International Journal of Engineering &Technology, 7 (3.12) (2018) 1336-1341

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper



Relationship between 'Big Data', 'Internet of People &Thing' and 'Internet of Signs &Things'

Vidhi Sen[1*], Priyanka Mishra[2]

[1,2]Global Institute of Technology, Jaipur (India)
**Corresponding Author Email: [1]vidhisen01@gmail.com*

Abstract

This paper will try to determine the co-relationship exist in between 'Big Data', the 'Internet of People and Things' and the 'Internet of Signs.' Specifically , we will find out various ways through which the 'things' present in the 'Internet of Things' makes 'Big Data', and the various ways through which both are combined in order to form semiotic 'signs'. We will find out how context is important and also the various types of relations that exists in between 'Big Data', the 'Internet of People & Things', and the 'Internet of Signs'.

Keywords: *Big Context; Big Data; Internet of Everything; Internet of People & Things; Internet of Signs;*

1. Introduction

The main objective of the paper is to determine the integration that exists in between the three upcoming concepts: 'Big Data', the 'Internet of Things' and the 'Internet of Signs'. Finally, in this paper we discuss how 'Big Data' can be generated from the 'Internet of Thing' and 'Internet of People &Thing', etc and further 'Internet of Sign 'can be generated from the 'Big Data' and the 'Internet of Things'. Further, we will discuss various type effect each of these, 'Big data', 'Internet' of People &Thing' and 'Internet of sign', three interrelated concepts is having on context and the available information about context through various sources. The term "big data" or "Large data" refers to data sets that are voluminous and complex . This term has evolved to showcase the characteristics, which includes integrating different types of analyses and data. This paper, further reviews all those definitions that already exists and then we will find out the similarities among them .Further, all the definition will be reviewed in order to obtained the contribution of application as the voluminous data or 'Big Data'.[2] .

The 'Internet of Things', come into existance in 1999, and it was considered that the internet depends on human which have limited attention ,time and accuracy for the information so, in order to rectify the human flaws ,there was a requirement to provide the power to the computers through their own means of collecting information, so they can gain the senses like, vision , hear and smell for themselves and therefore , the 'Internet of Things 'becomes the provider of a computer linked programs sets and sensors which is free from the limitations that is been posses by people. However, in some of the contexts it seems as if the 'Internet of Things' is the starting that need to be configured so that we can include inputs from humans and input can further be attached to the internet, finally refer as the 'Internet of Everything' [27]

In this paper we review how does it originally evolved in the beginning i.e. - the original concept of its evolution and which is then further used as an instrument to review context.

The 'Internet of Signs' actually indicates the internet generated data , gained from the various from sources, which includes the 'Internet of Things' devices , social media information and various other internet sources and (e.g. blog), provide 'signs', which includes the 'sentiment' toward some particular issues . The information 'generated signs which is linked with the internet, provides an 'Internet of Signs'. These 'Internet of Signs' generated from the information gain from Internet provides solid data about situations and event[21]

1.1. Motivation

This paper determines the notion of 'Big Data'. We do the various analysis of the 'Internet of Things'. we reviews the semiotics and then we further we examine the concept of the 'Internet of Signs'. we do the analysis on the concept of context and on the various contributions of 'Big Data', towards the 'Internet of Things' and further on the 'Internet of Signs' to bring ease to context. It provides us the summary of some of the solid applications obtained from the integration of these three concepts. Finally in this paper we briefly investigate some extension and examine its contributions.

2. Big Data

The word 'Big Data' is defines as continuous increasing amounts of the digital information, and the various ways to make the available information capable of being analysed. Further, the use of that data as a medium to enhance and improvised the production, facilitating and generating innovation and enhanced decision making. There are various ways via which we can define 'Big Data'. For example, according to the Gartner 'Big Data' is defined as high Volume, Variety and Velocity information that demands such a form of information processing which is cost-effective, innovative for enhanced insight and decision making'. Now, we will further discuss the services offered in 'Big Data' by three most leading vendors namely IBM, EMC and Teradata.

