

Sustainable Development through Knowledge Management on the Example of Public Utilities Enterprise in IT Environment

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Abstract

Identifying the sustainable development with eco-development and the principles of the concept of social welfare in the long term (strategic), with particular emphasis on the economic and environmental efficiency projects, it is worth to pay the attention to the implementation of these rules to the utilities sector. This problem becomes particularly important in the era of the Information Society and the knowledge economy, where the skillful management of the diffusion of knowledge in subsystems of partners relations platform will foster communities of creators eco-values and commercial values. The purpose of this article is identification of ways to implement the concept of sustainable development through knowledge management in the eco-system of the chosen company, a regional leader in the municipal services sector and its partners, in IT environment.

Keywords: sustainable development, knowledge management, holistic model

Kod JEL: L14

1. Introduction

Sustainable development is frequently identified with eco-development and the principles of the concept of social good in strategic perspective, with special focus on economic and environmental effectiveness of ventures (Cash, Clark, and othr., 2003; Kristjanson, Reid, Dickson, and othr. 2009). It seems that special attention should be paid to the method of implementation of these principles by enterprises from the sector of public utilities. The problem of sustainable development is gaining importance in the period of Information Society, knowledge economy and developing environment of IT solutions where skilful knowledge management, particularly its diffusion in sub-spheres of relationships with stakeholders, favours establishment of the platforms of creators of eco-values and commercial values.

Sustainable development also referred to as stable development or eco-development is a concept in economics that presumes the level and quality of life to be the level as guaranteed by civilizational development in particular time. The idea of sustainable development is summarised in the first sentence of WCED (The World Commission on Environment and Development, also referred to as „Brundtland Commission”) report of 1987 – „Our Common Future”: *“On current civilizational level sustainable development is possible. Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs”*. This definition is based on two fundamental notions: the notion of „needs”, particularly elementary needs of the poorest in the world that should be prioritised, and the notion of limitations, i.e. imposed capabilities of the environment to meet present and future needs through the level of technology and social organisation. The content of the report suggests that achieved civilizational level is possible to be retained on condition of appropriate management in the sphere of economics, environment and social welfare. According to the opinion of the Club of Rome, included in the report entitled „Limits of Growth”, sustainable development of all spheres of human life and activity should be taken care of for the purpose of ensuring further existence of life on Earth and possibilities to meet elementary needs of all the people and future generations. It results from the definition included in standards and also documents of the United Nations that sustainable development of Earth is the development that meets elementary needs of all the people. It preserves, protects and restores health and integrity of Earth eco-system without a threat to the possibility to satisfy the needs of future generations and without exceeding long-term limits of the capacity of the Earth ecosystem (Stappen, 2006).

Therefore Sustainable development represents such an economic growth that leads to social coherence and increase in the quality of natural environment (Gerwin, 2008; Kozłowski, 2005). In Poland the principle of sustainable development is included in clause 5 of the Polish Constitution (Konstytucja Rzeczypospolitej Polskiej Constitution of Poland), whereas

the definitions of sustainable development is comprised in the Act entitled Environmental Protection Law in the following wording: [it is] such social and economic development in which the process of integration of political, economic and social activities is observed, with maintenance of natural balance and durability of elementary natural processes, for the purpose of ensuring the possibility to satisfy elementary needs of individual communities or citizens of both present and future generations (Ustawa z dnia 27 kwietnia 2001 r. Prawo ochrony środowiska: [Act of 27th April 2001 Law of environment protection] Dz. U. [Official Journal of Law] of 2001).

The ways of implement of the concept of sustainable development through knowledge management is very important in the eco-system of the chosen company, a regional leader in the municipal services sector and its partners, in IT environment. It is supposed that, the model of sustainable development through knowledge management in researched firm and partners is multi-subject, multifunctional and multi-tool.

2. Data and Methodology

The goal of the paper is to identify the ways of implementation of the concept of sustainable development through knowledge management in the eco-system of relationships of an example public utilities enterprise and its network partners in the environment of IT solutions.

