GVZ Osnabruck, GVZ Herne-Emscher, GVZ Kiel, GVZ Kassel, GVZ Hamburg, GVZ Bremen SW, GVZ Rostock, GVZ Koblenz
Greece	Promachon S.A.
Hungary	Budapest Intermodal Logistics Center
Italy	Interporto di Bologna, Interporto Marche, Interporto di Novara, Interporto Quadrante Europa, Interporto di Padova, Interporto di Parma, Interporto Rivalta Scrivia, Interporto di Rovigo, Interporto di Torino, Interporto di Venezia, Interporto di Verona
Portugal	Terminal Multimodal Do Vale Do Tejo S.A.
Spain	Bilkakobo-Aparcabisa, Centro de Transportes Aduana de Burgos, Centro de Transportes de Coslada, Centro de Transportes de Irun, Centro de Transportes de Madrid, Centro de Transporte de Vitoria, ZAL Port de Barcelona, Zona Franca de Barcelona, ZAL Gran Europa, Centro De Transportes de Benavente, Cimalsa, Ciudad del Transporte de Pamplona, Ciudad del Transporte de Zaragoza, Platforma Logistica de Zaragoza
Ukraine	Liski-Ukrainian State Centre of Transport Service
United Kingdom	DIRFT Logistics Park, Keypoint: Swindon's premier logistics park, Kingmoor Park, Port of Tyne, Wakefield Europort, Birch Coppice business park
ASIA	
Singapore	Keppel Distripark, Pasir Panjiang Distripark, Anexandra Distripark
China	ATL Logistic Center Hong Kong, Beijing Airport Logistics park, Shenzhen Pinghu Logistics, Husihai Integrated Logistics Park, Shanghai North-West ILP, Nanjing Wangjiawan ILP, Tradeport Hong Kong
Korea	Gwangyang Port Distripark, Busan New Port Distripark, Gamcheon Distripark
Taiwan	Far Glory FTZ, Taisugar Logistics Park
Malaysia	Northport Distripark-Port Klang
NORTH AMERICA	
US	CenterPoint development in Joliet IL, Alliance TX, Pureland Industrial Complex NJ, Raritan Center NJ, Heller Industrial Park NJ, Hunts Point NY, Winter Haven FL, Mesquite Intermodal Facility/Skyline Business Park TX, Guild's Lake Industrial Sanctuary, Oregon, Dallas Intermodal Terminal/Dallas Logistics Hub TX, Rickenbacker Intermodal Facility OH, California Integrated Logistics Center Shafter CA, Salt Lake City Intermodal Facility UT, Cumberland Valley Business Park PA
Canada	Atlantic Gateway-Halifax Logistics Park

CLOUD COMPUTING: THE IDEA AND BENIFITS

According to the National Institute of Standards and Technology (NIST), cloud computing is defined as ―a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.[6]

DEFINITION

Cloud computing has many definitions. Many studies and research have tackled it. Cloud computing in itself is not a new trend. It has been introduced so many years ago. However, it's the development in technologies and communications that made it come to reality.

"A Cloud is a type of parallel and distributed system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resource(s) based on service-level agreements established through negotiation between the service provider and consumers."[5]

According to the National Institute of Standards and Technology (NIST), cloud computing is defined as ―a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.[6]

Clouds might seem like a combination of grids and clusters. However, that's not the case. Clouds are clearly next-generation data centers with nodes "virtualized" through hypervisor technologies such as VMs, dynamically ``provisioned" on demand as a personalized resource collection to meet a specific service-level agreement, which is established through a ``negotiation" and accessible as a composable service via Web Service technologies such as SOAP and REST[5]

CLOUD SERVICE MODELS

Cloud computing users have access to three types of services.[6] The services are as follows:

Software as a Service (SaaS): It offers implementations of specific business functions and business processes that are provided with specific cloud capabilities, i.e. they provide applications / services using a cloud infrastructure or platform, rather than providing cloud features themselves.

Platform as a Service (PaaS): It provides computational resources via a platform upon which applications and services can be developed and hosted. PaaS typically makes use of dedicated APIs to control the behavior of a server hosting engine which executes and replicates the execution according to user requests (e.g. access rate).

Infrastructure as a Service (IaaS): It provides managed and scalable resources as services to the user through enhanced virtualization capabilities. Accordingly, different resources may be provided via a service interface.