Copyright © 2018 Authors. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

2.1. Volume, Velocity, Variety, Veracity and Value

Volume, Variety, Veracity, Velocity, Value According to IBM publication, 'Big Data' is defined through three V-words': volume, velocity and variety. The word Volume indicates the increasing amounts of data over old settings. The term Velocity indicates that information which is being generated nowadays is being generated at a high rate that is much more then in comparison of the data that is generated in traditional systems. Variety is indicates that there is various types of emerging forms of data which comes under the category of interest to enterprises. Very famous and common example of it is, Twitter, and various social media is a common originator of big data. In the year 2010, Twitter tweets had been calculated more than 75 million data every day and there are 180 million users which was using it. [25]
There was an introduction of new concepts of veracity and volume of value into 'Big Data' by IBM publication which further enhances the definition given by the three V-Words. The word Veracity which is been introduced by IBM publication indicates to the accuracy, reliability and truthfulness of the data but, was difficult to ensure that, especially when the data is been generated from large number of multiple sources. The term 'Value' indicates to the capability of Big Data to provide an improved cost-effective and cost beneficiary addition to an enterprise's technology. It determines whether it is beneficial to use the big data in terms of cost or not. A well structured infrastructure is required for the development of 'Big Data' which can help in gathering, processing, storing and using all the accumulated information. [32]

2.2. Varied and Unstructured Type of Data

EMC posses a perspective which is been embeded in 'Big Data' as a service (BDaaS). It also considers the data variety, less structured data and data complexity. EMC put stress on the fact , that the present data required to be analysed more rapidly than in the past as day by day the current data is rapidly transforming into more complicated ,more varied and less structured, and hence, it has become quit critical to process such data in short duration of time . In order to cope up with such requirements, it is quit challenging task for traditional databases and scale-up infrastructures. In order to meet such requirements, Big Data indicates new scale-out architectures which is been widely used to address such needs. Big Data is parallel processing highly distributed architectures which uses commodity building blocks to manage and analyze the given data. [15]

2.3. WideData, Different Data Structures and Analytics

According to the Teradata with the increase in the number of application, the data generated by such application is exploding and the program written to ingest such a large data is also exploding day by day. It is also noticed that the architecture of that diverse data generated is varied and a function in part, of the program which is responsible for its generation. Therefore, this rising data give rise to the analysis in larger amount which is of different types totally based on data. [3]

2.4. What is 'Big Data'

In this portion we will review and then we will discuss a number of definitions of 'Big Data' mention by the Vendor. The 'Big Data', as currently conceived, is not only the data which is big in volume but it also includes high speed generated data and with which enterprises must be able to cope up. 'Big Data' definitions also show the diversity, unstructured nature and complexity of the data generated. Further, to analyse such a large and varied data we require strong analysing technique, in order to remove equivocality, equivocality is required. The definition from EMC finally put emphases on the fact that the information technology architectures need to be changed, as more parallel processing is required. [1]

3. Internet of Things

The 'Internet of Things' is define as '. . . sensors and actuators inserted into physical objects – from pacemakers to roadways – are joined with each other through wireless and wired networks, using the same (IP) Internet Protocol .which is used to connect to the Internet' . As, on internet different types of 'things' are connected to internet so they can be connected with each other also and all those things that are connected to internet can be sensors ,database ,other devices and software. These devices that are included in the sensor are pacemaker, individual identification devices example (RFID) radio frequency identification pacemaker, location identification devices (GPS) Global Positioning system. Sensors .Information characteristics is been provided by the Sensors, For example different types of sensors are used for different purpose, some are used for the indication of location such as RFID sensors while the other are used for capturing the heart rate such as time pacemaker and other are available for capturing the status of the item that the sensors is monitoring currently. 'Things' can be both intelligent as well as aware of other things and hence .the things must be willing to communicate with the other existing things and hence, the 'Thing' which is willing to communicate, might find the location of the other 'Thing' and then, initiate the exchange of information in order to gather the required information with each other and further communicate the implication of the information which is acquired from it towards the decision maker for example in case of highly combustible Tagged vats of chemical if placed adjacent to each other could leads to spontaneous combustion and hence could communicate ,the obtained conclusion will help and confirm the safety related to storage of all those chemical that are highly combustible. Hence, it would not be wrong to say that 'Things' has the capacity to gain information and knowledge with each other through their interaction and information. Knowledge that is gained could be save locally or it could be pass to the cloud from where it could be accessible to others **.** For example if we consider the use of RIFD in hospital and we will find that in case of the patient the tags , only have the information about the patient number and all the necessary information available about the patient is kept confidential ,by keeping it on the secure server. Now, if we consider the uses of the RIFD in case of the automobile is in the form of tag number only i.e. toll devices .Hence, for the storage ,analysis and processing of the 'thing' information, we got multiple information technology architecture.[5]
'Things' can be classified into three category namely autonomous, semi-autonomous or not autonomous. As the 'things' have the capacity to interact with other 'things' hence, it can become more autonomous. As the 'network effect' can be develop within the things hence the composite of the network and 'thing' can be more then the individual 'thing' and therefore ,the information associated with any one thing is lesser than the information gather from the network**.** . [20]