In-depth case analysis is one of the methods applied in the research¹. This method consists in a comprehensive presentation of a real situation occurring in a particular company or in regard to one of the functions realized within the company (e.g. sustainable development through knowledge management), which is treated as an individual case. It involves seeking for all necessary data enabling its in-depth analysis, formulating possible choice options and making the best possible decision, accompanied by a proper justification. The subject of research is Master – Odpady i Energia Sp. Z o.o. [*Master – Waste and Energy PLC*] in Tychy that provides complex services in the sphere of collection and management of municipal waste. It is one of the leaders in this sector, in Poland. It has the status of regional installation for region IV of Śląskie voivodeship. During research direct interviews with managers of Master and its consortium members were conducted. Furthermore, websites of the companies providing municipal services and the trade organisations such as Krajowa Izba Gospodarki Odpadami [*National Chamber of Waste Management*] (KIGO), Polska Izba Gospodarki Odpadami [*Polish Chamber of Waste Management*] (PIGO), Stowarzyszenie Polskich Przedsiębiorców Gospodarki Odpadami [*Association of Polish Waste Management Entrepreneurs*], Ogólnopolska Izba Gospodarcza Recyklingu [*All-Poland Economic Chamber of Recycling*] and Polska Izba Ekologii [*Polish Ecology Chamber*] were analysed. Specialist trade journals of IT sector, mainly Computerworld magazine and annual issues of Computerworld TOP 200 from the period between 2000 and 2015 were also reviewed.

Table 1. Basic information about performed research

Specification	Characteristics of performed study
Research technique	analysis of Internet pages, analysis of sponsored interviews in journals, direct interviews, analysis of rankings in Computerworld TOP200
Sample selection	purposeful selection 1 promoters of network relationship (MASTER - Odpady i Energia Sp. z o.o. in Tychy)
Sample size	5 sector organisations The best 200 IT firms selected by Computerworld TOP200
Criteria of selection of sample group	purposeful selection, typical entities
Spatial range of research	Poland and global range
Time range of research	2000-2015

3. Sustainable Development through Knowledge Management

The concept of sustainable development is becoming particularly important in the period of knowledge society and knowledge economy where knowledge is the reason and a driving force for comprehensive development of individuals and all economy (Roblek., Meško, and othr., 2014). In this context the notion of sustainable development, in business

¹Application of the method seems justified because:

- 1/ research concerns contemporary, dynamic phenomena and knowledge about these phenomena that is being formed;
- 2/ it concerns research of real contexts of these phenomena at large ambiguity of borders between the very phenomena and their contexts;
- 3/ the subject of the research is too complicated to explain cause and effect relationship by means of the survey method or experiment. (Perry, 2001; Żabińska & Żabiński, 2007).

environment is often approached as the synonym of behaviours associated with success and innovativeness², often of pro-ecological character in relationships with various groups of stakeholders, in the process of creation of systemic values³, in IT environment.

The concept of sustainable development implemented by the entities of network relationships in knowledge environment fits in the model of holistic knowledge management (SET KM Model) that is based on three pillars: (1) company strategy, i.e. strategic concept of organisational awareness, knowledge and learning, (2) environment of knowledge creation, co-sharing and application that is dependent on the company and its partners, and on objective determinants, (3) knowledge tools that are conducive to processes of effective management, including knowledge diffusion (Choo, 1998; Nonaka & Konno, 1998; von Krogh, Ichijo & Nonaka, 2000; Neto, 2008).

Systemic relationships (Creech, Willard, 2001) with all entities of the environment of sustainable value creation, established on the basis of knowledge diffusion, favour implementation of the principle of 3R (*Reduce, Reuse, Recycle*) of the concept of sustainable development. Reduction of use of natural resources and energy, as well as waste (*reduce*) is a desired and rational activity within sustainable development. In the case of waste management these activities can consist in introduction of tools and solutions reducing the use of multi-material, large packaging, particularly these that do not perform usability role, but mainly marketing one, promoting reusable packaging and centres of their purchase. The latter, as well as organisation of the so-called centres of their reuse, lobbying for repeated use of resources (e.g. water for industrial purposes, devices recuperating heat), correspond to the second principle of the concept, i.e. *reuse*. Limited possibilities in the sphere of waste reduction and reuse bring implementation of activities in the sphere of the third principle, i.e. *recycle*. Its execution depends on skilful integration of selective collection of waste with its commercial reuse (Kronenberg & Bergier, 2010).

Considering what has been said, companies providing public utilities services perform the role of the so-called promoters of relationships based on three principles of sustainable development (3R) in the system of relationships with entities representing the environment of suppliers of the stream of waste and commercial use for the purpose of acquisition of sustainable value in the form of balance between social and environmental well-being and the economic effect in long term perspective. Its success also depends on skilful knowledge management in this eco-system that builds awareness, prosumer attitudes and satisfaction from involvement. It also results from competent engagement of IT technology.