CLOUD DEPLOYMENT MODELS

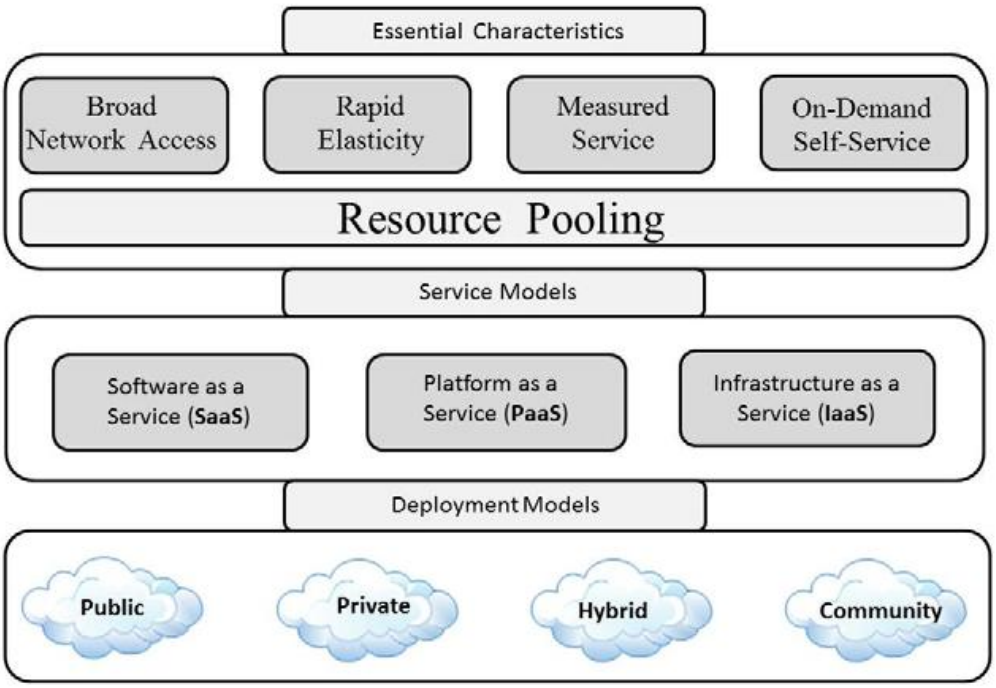

Figure (1) Main characteristics of cloud computing

There are four deployments models for the cloud. The deployment model is chosen according to the business needs and situation. Figure 1 show the cloud service and deployment models. The deployment models are as follows:

Private cloud: The private cloud uses the private network of the organization. It's owned, managed and run by the organization itself, a third party or a combination of the two. It's usually used to support the organization's business strategy and objectives so that it can gain from the economic benefits of cloud computing. Yet it maintains high security and compliance with legislations and regulations.

Public cloud: Enterprises may use cloud functionality from others. Third party providers offer their own services to users outside of the enterprise. Users can benefit from using cloud computing over the internet without having to invest in their own infrastructure.

Hybrid cloud: This type of cloud uses a combination of both private and public clouds.

Community cloud: Through this type of cloud, a community of common interests and aims can share the same cloud infrastructure and applications. Thus, providing such organizations with economics of scale.

E-CLUSTERS

In a series of six papers (2004a, 2004b, 2005a, 2005b, 2006a, 2006b), Ute Hansen of the Ministry of Economic Affairs, Employment and Transport of the State of Schleswig-Holstein in the Federal Republic of Germany developed E-clustering as an innovative approach for economic policy[7,8,9,1,11,12]. According to Hansen, times-markets comprise a major mechanism for the transformation from industrial to information society. Developing rapidly and causing innovations in all industries, times-technologies can be an accelerator for the economic and technological development of a region. The digitization and networking precipitated by the development of broadband infrastructure and applications can push the convergence of different media: information technology and telecommunications industries. Changing business processes, new integrated value-added chains, different organizational structures and innovative products will spur increased employment and economic growth.

E-clustering is a macroeconomic concept of building clusters in TIMES (TIMES - Telecommunication, Information technology, Multimedia, Entertainment, Security) technologies sectors that support a wide concentration of rivals, customers and suppliers as well as their focus on specialization, efficiency and innovation, digitalization of the internal cluster processes and processes between clusters [13]

The geographic area covered by e-clusters can vary. They are usually regional clusters, but also may be national and even international (industrial clusters, clusters of excellence, union of clusters e.g.) [13].