3.1. Generation of 'Big Data' through 'Internet of Things'

The 'Internet of Things' has the capacity to generate 'Big Data'. The large amount of data is attribute to the 'Internet of Things'. As we already know that the sensors has the capacity to interact with the world. The digital processing is a feasible requirement as the 'Things' is capable of generating volumes and volume of data. When the speed of the traditional transaction processing is compared with the speed of the data that is associated with the 'Internet of Thing', it is found to be explode as the sensors have capacity to capture data continuously. The variety of all the data that is

linked with Internet of things expands with the expansion of source of data and types of sensors.

3.2. How 'Internet of Things' comes into Existence

In today's world maximum number of 'things 'are automation of people and out of all the work that is been done by 'thing', maximum no of work is for and about the people. Hence, it's become really important to put emphasis on the concept which is of more importance then the 'Things'

The approach that would lead to the extension of 'Internet of Things' to 'Internet of People and Things One of the way would be to increase the 'Internet of Things' which help to provide the large base of connection and relationship [31]

The information which is provided by the people includes Sensors that 'represent' People example, capturing other variables and their location .People based information includes Social media which help to provide additional context information. In order to achieve the context information it provides the access and connection to other entity. Moreover, the research have started on "Internet of Everything" where it is assume that Internet is connected to Everything virtually and since they are connected to each other hence, can communicate with everything. In this paper mainly we will discuss Internet of thing. Now let us consider an example in which we see the integration of sensor and data of people.

Let us consider an example which is perfect mixture of both sensor and people data .Nowadays there are large number of information providing sensors present that gives the driver information about traffic on internet .For example the site Sigalert .com provides the detailed analysis of the traffic available at the particular location given by sensors or about the available crowd on the respective Highways .Apart from this, there are certain application available that provide the social data through Social media about the traffic available at the particular location. For example the application software 'WAZE' is used by social media from which we can get the information about the traffic available on particular site by the input or information given by the people on social media ,which includes the input like ,hazard , location of police ,traffic density and various other data that is helpful for the person using the WAZE application. Now, when we Combine ' Waze' with sensor-based media ,then the output obtained by the combination give user very detailed view of the traffic density and the other context such as hazard , police etc .By obtaining the data from the combination, provide improved veracity of data and hence provide the user new detailed value . (SRA, 2009).

4. Semiotics and Generation of the 'Internet of Signs' through 'Internet of Thing' and 'Big Data'

The main motive of this section is to view in short about semiotics and further analyse various ways via which the 'Internet of Things' and 'Big Data' is responsible for the generation of 'Internet of Signs'.

4.1 . What is Semiotics?

However, those signs are normally sticks to cultural and social concerns. The science examines the role of signs as a portion of social life'is termed as 'Semiotics' .Moreover, it says that with semiotics we started thinking of 'our social as well as cultural life as a series of sign systems (Culler, 2005) .

Large no of process is available for the generation of Signs. In form of semiotics wide range of topics is developed by A Theory of Semiotics, which includes written language, formalized languages, text theory, mass communication and other issues. Further, communication is been permeated by Signs. There is a specific disciple for the occurrence of the Semiotics Example economic semiotics and medical .Non linguistic information can also be used to generate the sign. For example, It also include visual communication [13]

Multiple types of signs is capture by the semiotics (e.g. 'symptom signs'). Example, it can be utilized to do the investigation of the 'symptoms' of events and behaviour. It is noted as part of semiotics, the history of the event can be reconstructed .Symptom as a sign of prior cause might be investigated. 'Signs' of potential reasons of behaviours and events is provided by 'Symptoms' and the, changes that occurs in those 'symptoms' also may be occurs in the form of 'signs'.

Semiotics can be defined as study of signs, It can also be define as the science in which we study the various role of the signs which is consider as a part of the day-to-day social life .Finally the semiotics leads us to consider our world which is full of social and cutural life as the series of the signs system .[12]

For example, symptoms signs can have blogs that can be helpful to provide us suggestions that there is something wrong with some product. Using all the information provided by the blog, leads us to find out how can we utilize the data to further provide those symptom and signs**.** For example, on the basis of the information provided, we can gain the 'signs' of Fraud or reputation, bankruptcy, [27].