4. Eco-system of Sustainable Relationships of the Enterprise Providing Collection and Waste Management Services

Amending the Law on keeping cleanness and order in municipality (Dziennik Ustaw [Official Journal of Law] of 2013), changed the previous way of municipal waste management and the role of public utilities enterprise in eco-system of knowledge-based relationships that serve sustainable development. Ecological result is obtained thanks to reducing the time of application of solutions promoting the use of renewable sources of energy, implementation of selective waste collection, reducing the amount of waste dumped in unlisted landfills, formalising composting of biodegradable waste and the chance for development of areas for recycled resources, including enterprises producing fuels from municipal waste. Considering the content of the Law, public utilities enterprises, particularly of RIPOK type (Regionalna Instalacja Przetwarzania Odpadów Komunalnych oraz Odpadów Zielonych [*Regional Installation of Municipal Waste and Green Waste Processing*]) is gaining the role of creator of the platform of knowledge diffusion that develops awareness, and activates the stakeholders in the process of sustainable values formation.

The studied enterprise – MASTER – Odpady i Energia Sp. z o.o. in Tychy provides complex services in the sphere of collection and management of municipal waste. The company is specialised in waste collection and disposal, selective collection of waste and renewable energy production. Closing the chain of waste management, from production through

²Compatibility of intelligent development and sustainable development found their reflection in the works of European Commission that indicated three priorities in the document *Europe 2020. Strategy for intelligent and sustainable development favouring social inclusion*:

- 1) intelligent development: development of knowledge and innovation based economy;
- 2) sustainable development: support for economy that effectively uses resources, that is more ecologically friendly and more competitive;
- 3) development favouring social inclusion: support for economy of high level of employment that ensures social and territorial coherence. (Europe 2020. Strategy for intelligent and sustainable development favouring social inclusion, 2010)

³More on the subject of formation of systemic values in: Żabiński, 2012

reduction of the amount of produced waste, returning the products of waste management to economy, and finally disposal of food waste that forms a specific type of Eco-system for creation of sustainable values is one of assumptions of the company functioning. This is also because the installation MASTER-ODPADY I ENERGIA Sp. z o.o. in Tychy was given the status of INSTALACJA REGIONALNA MBP [REGIONAL INSTALLATION MBP], i.e. the installation for mechanical and biological processing of mixed municipal waste (MBP) for Region IV. This means processing municipal waste that comes from municipalities located in the southern part of Śląskie voivodeship⁴ (RIPOK). Three major groups of entities are distinguished as participants in this network of relationships in the Eco-system of sustainable value creation.