Those e-clusters are defined as "digital enterprise communities enabled by one or more intermediaries and based on a new type of electronically enabled inter-organizational system". The e-clusters use information and communication technologies as a digital platform for cooperation [14].

Figure 2 shows the key drivers for e-clusters. Innovation and organizational knowledge are key drivers for e-clusters. It is through innovation that organizations can increase their profitability and ensures their sustainability. Knowledge management is a key factor for improvement.

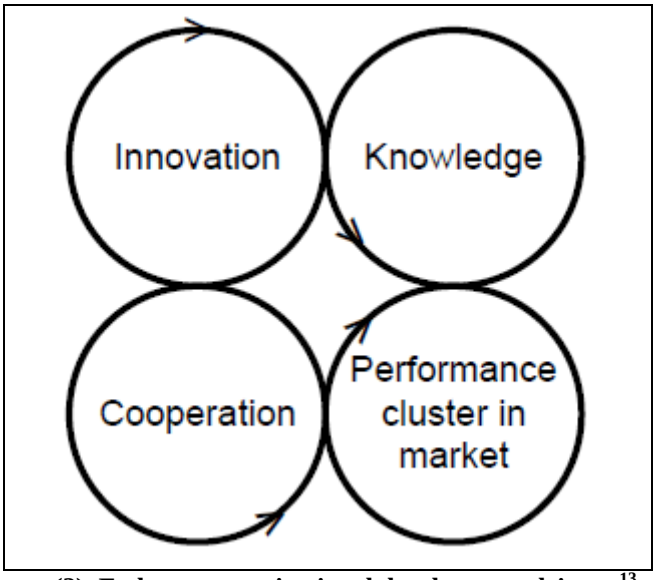

Figure (2) E-cluster organizational development drivers [13]

PROBLEMS WITHIN SOME TRADITIONAL SYSTEMS USED IN THE LOGISTICS SECTOR

E-clusters depend on using information technology ICT to support the interactions between its participants. Though many entities within the logistics industry are depending on ICT, yet there are some problems within the traditional systems used.

First of all, most of the used systems are tailored to the specific use and needs of the organizations using them. Such organizations are not willing to get rid of those old systems. However, such systems are not community ready.

|Another issue is lack of synchronization. Databases are not synchronized in the means required for an e-cluster. There is no real integration among existing systems leading to inconsistency of data. Data entered at one end is not synchronized or updated properly at other participants' systems.

Connectivity among systems is another concern. It depends on "pushing" data. Nevertheless, the high cost of traditional systems implementation and maintenance is another obstacle. Licensing is another issue. Also there are high costs incurred for purchasing electronic devices and also for applying mass customizations. This leaves some middle and small enterprises unable to cope with the rest of the community.

Monitoring and tracking transactions in such systems becomes a very tough mission that cannot be achieved.

CLOUD COMMUNITY IN E-CLUSTERS

With the advancements in telecommunication and technology cloud computing comes

with some solutions to the traditional systems problems. The use of cloud community in e-clusters makes it possible to create an electronic logistics platform which is targeted at a limited set of organizations. This platform provides, inter alia, cooperation of logistics companies, especially to gain access to data about logistics services and supply capacities. It allows to work together in the changing conditions and access resources; software and information are provided to computers and other devices on demand.

At the moment, companies are not activating collaboration as they are traditionally managed like small "family enterprises". This limits their ability to get potential opportunities offered by collaboration with other actors operating in the market.

Cloud logistics platforms used as e-clusters are very flexible. They can be used for short term-contracts instead of old systems that were tailored to long term contracts. An e-cluster can be tailored to the specific needs of its formation.

Also decision makers are now provided with right timely data through e-clusters. Such data cannot be availed before through traditional systems. Accordingly, they can take more informative decisions based on this data.

PROCESSES OPTIMIZATION IN CLOUD COMMUNITY

Cloud computing comes as a remedy for the mentioned problems. It's is expected to contribute to the optimization of enterprises in business processes as well as in IT solutions. From the perspective of a business process, the optimization can be carried out in the field of finance, administration, marketing, human resource management and logistics.

At the moment, companies are not activating collaboration as they are traditionally managed like small "family enterprises". This limits their ability to get potential opportunities offered by collaboration with other actors operating in the market. Cloud community enables better collaboration and more visibility.

This proposed use of cloud community in e-clusters is based on the LOGICAL project and other projects in the EU.