Number of attempt is been conducted by the 'semiotics', in order to make explicit the knowledge which helps signs to have meaning, using multiple category of information the explicit knowledge has been generated. [8]

Multiple types of analysis is required in order to make the knowledge explicit. The development of explicit knowledge is required to, ease the integration and use with ' the 'Internet of Things 'and Big Data and such knowledge can be access through social media or Blogs[21]

4.2 . Generation of Signs Through Things

Computer based devices are used in large scale to generate the information for people to monitor the devices and further to bring the automation to the task which was done by the people previously . Accordingly, one intension of this paper is to reflect on those 'things' that can be utilised to generate signs. 'Things' are capable of generating large number of measurements which can be further utilize and give insight into signs .For example, sensors used to indicate to the people about the availability of the parking by providing a sign that some event is going on the particular parking place or a facility is busy. Despite of the fact ,that there has been a very less study done on 'things' inside semiotics, the emphases has not been restricted with the 'things' but despite , it has been put on the signs, concepts and symbols that the 'things' represent and present**.** Now if we consider the things then we have discovered that we have the various conceptions, not the things themselves . The thing do not symbolises directly by the symbols**.** When we interact then we are actually interacting with the representations and conceptions of the 'things'. Moreover, the information on which the sign about those things is based, that information is generated by 'things'. A very good example of it can be seen in the stock market where semiotics have used the parameters like price tags, slogans and even slogans as a medium via which it investigates behaviour and events .Hence, we can say that the things are responsible for the generation of sign (Dorsey, 2003).

We have the data about the things and we also have the data about the relationship between the things which further generates the 'Big Data'., which is been discuss in section 4.3

Now, from the point of view of semiotics, more emphasis is given on 'internet of sign' rather than 'Internet of Things'. The focus is put on the fact that how 'Internet of Things' manage to show itself as 'signs' or in other words as 'Internet of Signs' and finding out ,various relationships that exists in between the 'things' and 'signs of things'? Hence **,**finding out various relations between 'things', conceptions of 'things' and symptoms of behaviours

which provides the solid basis for the proper understanding of the events, situations, behaviours and related issues. [18]

4.3 . Big Data Responsible for Generating Signs

The main focus of the semiotics is on the human generated information .Signs obtained from the information which is been generated by human, are embedded throughout the internet, which is been obtained from other data obtained in a wide range, besides sensors. For example, wikis, blogs, comments, Twitter messages, YouTube etc are the signs in different internet media.. All the messages of the twitter is been analysed by the Whatthetrend.com to discover all the issues and events that occurs frequently. Yahoo.com provides us the brief overview of what is occurring in current 'trend**.** Such an overview gain from all the social media activity help us in providing signs as what is presently taking place and what has already happened in future, further giving us information about what situations or events are important**.**
[7]
It was first mention on the twitter , that there is a player of Alabama team that had 'sonly meeting, which shows that the players of the team were not dedicated and focus ' as they were assume to be .Before few minute when the American Football College Championship game in year 2013 was about to begin , Notre Dame Vs Alabama . On the basis of The twit which was mention on Twitter ,the Researchers extracted the implicit knowledge and information that is available in blogs and so on Further, on the basis of those details access from the twitter ,they begun to find out the nature of 'signs' available on those media, with the intension of making signs and knowledge about them more explicit. In order to find out signs of 'sentiment' in blog or with the help of the information gain from the web research 'reputation' done by the researcher. On the basis of it, the potential of sign and indicators of activity is been captured by the data sources. Hence, this research results in the generation of signs. [27]

5. Context

The sets of circumstances or fact through which particular event or situation get surrounded is termed as context .Firstly, let us consider the notions of facts or circumstances Let us consider the case of the 'Internet of Things' or the big data in which ,using substantial data we characterize circumstances and further it will co-occur, pre-occur or post-occur ,according to the situation or event .For the characterization of context, substantial data provide the bases **.** Secondly, around situation or an event, context is defined. Hence, finally the approach was present, to discribe a model which surrounds the specific situation or event that further define context (Schilit & Theimer,1994).
Another example, shows that the very major part of events/context mention us that which resources are nearby i.e. resources, who are with us i.e. adjacent agents and where are you located i.e. the exact location. However, it is been suggested that all those definition mention are too specific and with such specific definition it has become quite complex to count the full set of variables. Context can be define as the information which is used to characterize an entity at some particular situation .Anything that has the capacity of interacting between the user and application is define as Entity for example it could be person, place or object. Hence ,with the intention of capturing and analysing particular situation or event it uses the considarable amount of data present in 'Big Data 'and 'Internet of Things'.[11]