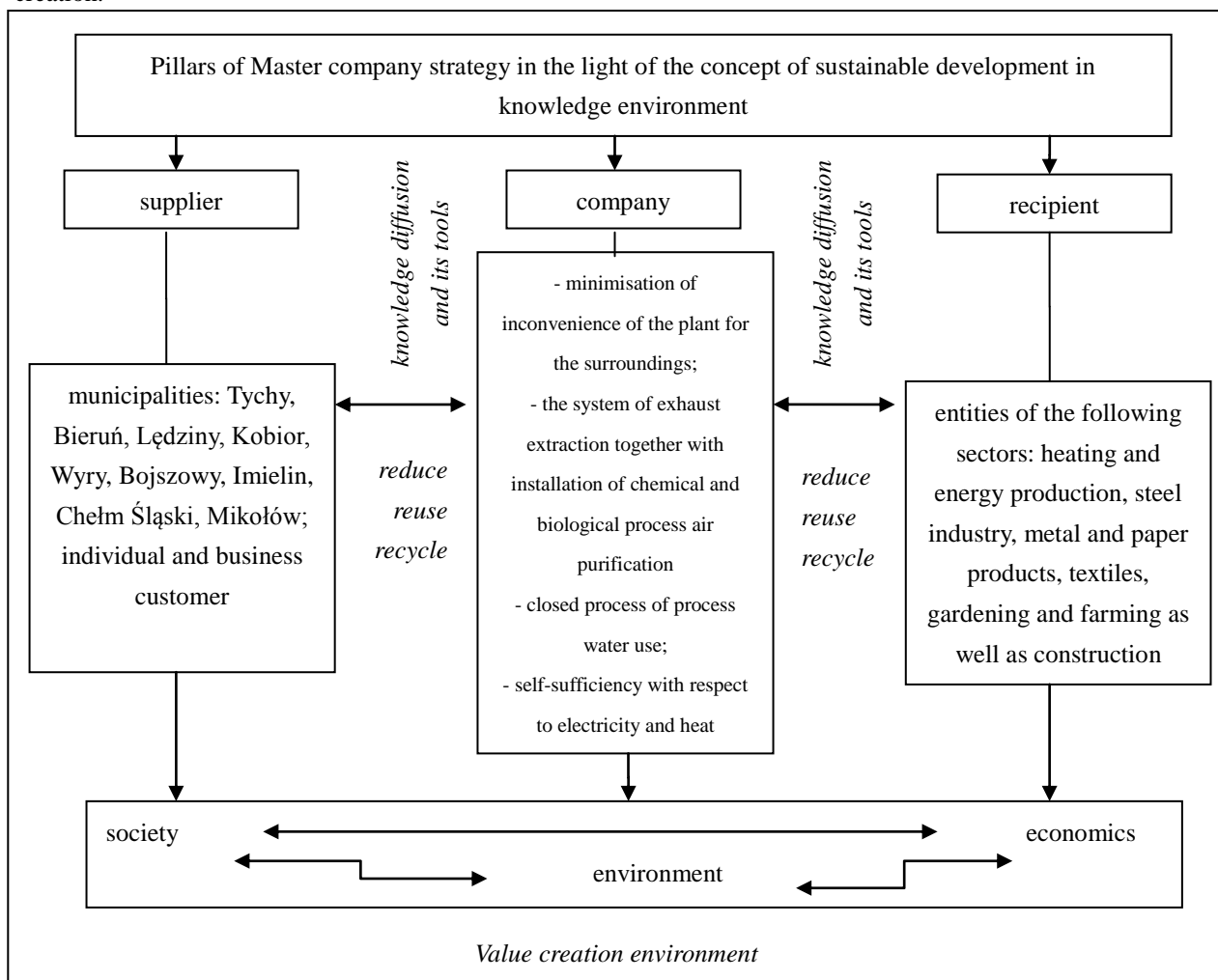


Figure 1. Pillars of Master company strategy in the light of the concept of sustainable development, in knowledge environment

Source: own case study

The company is the implementer of the concept of integral marketing with the elements of prosumer approach to customer. It is a coordinator and creator of value stream for which individual and business customer is the initiator and recipient. This fact proves systemic concept of company activity according to principles of 3R concept of sustainable

⁴With the RESOLUTION NO V/6/21/2015 of Sejmik Województwa Śląskiego [Regional Council of Śląskie Voivodeship] of 16th March 2015 on the amendment to the resolution No IV/25/2/2012 of Sejmik Województwa Śląskiego [Regional Council of Śląskie Voivodeship] of 24th August 2012 in implementation of „Waste management plan for Śląskie voivodeship 2014” the following changes are introduced: in table „List of installations for mechanical and biological processing of mixed municipal waste (MBP)” for Region IV: Installation MASTER-ODPADY I ENERGIA SP. Z O.O. in TYCHY is given the status of REGIONAL INSTALLATION MBP.

development (table 2).

Table 2. Methods of implementation of the concept of 3R sustainable development in studied company

reduce	reuse	recycle
1/ use of the installation of mechanical and biological waste processing that allows to obtain: secondary raw materials (paper, cardboard, glass, plastics, metals) for recycling, – components for production of alternative RDF fuel, biogas from which electricity and heat are produced), stabiliser (compost that dose not meet fertiliser requirements), – soil improver obtained from composting of green waste.	1/ cooperation with prospective construction sector with respect to the possibility to refine construction waste and generate high-quality aggregate, 2/ use of by-products obtained in the process of air purification in the form of ammonium sulphate that might be used as fertiliser in agriculture, 3/ organising and promoting the so-called reuse Centres, 4/ promoting and supporting the network of repairs and reuse, particularly of bulky waste, 5/ solar installations for production of warm usable water, 6/ filling in the empty spaces that occurred after coal mining in protective pillars.	1/selective collection of waste with separation of ash, 2/ organisation of Centres of Selective Collection of Municipal Waste (the so-called PSZOK), 3/ collection of dangerous waste, 4/ municipal waste management, 5/ production of alternative fuels, production of electricity and heat from landfill biogas OZE within installation of landfill degassing and installation of biological waste processing (fermentation) in the Plant. 6/ application of depolymerisation processes that serve processing waste from plastics, the result of which is a liquid fuel component, paraffin oil, 7/ document disposal services with acquisition of recycled paper waste, 8/ gasification of residual waste from plants and sludge from Regionalne Centrum Gospodarki Wodnościkowej [<i>Regional Centre of Water and Waste Water Management</i>]

Source: Own case study

Effectiveness of the company operation is expressed in the recovery and production rate at the assumption of full working efficiency of the Plant⁵.