The described logistics platform will run on "a pay as you go" principle. Contrary to ERP (Enterprise Resource Planning) and SCM (Supply Chain Management), this platform will not require significant expenditure on the design, construction and maintenance of the system and applications supporting production planning, logistics and sales.

Optimized used of the resources within the network and better coordination of orders help in performing group purchases. This reflects in lower costs. Actors within the cloud community are considered as a whole even if they are geographically dispersed.

Better utilization of resources ensure no empty transportation runs. Using mutli-modal means of transport help lower costs and time of transportation.

All those factors serve both the customers who benefit from better services and lower costs and also logistics service providers who enjoy lower costs and higher efficiency and profitability.

Tracking and tracing of shipments becomes easy. This enables the participants to observer their consignments in real time and intervene whenever accidents occur.

Another example is the shipment realization order process, which is mostly realized with the use of cloud computing. The preparation of and sending the offer as well as receiving feedback are done automatically in a cloud and are based on the data collected in the previous processes. The forwarding actor's task is to approve the prepared order and pass it on to the realization stage.

Also, the coordination of the transportation process takes place entirely without interference of the forwarding agent. Changes of the transport status are made on the basis of the information received from the carrier automatically and are available to the client [13].

However, there are still some problems facing the adoption of cloud computing. Many organizations are worried about information security. Also the use of cloud computing depends on sound infrastructure communications and networks.

CONCLUSIONS

Based on the current research there are some conclusions that can be applied to the logistics industry:

1. The use of clusters can lead to better efficiency and more collaboration and trust among actors.
2. E-clusters are needed to build on information technology and communications advancements
3. E-clusters can in some cases compensate lack of colocation. The whole e-cluster acts as one entity no matter where the locations of the participants are.
4. Cloud computing for logistics is a very promising means of collaboration and also monitoring and tracking.
5. There are still some worries regarding moving to the cloud.
6. Using community cloud can limit the worries raised regarding cloud security. The cloud will only be available to industry participants instead of going to the public cloud.
7. Investing in communications infrastructure is vital.

REFERENCES

1. Alfred Marshall, Principles of Economics. London: Macmillan, (1920).
2. Michael Porter, Clusters and the New Economics of Competition. Harvard Business Review. Nov-Dec 1998
3. Yossi Sheffi, "Logistic clusters and economic growth", (Feb. 11,2011)
4. Boile, M., Theofanis, S., & Strauss-Wieder, A. Feasibility of freight villages in the NYMTC region: Tast 3- description of how typical freight villages work. Rutgers Center for Advanced Infrastructure and Transportaion. (2009).
5. Rajkumar Buyyaa, Chee Shin Yeo, Srikumar Venugopal, James Broberg, Ivona Brandic, "Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility," Future Generation Computer Systems 25, 2009, pp. 599 616.

6. Mell, P. and Grace, T., "A NIST definition of cloud computing," http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf, accessed Nov. 1, 2011.
7. Hansen, Ute. 2006a. Cybernetics of a regional e-cluster system. In L, Galetić (ed.). Proceedings of the 3rd International Conference on Enterprise Odyssey: Integration or Disintegration (June 15-17, 2006).Zagreb: Faculty of Economics and Business, University of Zagreb
8. Hansen, Ute. 2006b. How to manage and control e-government. In D. Remenyi and Trinity College Dublin (eds). Proceedings of the 6th European Conference on E-Government (April 27-28, 2006).
9. Hansen, Ute. 2005a. Innovation through process oriented knowledge management in a regional e-cluster system. Refereed paper no. 757, ERSA-Congress, Amsterdam.
10. Hansen, Ute. 2005b. E-government and e-clustering: The public sector as a key player in a regional e-cluster system. In D. Remenyi and Trinity College Dublin (ed.). Proceedings of the 5th European Conference on E-Government (June 16-17, 2005). University of Antwerp, Belgium: Academic Conferences Limited.
11. Hansen, Ute. 2004a. E-clustering—an innovative approach for economic policy. Refereed Paper No. 650. ERSA-Congress, Porto.
12. Hansen, Ute. 2004b. Innovation durch prozessorientertes Wissensmanagement in einem e-Cluster. Research Publications 2, Bovenau.
13. Davidović, M.: "Building e-clusters", XIII Business Logistic in Modern Management, Osijek,October, 2013.
14. Arkadiusz Kawa and Milena Ratajczak-Mrozek:" Cloud Community in Logistics e-Cluster" ACIIDS 2014, Part II, LNAI 8398, pp. 495–503, 2014.