5.1 . Potential Provided By 'Internet of Things' to Capture and Generate Context

The main objective of the "'Internet of Things' is always the Context-based devices. Hence, it is found that the potential required to capture and generate the context about the relevant things is provided by 'Internet of Things 'itself. The context is created by the interaction of one 'Thing' with the other 'Thing 'and the context data is obtained by the various parameter of the 'Thing' namely Time, Date, Location and other issues related to 'Things', Dispite of all studies done so far still, the 'Things' need to study, for the proper assurance of the fact that the information that is captured is appropriate and perfect parsimonious model has been built. For example in order to represent inventory, the RFID tags are used with some expectation and understanding regarding the behaviour as the Tags represent inventory. [16]

5.2 . Big Context Provided by Big Data

The 'pre-occurring', 'co-occurring' and 'post-occurring ' sets of data are used to define the context. Variety of sources generates Data, as per the occurrence of events . In order to capture more Context we need to capture large volume and different type of data .If using the larger volume of data the context is been created then, it would further result in the 'Big Data 'Providing "Big Context'. In such case, 'substantial data could be access by the 'Big Data' in various format by various sources, regarding a specific situation **,** integrated and accesable for the use. If we compare the traditional setting with the 'Big Data' then it been find out that the big data provide more context then the traditional one**.** The most recent work done on the 'Big Data' is to embed the data into the context For example if we consider the case of business based transactions ,all the types of transaction done is stored into the context of business activity examples transaction such as doing the payments , purchase, search ,growth of business , who initiated the business , what is the location of the user etc.[19]

5.3 . 'Internet of Signs' and Context

Insight on the context can be provided by the context of the semiotics. The stress is put on the fact that the context reflects that the sign posses meaning only when it is embeded into big context. The three terms meaningful, intelligible, and reasonable makes the information a part of context .According to the word 'Meaningful' there exist a model which mention the exact functioning of world and further help us in knowing the data in both the context local as well as global. 'Reasonable' is used to the project the behaviour of the data that weather behaviour in the model is fine or not. Further, the relationship between the data and the model is understandable and is reflected by 'Intelligible' [14]

5.4 . 'Larger' Context and 'Local 'Context

The definition of both Larger and local contexts can be facilitated by the constructs such as the 'Internet of Things'. In order to facilitate the analysis, classic network approach is used as internet of things forms the network. The model can act as a base to group the 'Things' example, 'things' related to the inventary may be grouped by truck and trucks could be further grouped by fleets and so on. Multiple relationship is been exhibited by such models example cascading of various thing into a groups and such cascaded groups could be used to define local and larger contexts[14]

6. Applications

Large numbers of applications are available which is based on these concepts. Brief description of all those applications are as follow

6.1 . Continuous Monitoring of the 'Internet of Things', as a Source of Big Data

Let us consider an example in which we consider the patient that is suffering from the history of the heart problem, continues monitoring is done by using RFID tag .Let us consider another example

in which we use sensors in order to gain the knowledge about the availability of parking place which is based on 'Internet of Thing'. The definitional requirement of big data arises due to the continuous monitoring of such data. The Tags generating the larger amount of data leads to the definitional requirement of the 'Big Large variety of information is available to monitor due to multiple types of information. Classic big data is a continuous monitoring environment which results from the information gain from the sensors which are operated in real time, which further speed up the velocity.

6.2 . Continuous Monitoring of Social Media as a Source of 'Big Data'

For different purpose, social media is on continuous monitoring For example, there is a continuous monitoring on blogs and other information to gain the review and to gain the detailed information about a reputation of a particular brand .In such cases the information generated by social media is continuously monitored. The analysis done in such cases is generated by information gain by large range of sources and media and then the analysis is done .which is further defined by high-velocity data , Large volume and variety of different types of data, which further qualifies application as 'Big Data'. [27]

7. Summary

In this paper have done various investigation on the relationship posses by the three upcoming concepts namely: 'Big Data', the 'Internet of People & Things' and the 'Internet of Signs'. The paper has done the investigation on the various reasons for how these three concepts are interlinked and interrelated with each other and ways via which concepts relate to context notion. Finally, the paper applies those concepts to all the existing applications which relay on continuous monitoring.