5. Tools of Implementation of the Concept of Sustainable Development through Knowledge Management on Selected Example

The studied company providing public utilities services establishes the community of sustainable values on the level of knowledge exchange in three subsystems of relationships with stakeholders (fig. 2).

⁵In the case of Master company they are the following annual amounts:

- 10 thousand tonnes of recyclable materials,
 - 10 thousand tonnes of energy producing materials for production of alternative fuels RDF,
 - 10 thousand tonnes of construction waste,
- and production of:
- biogas production in the amount of 1 980 000 Nm³/year,
 - electricity in the amount of 4 000 MWh/year,
 - heat in the amount of 14 000 GJ/year,
 - 15 thousand tonnes of stabiliser for re-cultivation,
 - 2 thousand tonnes of compost from green waste.

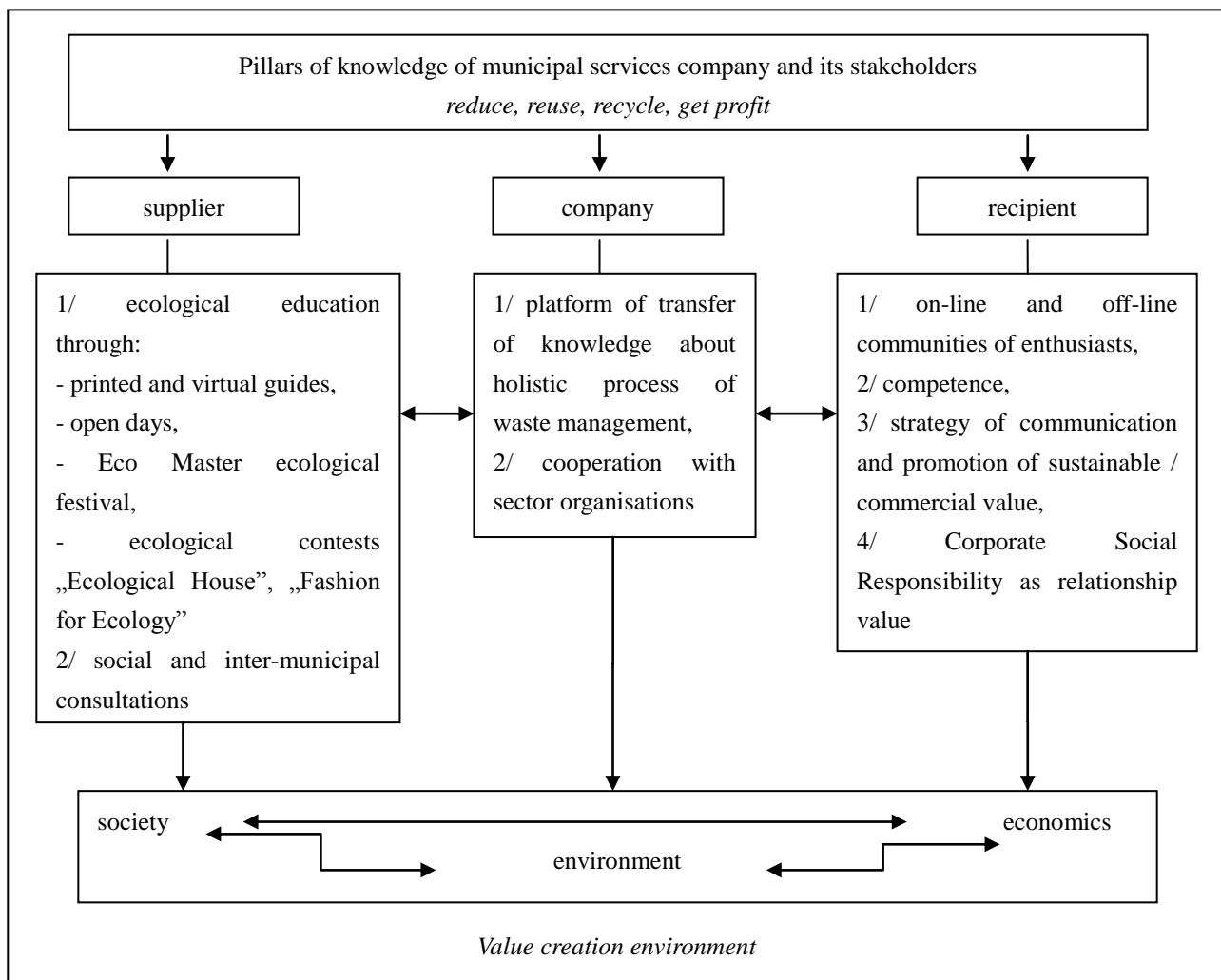


Figure 2. Knowledge pillars of public utilities company and its stakeholders

Source: own case study

Subsystem of relationships with supplier is made of targeted educational actions, and social as well as inter-municipal consultations. The company activates local community to undertake projects of strategic dimension, i.e. establishment of aware pro-ecological behaviours. The major assumption of ecological education in this case is to show the inhabitants of the city and also neighbouring communes of Śląskie voivodeship how important the idea of recycling is and how it can be applied in everyday life through appropriate waste management with special focus on selective collection of raw material waste, electrical and electronic equipment and also batteries.

The company's *task* is to create the platform of knowledge about holistic process of waste management on all levels from local to national and European Union in sub-spheres of all groups of stakeholders from municipal waste suppliers to recipients of commercial products. Suggested tools include platforms of ecological knowledge communities, seminars, conferences, social consultations with co-participation of such sector organisations as Krajowa Izba Gospodarki Odpadami [National Chamber of Waste Management] (KIGO), Polska Izba Gospodarki Odpadami [Polish Chamber of Waste Management] (PIGO), Stowarzyszenie Polskich Przedsiębiorców Gospodarki Odpadami [Association of Polish Waste Management Entrepreneurs], Ogólnopolska Izba Gospodarcza Recyklingu [All-Poland Economic Chamber of Recycling] and Polska Izba Ekologii [Polish Ecology Chamber].

The subsystem of knowledge based relationships with commercial recipient should be based on the so-called on-line and off-line communities of enthusiasts, competence centres with qualified access to knowledge with respect to the value brought to the system, strategies of communication and commercial promotion of sustainable value and activation of relationships on the basis of co-implementation of Corporate Social Responsibility.

6. IT Solutions for Sustainable Eco-system of Public Utility Services