8. Contributions

The paper put a great stress on the 'Internet of Signs' and argues for the existence of the 'Internet of Signs'. The paper says that the basis for the 'Internet of Signs' is provided by the 'Internet of Things' and 'Big Data'. Further, the existence of the 'Big Data', 'Internet of Thing 'and 'Internet of Signs has been analysed. This paper suggests what are the various reason for the evolution of the 'Internet of Things' to an 'Internet of People and Things', and further to 'Internet of Everything' .Different types of information gain via social media and information of other types are combined into 'Internet of Things'. For example, the line between the data generated through the human and the data generated by machine is increasing due to more modernization. This paper do the analysis of some notions of context, and Further find out various ways through which context get relates to 'Big Data', the 'Internet of People &Things' and the 'Internet of Signs 'and because of the potential availability of Context data ,the 'Big Data' droves 'Big Context'. This paper also mentions that 'Big Data' and the 'Internet of Things' can be further used for development and analysis of contexts. At the end, this paper discusses all those applications that further illustrate the concepts. Such applications includes the unstoppable monitoring on the various areas and using 'Big Data,' visualising information related to location other data .

9. Future work

Future work on the current topic can be done in a number of directions. Firstly, the paper has not involved the investigation on the various functions of classic data warehouse and business intelligence. All the data that is captured and analysed has put more stress on traditional data transaction not with the modern data transaction. Further, the information gather from the 'Internet of People &Things' and 'Big Data' involve other forms of unstructured data and social media can be further combined into business intelligence and data warehouse, which include the 'Internet of Signs'. Secondly, we have observed that sensors have capacity to capture information and then it keeps that information stored either locally or else it store that captured information into cloud-based system. In certain situtation there may be substantial sensor data that needs to communicate. Hence, this research can be further extended to do the analysis when self-storage or communication has to be done. Further, the analysis could be done on the other related architecture-based issues. Thirdly, further the research could be done to understand and infer context. The paper discribe that the sign-based information could be consider for the analysis of context and also certain additional models could be introduce in order to understand the context example, how the local context converts to big context and cascaded contexts. Fourthly, though the 'Internet of Things' has gain increased attention day-by-day but, more stress need to be given to the 'Internet of Signs' and the 'Internet of People and Things'. The research could put stress on the fact that how it could be use in understanding context and for the proper understanding links maintain between various types of signs. Fifthly, large no of new approaches are yet to come to use 'Big Data' to improve auditing or continuous financial assurance as more new upcoming technologies are coming to provide data . Moreover ,as large number increasing volume of data are available and hence new approaches for analysing such data are likely to be required for unstoppable financial assurance and auditing of 'Big Data.'

References

[1] Ashby R, Introduction to Cybernetics,(1965) ,John Wiley & Sons.

[2] Ashton K. (2009), "That 'Internet of Things' thing: in the real world, things mattermorethanideas", http://www.rfidjournal.com/article/view/4986, 22 June (accessed January 2013).

[3] Bawa M. (2011), "Multi-structured data: platform capabilities required for bigdata analytics. Teradata Aster – TheData-Blog",http://www.asterdata.com/blog/2011/06/multi-structured-data-platform-capabilities-required-for-bigdata-analytics/#Citation, 13 June (accessed January 2013).

[4] ChandlerD(2009),"Semiotics for beginners", http://www.aber.ac.uk/media/Documents/S4B/sem02.html" (accessed January 2013).

[5] Chui M, Loffler M, Roberts R.(2010),The Internet of Things. McKinsey Quarterly.pp: 1–9.

[6] Cox M, Ellsworth D. (1997), Managing big data for scientific visualization. ACM Siggraph.

[7] Crowd sourcing (2012),"New signs that Wikipedia began a long decline in 2012", http://www.crowdsourcing.org/editorial/new-signs-wikipedia-began-a-long-decline-in-2012/22895 (accessed January 2013).

[8] Culler J, The Pursuit of Signs. Rout ledge: London and New York.,(1981).

[9] Culler J,The Pursuit of Signs. Rout ledge: London, (2005).

[10] Dey AK.,Understanding and using context, Personal and Ubiquitous Computing 5, (2001), pp : 4–7.