Entities of utilities sector (utility services) aim at achievement of better consolidation and control of key corporate processes including knowledge diffusion and increase in transparency of flow and centralisation of purchase and investments by means of systemic IT solutions. Tendencies that are conducive to investments of this sector in IT include:

- Information Technology and Operational Technology convergence,
- the need to streamline and standardise communication between the participants in utilities market,
- liberalisation of energy market,
- occurrence of multi-product, systemic offers, ,
- increase in the significance of RES (renewable energy sources).

According to the entities of IT sector, the needs of the sector of utilities services concern smart metering / smart grids (intelligent measuring), information hubs, systems for dynamic balancing of MDM network (Meter Data Management), solutions for SMO (Smart Measurements Operators), HAN (Home Area Network), smart management of waste streams and energy at home (Computerworld TOP200, 2007-2015). Oracle Poland, Capgemini Poland, IT.expert, SAP Poland, Unisoft were the largest suppliers of such IT solutions and services for the sector of utilities between 2010 and 2014.

Generally, mobile Internet, smart things (smart waste separators), automation of knowledge-based work, cloud computing for big data, advanced robotics, self-propelled vehicles in landfills, the next generation of genomics, 3D printing, advanced methods of exploitation of raw material deposits and advanced technologies of municipal waste processing into energy are technologies that, according to experts of McKinsey Global Institute will perform an enormous role in social and economic life until 2025. All these technologies are associated with the necessity to provide the possibility to process large amount of data which is the task for companies offering IT solutions and services (Farley, Walker, Harris, 2012).

7. Conclusions

Operators providing public utilities services perform a significant role in implementation of the concept of sustainable development in local and supra-local perspective. They constitute a specific type of catalyser of relationships based on knowledge transfer in three subsystems of holistic model of sustainable development: company subsystem, supplier of waste streams and recipient of commercial value. An enterprise is an implementer of the integral concept of knowledge-based activity while promoting the idea of sustainable development through closing the chain of waste management and obtaining profit. The concept of sustainable development through management of knowledge of the eco-system stakeholders, integrated by companies of utility services, are favoured by IT solutions in the sphere of improvement of the processes of waste collection and processing as well as formation of platforms of knowledge diffusion. The final conclusion is that, the model of sustainable development through knowledge management in researched firm and partners is multi-subject, multifunctional and multi-tool.

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