[11] Diebold FX. (2012),A personal perspective on the origin(s) and development of "Big Data: the phenomena, the term and the disciline",http://www.ssc.upenn.edu/~fdiebold/papers/paper112/Diebold_Big_Data.pdf (accessed January 2013).

[12] Dorsey W (2003), "Market semiotics: behavioral market diagnosis",http://www.marketsemiotics.com/docs/pdf/MSBrochure.pd(accessed January 2013).

[13] Eco U(1981),The theory of signs and the role of the reader, The Bulletin of the Midwest Modern Language Association14(1): 35–45.

[14] EMC (2012),"Big data-as-a-service: a market and technology perspective",http://www.emc.com/collateral/software/white-papers/h10839-big-data-as-a-service-perspt.pdf, July (accessed January 2013).

[15] Heil A, Knoll M, Weis T (2007),"The Internet of Things – context-based device federations", In Proceedings of the40th Annual Hawaii International Conference on System Sciences (HICSS 2007).
[16] Hernandez P (2012) ,"App employs context for Big Data analytics efficiency", Enterprise Apps Today, 18 September,http://www.enterpriseappstoday.com/businessintelligence/app-employs-context-for-big-data-analytics-efficiency.html(accessed January 2013).
[17] Langer S,Philosophy in a New Key, A Study in the Symbolism of Reason, Rite, and Art. Harvard University Press: Cambridge, MA ,(1942).
[18] O'Leary DE,1999,REAL-D,: a schema for data warehouses. Journal of Information Systems 13(1): 49–62.
[19] O'Leary DE (2006),"Using mirror worlds to support supply chain management", Applications of Management Science12: 203–217.3.20
[20] O'Leary DE (2008),"Supporting decisions in real-time enterprises: autonomic supply chains", In Handbook on Decision Support Systems 2: Variations, Burstein F, Holsapple CW (eds). Springer: Berlin; 19–37.
[21] O'Leary DE. , Blog mining: from each according to his opinion, Decision Support Systems 51(4): 821–830.
[22] O'Leary DE. 2012a, Knowledge discovery for continuous financial assurance using multiple types of digital information.In Contemporary Perspectives in Data Mining, vol. 1, Lawrence KD, Klimberg R (eds). Information Age Publishing: Charlotte, NC; 103–122.
[23] O'Leary DE. 2012b,"Semiotics and the Internet of Signs", Presented at the IC3K Conference, Barcelona, Spain, October.
[24] Schilit B, Theimer M (1994),Disseminating active map information to mobile hosts. IEEE Network 8: 22–32.
[25] Schilit B, Adams N, Want R (1994), "Context-aware computing applications", First International Workshop on Mobile Computing Systems and Applications; 85–90.
[26] Schonfeld E (2010), Costolo,Twitter now has 190 million users Tweeting 65 milliontimesaday,
http://techcrunch.com/2010/06/08/twitter-190-million-users/, 8 June (accessed January 2013).
[27] Spangler S, Chen Y, Proctor L, Lelecu A, Behal A, He B, Davis T, (2009), COBRA – mining web for corporate brand and reputation analysis, Web Intelligence and Agent Systems7(3): 243–254.
[28] SRA. (2009),"The Internet of Things StrategicRoad-ad-Map",http://sintef.biz/upload/IKT/9022/CERPIoT20SRA_IoT_v11_pdf.pdf.
[29] Swedberg R (2012), Schumpeter's theories f organizational entrepreneurship.InHandbookonOrganisationalEntrepreneurship, Hjorth D (ed.). Edward Elgar Publishing: Cheltenham; 31–48.
[30] Tucker E, Watkins T(2011),"Flash mobs no longer just dance parties and pillow fights, pose growing criminal threat: cops,Huffington",Post,9August,http://www.huffingtonpost.com/2011/08/09/flash-mobs-no-longer-just_n_921973. html (accessed January 2013).
[31] UK Future Internet Strategy Group (2011),"Future Internet Report",May2011,https://connect.innovateuk.org/c/document_library/get_file?folderId=861750&name=DLFE–34705.pdf (accessed January 2013).
[32] Zikopoulos P, Eaton C, DeRoos D, Deutsch T, Lapis G(2012), Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data. McGraw-Hill.
[33] Zikopoulos P, DeRoos D, Parasuraman K, Deutsch T, Corrigan D, Giles J(2013),Harness the Power of Big Data.McGraw-Hill.